

**ADVANCED COST AND
MANAGEMENT ACCOUNTING
(DCM24)
(M.COM)**



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Lesson - 1**COST ACCOUNTING : NATURE AND SCOPE - ROLE OF COST ACCOUNTING - ITS RELATIONSHIP WITH OTHER FUNCTIONAL AREAS****Objectives :**

After studying this lesson, you will be able to learn :

- κ Why cost accounting has developed into a branch of study.
- κ The nature and scope of cost accounting.
- κ Role and importance of cost accounting is managerial decision - making.

Structure :

- 1.1 Introduction**
- 1.2 Costing, Cost Accounting and Cost Accountancy**
- 1.3 Scope of Cost Accounting**
- 1.4 Objectives of Cost Accounting**
- 1.5 Role and Importance of Cost Accounting**
- 1.6 Limitations of Cost Accounting**
- 1.7 Objections Against Cost Accounting**
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1.1 Introduction

An effective managerial decision making is possible only when adequate and appropriate information is available. Cost accountancy provides all the necessary cost information to take effective and efficient decisions for cost control, profitability ascertainment and internal and external reporting. Cost accounting is a branch of accounting. It has been developed due to limitations of financial accounting. Financial accounting is mainly concerned with the maintenance of books of accounts for the purpose of the preparation of profit and loss Account and balance sheet. While profit and loss account shows the net result (profit or loss) of various activities carried on by a business firm during a

period, operational balance sheet shows its financial position as on a particular date. However, the information provided by financial accounting system is not adequate to ascertain the operation divisions or units of a firm. There arises the need for cost accounting system.

1.1.1 Limitations of Financial Accounting : Financial accounting has the following limitations which have led to the development of cost accounting :

1. No clear picture of operating efficiency. Financial accounting fails to give a clear picture of operating efficiency. Profits may be more or less not because of efficiency or inefficiency but because of inflation or depression.
2. Showing only the net result. Financial accounting discloses only the net result of the total activities of the business firm. It fails to give the profit of each department, product, process, job etc.
3. Not helpful in price fixation. It does not provide the necessary cost information for price fixation and other marketing decisions.
4. Historical information. It provides information relating to the events which have already occurred. This historical information is not much useful in decision-making.
5. No useful classification of costs and accounts. Financial accounting does not provide for any classification of accounts and costs as direct and indirect, controllable and uncontrollable, on the basis of departments, processes and products etc, because of which management cannot take effective decisions.
6. No useful data for comparison and decision making. It does not provide useful information to management for making comparisons with the past data and also for making various decisions such as introduction of new products, to drop or continue a particular product, to make or buy a product from outside, fixation of product mix, etc.
7. Absence of control on cost. It does not provide for a proper control of materials and supplies, wages and overheads.
8. Absence of standards for performance evaluation. Financial accounting does not provide a well developed system of standards for different elements of cost because of which it becomes very difficult to assess the organisational efficiency.
9. Difficulty in controlling wastages. Financial accounts do not help in controlling material wastages in the form of scrap, pilferage, spoilage and obsolescence.
10. Ineffective reporting. It does not provide adequate information for reports to outside agencies such as banks, government, insurance companies and trade associations.
11. Decision making becomes defective because financial accounts do not distinguish between normal and abnormal costs.
12. Financial accounting information cannot be helpful in controlling various types of labour costs such as idle time, overtime, set-up time etc.

1.2 Costing, Cost Accounting and Cost Accountancy :

Definitions of “Costing” : According to the chartered Institute of Management Accountants (CIMA), London, “Costing is the technique and process of ascertaining costs.”

According to Wheldon, “costing involves the classifying, recording and appropriate allocation of costs of products or services, the relation of these costs to sales values, and the ascertainment of profitability.”

It is evident from the above definitions that costing is a technique and process of determining the cost of a product, cost of rendering a service and cost of performing a function.

Cost Accounting : Cost accounting is the classifying, recording and appropriate allocation of expenditure for the determination of the costs of products or services, and for the presentation of suitably arranged data for the purpose of managerial decision making.

According to experts, “cost accounting is the application of accounting and costing principles, methods and techniques in the ascertainment of costs and the analysis of saving or excess cost incurred as compared with previous experience or with standards.

Thus, cost accounting relates to the collection, classification and ascertainment of cost and its accounting and control relating to the various elements of cost. The terms “Costing” and “Cost accounting” are at times used interchangeably. However, there is a difference between these two. Costing refers to the principles, techniques and methods of ascertaining costs of products and services. On the other hand, cost accounting refers to the formal mechanism of ascertaining and recording costs. It emphasises on formal procedures and systematic recording.

Following are the features of cost accounting :

- i) Cost accounting is a process of accounting for costs :
- ii) It is concerned with cost ascertainment and cost control :
- iii) It establishes budgets and standards in order to compare the actual cost to find out deviations or variances.
- iv) It involves the presentation of right information at the right time to management for planning, control and decision making.

Cost Accountancy :

Cost accountancy is a broader term than costing and cost accounting. Cost accountancy includes costing and cost accounting. According to the Institute of Cost and Works Accountants, U.K., “Cost Accountancy is the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and ascertainment of profitability. It includes the presentation of information derived therefrom for the purpose of managerial decision making.

Thus, cost accountancy is a science, art and practice of cost accountancy. It is a science because it is a systematic body of knowledge having certain principles, which a cost accountant should possess for proper discharge of his duties. It is an art because it requires the ability and skill with which a cost

accountant can apply the principles of cost accountancy to various managerial problems. It is also a practice because a cost accountant has to make continuous efforts in the field of cost accountancy so that appropriate information can be presented to management for decision making.

1.3 Scope of cost Accounting

The scope of cost accounting includes the following activities :

1. **Cost Book-keeping** : Cost accounting involves maintenance of complete record of all costs incurred from their incurrence to their change to departments, products and services. This recording is preferably done on the basis of double entry system.
2. **Cost Ascertainment** : The major function of cost accounting is the ascertainment of cost of products, processes, jobs, services etc. Cost ascertainment becomes the basis of the other managerial decisions, such as, pricing, planning and control.
3. **Cost Analysis** : It involves an investigation into the causes of variances between actual costs and planned or budgeted costs and fixation of responsibility for cost increases.
4. **Cost control** : Another important aspect of cost accounting is utilisation of cost information for exercising cost control. Cost control is the guidance and regulation by executive action of the costs of operating an undertaking. It aims at guiding the actuals towards the line of targets. The cost can be controlled by standard costing, budgetary control, proper presentation and reporting of cost data and cost audit.
5. **Budgetary control** : It refers to the controlling through the establishment of budgets relating to the responsibilities of executives. It involves the fixation of budgets and comparison of actual costs with the budgeted figures.
6. **Cost Audit** : it involves the verification of the correctness of cost accounts and a check on the adherence to the cost accounting principles and rules.

1.4 Objectives of Cost Accounting :

The main objectives of cost accounting are as follows :

- i) **Cost ascertainment.** The main objective of Cost Accounting is to ascertain cost of products, operations, processes etc. by using different techniques and systems of costing.
- ii) **Fixation of selling prices** : After the ascertainment of cost, the prices of different products under different circumstances are determined.
- iii) **Cost control** : This objective is to achieve maximum efficiency in various production activities by exercising control over various elements of cost like material, labour and overheads. Budgetary control and standard costing are the two important techniques useful for cost control.
- iv) **Determining the value of closing stock.** This will help in the preparation of financial statements of the firm without any delay.

- v) Ascertainment of profitability : This provides all the necessary cost data with the help of which profitability of each of the products can be ascertained. This helps the management to take various measures for maximising profits.
- vi) Data base for operating policy : It provides a basis for operating policies such as, cost - volume relationships, whether to close or continue at a loss, whether to make or buy from outside, whether to continue the existing method of production or to replace it etc.
- vii) Data for short term and long-term Decisions. An efficient system of cost accounting maintains all the necessary data required by the management for making short term and long-term decisions.

1.5 Role And Importance of Cost Accounting - Its Relationship with other Functional Areas :

A system of cost accounting plays a very important role in decision making by management. It provides the necessary information to management in discharging various managerial functions. Moreover, it is also advantageous to various other interest groups like employees, creditors, government and the public in general.

1.5.1 Role of Cost Accounting and Its Relationship with other functional areas :

Cost accounting plays a crucial role in performing various functions by management. Its relationship with such managerial functions is as follows :

A. Relationship with Production Function :

1. The choice of location, technology and capacity at project stage is totally based on cost calculations.
2. Installation of a plant is guided by breakeven analysis. If the expected sales are more than the break even level, the plant is installed.
3. It helps in controlling material, labour and overhead costs.
4. It facilitates the determination of the most profitable product mix.
5. Optimum resource allocation is ensured
6. It helps in making various manufacturing decisions, such as, to make or buy a sparepart from outside, to shut down or continue producing a product etc.
7. Production planning and control will be effective because of the use of production budgets.
8. It facilitates inventory control by following various inventory control techniques and procedures for procurement, issue and use of materials.
9. The acceptance or rejection of an order requires preparation of cost estimates for the job, contract or operation.
10. By making the most economical use of production facilities and keeping the costs down, an effective production scheduling is done.

B. Relationship with purchasing :

The following advantages can be had in case of purchasing function :

1. Whether to buy from a nearby source or from a distant source is guided by cost considerations.
2. The determination of Economic Order Quantity (EOQ) is determined by cost calculations.
3. Decisions regarding centralised buying and decentralised buying are made basing on comparative costs.
4. The most economical and efficient purchase procedures are determined by costing department and controller's office.

C. Relationship with marketing :

Cost accounting has the following advantages in performing marketing fuction :

1. Price fixation under imperfect market conditions is done around cost of product.
2. Cost accounting provides information regarding fixed cost and variable cost which is necessary for fixation of pricing under dumping.
3. Comparative cost of selling is useful in the following decisions :
 - i) Whether to sell direct or through intermediaries
 - ii) Determination of channels of distribution
 - iii) Choice of sales territories
4. Cost is an important consideration while deciding the media of advertisement.
5. Comparative costs and revenues are the bases for decisions regarding granting of higher sales commissions to dealers or price discounts to customers.
6. For proper planning of sales product wise and territory wise, sales budgets are prepared.
7. Decisions regarding quality of product and the price level are based on considerations of costs and revenues.
8. Short - term and long-term cost considerations guide all decisions regarding product mix, territories, prices and sales strategies.

D. Relation ship with personnel function :

Cost accounting is related to personnel function in the following ways :

1. Number of workers to be employed is determined on the basis of comparative cost of mechanised and labour intensive production.
2. The labour mix, covering skilled, semi - skilled and unskilled workers, that involves the least labour cost is employed

3. The method of recruitment and training of employees is determined on the basis of costs involved in each method or mode.
4. Promotion and incentive schemes are formulated so as to improve employee motivation and efficiency and bring down labour cost per unit of output.
5. Costing department helps exercising control on idle time, paid holiday and overtime.

E. Relation ship with Finance Funtion :

Various financial decisions are taken on the basis of cost considerations. Some of them are :

1. Project selection is done by comparing the return from the project with the cost of capital.
2. The cheapest source of capital, whether equity, debt, preference capital, is decided on the basis of comparison of cost of each such source.
3. Determination of optimum capital structure i.e. the ratio of various sources of capital like debt and equity, is done on the basis of weighted average cost of capital.
4. Fining of raising capital is also guided by cost considerations.

F. A good system of cost accounting serves the management through its activities in several ways:

1. **Planning** : Planning is thinking in advance in the areas of production purchases, marketing and finance as discussed ealier. Cost accounting provides database for future projections and development of plans or alternative plans to meet anticipated situations.
2. **Decision making** : It refers to the choice of one course of action out of several alternative courses of action available. Cost accounting helps in making decisions which are the most efficient and profitable by providing comparative cost data to management. These choices may include technology, product mix, location, optimum lot size, marketing mix, marketing strategies, personnel policies and capital structure.
3. **Coordination**: It refers to proper synchronisation of various activities like production, purchasing, staffing, financing and selling which is ensured by the process of preparing budgets for all these activities.
4. **Cost Reports** : These are the important communication tools from top to bottom and bottom to top. These reports give a detailed account of cost incurred on each product, service or operation.
5. **Controlling** : It refers to that part of management activity where by managers compare actual performance against the planned performance, find out the deviations and take remedial steps to remove the deviations. It is exercised through standard costing, variance analysis and budgeting.
6. **Efficiency Measurement** : Cost is an important criterion for measurement of efficiency of management in various managerial activities. Generally, the level of efficiency will be higher at a lower cost.

7. **Performance** : Appraisal of each division, sub-division, department, territory etc. is done on the basis of cost comparisons. Cost data plays an important role in the fixation of targets and bench marking against which performance of each segment head can be assessed.
8. **Best use of limited resources** : Cost accounting provides the reliable data of costs with regard to materials, labour and other expenses. This helps management to get maximum output at the minimum cost by making the best use of resources.
9. **Cost Audit** : The operation of a system of cost audit in the organisation will assist in prevention of errors and frauds. It will help to improve cost accounting methods and techniques which facilitate reliable information to the management.
10. **Expansion** : The estimates of cost of production at various levels provided by cost accountant enable management to formulate expansion policies.

1.5.2 Advantages of Cost Accounting to Employees :

A sound system of cost accounting is advantageous to employees, in the following ways :

- i) Employees are in a position to know in advance the efficiency level expected of them, so that they will have clarity of job they are doing. Because of this, under work pressure is avoided.
- ii) Since efficient employees are distinguished from inefficient and efficient people are recognised, it acts as a motivator.
- iii) Efficient workers are rewarded in the form of bonus and other incentive wages.
- iv) A good system of costing promotes prosperity of the organisation, which in turn ensures greater security of service and adequate reward to employees.

1.5.3 Advantages of Cost Accounting to creditors and Investors :

A good system of cost accounting serves the interest of creditors, investors, depositors of banks and financial institutions in the following ways :

- i) Cost reports give better picture of efficiency and profit prospects of the firm when compared to financial statements. Hence, investors can rely on cost reports for effectively judging soundness of firms.
- ii) Cost accounting helps promoting cost efficiency and higher profitability of the firm because of which the interests of trade creditors and lenders are better protected.

1.5.4 Advantages of Cost Accounting to Government and Public Enterprises

- i) Cost Accounting facilitates the assessment of excise duty, income-tax and sales tax and the formulation of policies regarding industry, export import taxation etc.
- ii) It also facilitates the preparation of national plans for economic development.

- iii) It provides ready data for use by the Government for application to problems like price fixation, price control, tariff protection, wage level fixation, payment of dividends or settlement of disputes.
- iv) The efficiency of a public sector enterprise can be best judged by comparing its cost of production with that of its counterparts in the private sector.
- v) Public enterprises lack the personal initiative and interest of private enterprises. A good cost accounting system ensures efficient and effective control through a proper analysis of their working.
- vi) It provides for graded financial control over expenditure and avoids conflict of authority.
- vii) It helps the management in fixing a reasonable selling price for the products manufactured or services rendered.

1.5.5 Advantages to consumers and society in general :

A good cost accounting system is useful to consumers in particular and society in general in the following ways :

- i) The ultimate aim of cost accounting is to minimise cost of production and maximise the profits of business. A part of the benefit of reduced cost is generally passed on to consumers in the form of reduced prices.
- ii) The installation of a costing system will create confidence in the minds of the public about the fairness of the prices charged.
- iii) Cost data facilitates optimum allocation of resources in the society.
- iv) Cost accounting helps spreading environment of cost consciousness in the society because of which wastages are minimised and resources are used efficiently.
- v) Cost Consciousness helps the society in enjoying advantage in exports.
- vi) Cost consciousness promotes overall rate of economic growth and also the growth of employment

1.6 Limitations of Cost Accounting :

Cost accounting is not an exact science. It is an art which has developed through theories and accounting practice based on reasoning and common sense. Cost accounting principles are not static but changing with the change of time and circumstances. Despite its great usefulness, cost accounting suffers from the following limitations :

- i) Cost accounting lacks uniformity. Cost records and reports prepared by different organisations may differ in depth, detail and forms. The assumptions made regarding various costs may also differ. Consequently, cost results of different organisations are not comparable.
- ii) There is a lot of arbitrariness in allocation of joint costs, apportionment of overheads, division of costs between controllable and non-controllable, and determination of overhead absorption rates.

Because of this, computation of cost of the same product in a given situation may be different by different cost accountants.

- iii) There are a number of costs, e.g., notional costs which do not appear in financial accounts. In the same way, there are certain expenses and revenues which appear in financial accounts but do not appear in cost records. This necessitates reconciliation of financial profits and cost profit.
- iv) The contribution of cost accounting for handling futuristic situations has been limited. It needs to be supplemented by various statistical tools.
- v) Small and medium size firms cannot afford to establish a good cost accounting system because it is very costly. Only big firms can use this.
- vi) Cost accounting by itself does not reduce cost. Cost reduction is the outcome of a large number of factors, such as, production engineering, technology, location, recruitment and placement policy.

1.7 Objections Against Cost Accounting :

Despite the various advantages of cost accounting in all functional areas of business, a number of objections are raised against the introduction of costing on various grounds. Some of the important objections are given below :

1. **Expensive :** Installation of cost accounting system involves considerable expenditure both at the stage of introduction and for maintaining the cost accounting department efficiently. As a result small organisations cannot afford it. But this argument ignores that a small organisation can also afford a costing system by going for simple inexpensive system which is suitable to its needs.
2. **Requires competent costing staff :** It requires technically qualified and trained staff for collecting, analysing and interpreting cost data, and accounting staff is generally not competent to handle this work. But the fact is that every specialised activity requires qualified staff.
3. **Inapplicability :** Another objection is that modern methods of costing are inapplicable to many types of industries. It cannot be applied with advantage to trading and concerns of small size. But it should be clearly understood that there is no stereo typed system of costing which can be applied to all types of industries and the system of costing should be devised to suit the business.
4. **Not successful in many cases :** Another argument is that costing system is defective as it failed to produce the desired results in many cases. Bt the failure cannot be attributed to the system alone. Apathy or indifference of the management, lack of adequate facilities, non-cooperation or opposition from the employees may be some of the causes for the failure of a system.
5. **Involves large number of forms and rulings :** It is argued that cost accounting system requires the use of large number of schedules, forms and reports. Because of this large paper work, the very essence of the system may get lost. But this is not the fault of the system. It is the fault of the way in which the system is maintained. Forms and rulings required for the system must be revised and up-dated in the light of altered conditions.

6. No necessity : It is argued that industries prospered in the past when there was no cost accounting system and only financial accounting provided the information for decision making. Hence there was no separate need for cost accounting. But in the modern days, the size of business organisation is large and they are run under heavy competition, and cost efficiency has become a must. Hence, a full-fledged cost accounting has become a necessity.

Thus, it is evident from the above that there are no genuine objections to cost accounting and all of them are ill-founded.

1.8 Summary

Cost accountancy provides all the necessary cost information for efficient and effective managerial decision making and also for cost control, profitability ascertainment and internal and external reporting. It has been developed due to limitations of financial accounting. The information provided by financial accounting system is not adequate to ascertain the operational efficiency of the organisation. Hence, there is the need for cost accounting system. Cost accounting relates to the collection, classification and ascertainment of cost, its accounting and control relating to the various elements of cost.

A good system of cost accounting serves the management in performing various functions like planning, coordination, controlling and in making various managerial decisions. It is also advantageous to employees, Creditors and investors, government, public enterprises, consumers and the society in general. However, the costing system suffers from certain limitations and all these have to be kept in mind by the cost accountant so as to make the system successful.

1.9 Key Words :

Costing is the technique and process of ascertaining costs

Cost Accounting. It relates to the collection, Classification and ascertainment of cost and its accounting and control relating to the various elements of cost.

Cost control. It is the guidance and regulation by executive action of the costs of operating an undertaking.

1.10 Self - Examining Questions :

1. "Need for cost accounting arises due to limitations of financial accounting". Discuss
2. What is cost accounting ? Explain the nature and scope of cost accounting.
3. Explain the role and importance of cost accounting in managerial decision making.
4. Explain objectives of cost accounting
5. What is cost accounting & Discuss the advantages of the system to various people.
6. Discuss Managerial uses of cost accounting.

7. "Cost accounting is important not only to a business, but also to the government and society in general". Discuss.
8. What are the limitations of cost accounting ? Can there be genuine objections to the installation of cost accounting system ?

1.11 Suggested Readings

1. C.T. Horngren - Cost Accounting - A Managerial Emphasis
2. S.P. Jain & K.L. Narang - Advanced cost and Management Accounting.
3. D.K. Mittal & Luv Mittal - Cost Accounting.

Lesson - 2

INSTALLATION OF A COST ACCOUNTING SYSTEM STEPS - DIFFICULTIES IN INTRODUCTION OF COST ACCOUNTING SYSTEM

Objectives :

After studying this lesson, you will be able to learn.

- K Characteristics of an efficient cost accounting system
- K Steps involved in the installation process
- K Practical difficulties involved and steps to overcome them.

Structure :

- 2.1 Introduction**
- 2.2 Characteristics of an efficient cost Accounting system**
- 2.3 Steps for installation of cost accounting system**
- 2.4 Practical difficulties in installing a costing system**
- 2.5 Steps to overcome, practical difficulties.**
- 2.6 Summary**
- 2.7 Self-Assessment Questions**
- 2.8 Suggested Readings**

2.1 Introduction

A cost accounting system is a set of plans, programmes, procedures and documentations designed to accumulate costs, assign the same to various cost units and report cost information to management at all levels. It assists management in planning, control and ascertaining profitability and making optimum utilisation of physical and financial resources for achieving organisational objectives.

Installation of a costing system requires thorough examination of all aspects of the organisation. While installing a costing system management should ensure that it retains all features of an efficient cost accounting system as discussed below and the system meets all its objectives efficiently.

2.2 Characteristics of an efficient Cost Accounting system :

An efficient cost accounting system should meet all its objectives and achieve all the advantages of a good cost accounting system. It should possess the following characteristics and should be taken into consideration at the time of installation of a cost accounting system.

1. **Suitability to the business** : Cost accounting system should be made to suit the specific needs of an organisation, division department even a product line. The system should be designed according to the needs, requirements and size of the business. It should supply the necessary information for running the business efficiently.
2. **Simplicity** : The system should not be complicated. It should be simple and capable of being understood by the costing staff without much difficulty.
3. **Flexibility** : The cost accounting system should be designed in such a way that it may be flexible enough to be changed according to the fast changing conditions and circumstances of business and industry. Thus, the system must have the capacity of expansion or contraction without much difficulty.
4. **Cost Effective** : The system should be economical both in installation and operation. The benefits to be derived from the system must be more than the costs involved. It must be adapted according to the financial capacity of the business.
5. **Comparability** : The costing system should provide all the necessary facts and figures to the management for evaluating the performance by making a comparison of these figures with the past figures of the same concern or those of other concern or against industry as a whole or other departments of the same concern.
6. **Timely presentation of information** : The system should be capable of providing accurate and timely information so that the management can make decisions for effective cost control.
7. **Minimum changes in the existing organisation structure** : The costing system must not disturb much the existing system of delegation and division of authority and responsibility. The system should be designed in such a way that it requires as minimum changes as possible in the organisational set-up.
8. **Uniformity of forms** : All the forms, proformas, procedures etc. used through out the organisation should be uniform in size and quality of paper. This avoids confusion and leads to quicker and better understanding of cost data by staff in different departments.
9. **Minimum clerical work** : Since most of the workers are not well educated, forms and procedures should be designed in such a way that clerical work is reduced to the minimum.
10. **Effective control on materials** : As materials usually account for a greater proportion of the total cost, there should be an efficient system of stores control.
11. **Adequate control on labour cost** : There should be well defined procedures for recording of time, preparation of wage sheets and disbursement of wages. There should be strict control on idle time, holiday with pay and overtime.
12. **Departmentalisation of overheads** : There should be an effective system of collection, allocation, apportionment and absorption of overheads so that ascertainment of accurate cost is possible.

13. **Reconciliation of cost and financial Accounts :** Cost accounting should be designed in such a way that it is possible of integrate or reconcile both cost accounting and financial accounting systems. This can be done through control accounts.
14. **Defining duties and Responsibilites of Cost Accountant :** Under a good system of cost accounting the rights, duties and responsibilites, of the cost accountant should be clearly defined. Because of this, he is able to know clearly whom he should approach, which information and which cost reports are to be made ready for whom by what time.
15. **Timely availability of cost reports :** The system should be designed in such a manner that cost reports and other cost information are made available as and when required.

2.3 Steps for installation of cost accounting system :

While installing a cost accounting system in an organisation, the following steps should be taken:

- i) **Design to suit Specific Needs :** The objective to be achieved through the costing system should be determined. If the objective is only to determine cost, the system will be simple and if the objective is to provide information to the management for decision making, the system will have to be elaborate.
- ii) **Deep study of production details :** Before installing the system, the management should make an in - depth study of the nature of business, products and processes, technologies, plant layout, nature of materials used, labour force etc., so that the cost accounting system is tuned to the requirements of the business.
- iii) **Determining the structure of Cost Accounts :** After a thorough study of the manufacturing process and the ancillary services, the system of cost accounting suitable should be determined. The structure of the system of cost accounts should follow the natural production line. The designing of the system should be such that there is a gradual build up of the cost at each significant stage of production as the product proceeds to completion.
- iv) **Cost - benefit study :** Before installing cost accounting system, a cost benefit analysis should be done. The benefits from the system should far exceed the costs involved. Even the best system becomes useless, if cost exceeds benefit.
- v) **Detemination of overhead Rates :** This involves classification of cost into direct and indirect and grouping of indirect costs into production, administration, selling and distribution overheads calculation of overhead rates and methods of recovery of overheads.
- vi) **Cooperation from the staff :** The success of a cost accounting system depends on the cooperation obtained from all the staff concerned. Hence, before installing the system the need, the benefits and intricacies of the system should be explained to all the staff concerned. This helps in removing apprehensions in the staff and getting cooperation from them.
- vii) **Support from management :** cost accounting system will be effective and can achieve the desired results only when management at all levels, particularly top management, extends whole hearted support both in installation of the system and in its operation.

- viii) **Minimum necessary changes in the existing set-up** : Only necessary modifications should be made in the existing organisation structure. This will help bring down cost of installation to the reasonable level. A wholesale change in the organisational structure will not only be very costly but also will disrupt the functioning.
- ix) **Not competitive system** : Cost accounting function is supplementary / Complementary to the accounting function. It should not be made competitive. Collection and reporting of information available from accounting department should not be duplicated in cost accounting department.
- x) **Organising the cost office** : It is advantageous to locate the cost office adjacent to the factory because the delay in routing out documents or in clearing up discrepancies and doubts is avoided. The costing staff should have access to works so that they can perform their duties properly. The size of staff should be decided on the basis of volume of work involved.
- xi) **Trained and qualified staff** : Since cost accounting is a specialised activity, before installing the system, adequately qualified staff should be recruited and they should be provided with intensive training. It helps in running the system effectively.
- xii) **Codification** : All costs of all products relating to all departments should preferably be coded. This will increase speed in handling and processing of costs. It also facilitates computerisation of costs.
- xiii) **Cost Audit** : Records prepared by costing department should be subjected to regular cost audit. It ensures correct compilation and maintenance of cost accounts and strict adherence to the costing principles laid down.
- xiv) **Relationship of cost office to other departments** : The costing department should function independently. The cost accountant should be responsible only to the top management-the managing director or the general manager. The costing system should be designed to serve the management at all levels. Therefore, the cost accountant should design his whole system of records and reports etc., with this purpose in view.
- xv) **External Environment** : Basically cost accounting system is designed to serve the needs of the management within the organisation. However, these financial needs are influenced by various external factors like, legislative changes, governmental policies, price level changes, technological advancement etc. Hence, while installing the costing system and monitoring its operation, all these factors should be taken into consideration.

2.4 Practical Difficulties In Installing a costing system :

A cost accountant may face a number of practical difficulties in the process of installing a cost accounting system. They are :

1. **Lack of Support from Top Management** : In most of the cases, one important practical difficulty is lack of enthusiasm and support from top management because they are not fully convinced about the benefits from the system. The system is often introduced by managing director or chairman without consulting the departmental heads, because of which the departmental managers treat it as an interference in their work.

2. **Resistance from the Existing Accounting staff** : Whenever a new system is introduced resistance is natural. The existing accounting staff may feel that they would lose their importance and it is a threat to their position in the organisation.
- 3) **Resistance and non-cooperation at other levels of organisation** : Production staff like foremen, supervisors and other staff and people at different levels in other departments may also resist the introduction of costing system because of their fears that there will be additional paper work and they may be subjected to additional controls due to this system.
- 4) **Shortage of Trained staff** : There may be a shortage of trained and well qualified staff. The work of costing department which involves cost analysis, cost control and cost reduction cannot be handled without the availability of trained staff.
- 5) **High cost of operating the system** : Unless the costing system is properly designed according to the requirements of each case specially, the cost of operating the system may be heavy.
6. **Failing to keep the system up-to-date** : The world has become competitive and the needs of business and industry are fast changing. But, in many cases, there is a failure to keep the system up-to-date so as to make it suitable to the changing needs of business and industry.

2.5 Steps to Overcome Practical Difficulties :

The above practical difficulties involved in installing a costing system and during its operation can be avoided by due care. The following steps are suggested to overcome those difficulties :

- i) **Support from the top management** : There must be wholehearted support and commitment to the system from the top management, before the installation of cost accounting system and during its operation. This will create cost consciousness and interest in cost improvement among various people in the organisation.
- ii) **Utility to the existing staff** : The existing accounting staff should be convinced about the need to supplement the existing financial accounting system. They should be informed and convinced about changes going to take place in their jobs and the new opportunities going to be created for them because of the new system.
- iii) **Creating confidence in workers** : Workers, Confidence in the system should be created so as to get their cooperation before steps are taken to put the system in practice. For this purpose, various employees should be properly educated regarding the benefits which can be obtained from such a system.
- iv) **Imparting Training to Existing Accounting staff** : The existing staff working in the accounting department of the organisation must be given proper training in costing methods and techniques. The help of the institute of cost and works Accountants of India may be taken for this purpose.
- v) **Designing of the system to the requirements of the organisation** : The costing system should be installed and operated as per the requirements of a concern, avoiding additional unnecessary work as far as possible. Because of this, the system may not entail heavy cost on the concern.

- vi) **Proper supervision** : After the installation of costing system, there should be proper supervision to make the system successful. There should be continuous efforts on the part of the cost accountant to achieve the desired goals of cost ascertainment, cost control and presentation.

2.6 Summary

Installation of a costing system requires thorough examination of all aspects of the organisation and the management should ensure that the system retains all features of an efficient cost accounting system and meets all its objectives efficiently. The cost accounting system to be installed should be suitable to the business needs, simple and flexible enough to be changed according to the fast changing conditions of business and industry. The installation of the system will be successful when there is a wholehearted support from top management and cooperation from the existing accounting staff. The staff should be properly trained and confidence should be created in the workers. Then only the installation of the system and its operation will be effective.

2.7 Self - examining Questions :

1. What are the characteristics of an efficient cost accounting system ?
2. Explain the steps to be taken to install a cost accounting system ?
3. What are the practical difficulties that may be faced by a cost accountant in the process of installing a cost accounting system ? Explain the steps to overcome them.

2.8 Suggested Readings

1. C.T. Horngren - Cost Accounting - A Managerial Emphasis
2. S.P. Jain & K.L. Narang - Advanced cost and Management Accounting.
3. D.K. Mittal & Luv Mittal - Cost Accounting.

Lesson - 3

PRODUCT COSTING APPROACHES

ABSORPTION COSTING Vs DIRECT COSTING

Objectives :

To explain the Procedures of Absorption costing and Marginal Costing
To familiarise you with the advantage and limitations of both absorption costing and marginal costing and explain utility of marginal costing in managerial decision making.

Structure :

- 3.1 Absorption Costing**
- 3.2 Concepts : Variable costing, Direct costing and Marginal Costing (M.C)**
- 3.3 Merits of Marginal costing (elaborated)**
- 3.4 Absorption costing vs Variable/Marginal costing**
- 3.5 Profit calculation under Marginal costing**
- 3.6 Profit calculation under Absorption costing**
- 3.7 Merits and Limitations of Absorption costing**
- 3.8 Place for Marginal costing**
- 3.9 Definition on - Marginal costing**
- 3.10 Nature of Marginal costing**
- 3.11 Merits and Limitations of Marginal costing**
- 3.12 Income determination under both Absorption and Marginal costing**
- 3.13 Marginal Costing And Differential Costing**
- 3.14 Marginal cost Equation**
- 3.15 Premises of Marginal Costing**
- 3.16 Utility of Profit Volume Ratio**
- 3.17 Improvement in P/V ratio**
- 3.18 Marginal Costing and Planning for profit**
- 3.19 Margin of Safety**
- 3.20 Break Even Analysis**
- 3.21 Marginal Costing as a Managerial Decision Making Tool**
- 3.22 Problems**
- 3.23 Key Words**
- 3.24 Self - assessment Questions / Exercises**
- 3.25 Further Readings**

3.1 Absorption Costing VS Direct Costing :

Absorption costing is also referred to as full costing. Absorption costing is a costing technique in which all manufacturing costs variable and fixed are considered as costs of production and are used in determining the cost of goods manufactured and inventories. All manufacturing costs are fully absorbed into finished goods. The fixed production costs are treated as part of the actual production costs. Stock and cost of goods manufactured are valued on a full production cost basis. In absorption costing fixed overhead is viewed as a product cost, not a period cost. In this costing technique, product cost, manufacturing cost and inventories cost all have the same meaning and are used to describe production costs. All manufacturing costs, variable and fixed are charged to products ; material and labour costs by direct measurement and identification with products; and fixed manufacturing overhead by some method of apportionment which seems to provide an equitable cost assignment. Thus we find in the stock valuation and cost of goods manufactured, such costs accounting department. When the stock is sold in the next accounting period, these costs are released and matched with the revenue of that period.

3.2 Concepts : Variable costing, Direct costing and Marginal costing :

Variable costing is a costing technique in which only variable manufacturing costs are considered and used while valuing inventories and determining costs of goods sold. That is only variable manufacturing costs are considered as product costs and are allocated to products manufactured. These costs include direct materials, direct labour and variable factory overhead. Fixed factory (manufacturing) overheads are not considered as product costs and are not used to value inventories and determine the cost of goods sold and are excluded from the cost of product. Fixed manufacturing costs are treated as period costs in variable costing i.e., costs which are function of a time rather than of production. These fixed manufacturing costs are necessary to provide only facilities and are the costs of maintaining a readiness to produce or service to which they relate. These costs are not affected by changes in the quantity of product manufactured and therefore are considered as expense of the period and written off to profit and loss account in the period they are incurred. Some examples of fixed manufacturing overhead are plant depreciation, supervisors salaries, property taxes, insurance, etc.

The Variable costing is referred to frequently in practice, by different names such as direct costing, marginal costing. However, the use of term variable costing is the most appropriate. The term 'Direct costing' refers to those costs which can be identified and traced directly to the units of output. The word 'direct' implies a high degree of traceability and in this regard, both variable and fixed costs can be direct product costs are all costs which can be traced to the department including supervision, depreciation and other fixed costs as well as variable costs. Variable costing is a more appropriate term because it emphasises 'cost variability' and it requires that distinction should be made between fixed and variable cost.

Variable costing also differs from prime costing in which only direct materials, direct labour and direct expenses are considered for inventory valuation and variable factory overhead is excluded. The prime costing method is based on a weak theoretical concept and is not acceptable for external reporting.

The use of the term 'marginal costing' interchangeably with the term 'variable costing' is also not appropriate. In fact the term 'marginal costing' and 'marginal cost' originated first in the area of

economics. These terms in Economics mean the aggregated costs expected to be incurred when the production quantity is increased or decreased by one unit. In Economics, therefore, marginal costs include both fixed and variable costs resulting from producing an extra unit if producing an additional unit results in an increase in fixed costs as well. Increase in fixed costs may be due to situations such as appointment of additional supervisor or increase in capacity due to purchase of additional machine. Clearly, therefore the term marginal costing has a different concept than that of variable costing which considers only variable production costs in all situations and never considers fixed costs as in marginal costing.

Some argue that if an extra unit is produced, the costs which could be incurred for producing this extra unit will be only variable costs as fixed costs remain constant. In this way, marginal costing may be interpreted in the same manner as variable costing. However, the use of the term 'marginal costing' in accounting will create confusion because the economists have been using this term as having accepted definition in economics. Therefore any attempt by the accountants and accounting practitioners in using the term marginal costing (assuming their own or restricted concept) will not bring clarity to the interpretation but only add more confusion.

It should be further understood that the terms incremental costing, differential costing imply similar meaning as that of marginal costing. It is better, therefore, not to use these terms also when referring to variable costing.

Variable costing is not a distinct method of cost determination as job or process costing are. It is simply a technique where the cost of goods manufactured is composed only of variable manufacturing costs, those manufacturing costs that increase or decrease as the volume of production rises or falls. This technique of variable costing can be used simultaneously in all methods of costing including job or process costing. Besides job or process costing, variable costing can be used in historical (actual) cost system and standard cost system. With a standard costing system, scientific estimates of an efficient level of performance are established.

By applying variable costing to standards, business enterprises have an excellent tool for managerial decision making.

3.3 Merits of Marginal Costing (Elaborated)

The Variable costing technique is generally considered as a basic requirement for many of the planning, control and decision-making activities a manager faces. Income statements and inventory valuations using variable costing provide useful insights and guidelines for internal managerial tasks and purposes. The variable costing provides many advantages, some of them are discussed below.

A) Planning and control : Financial planning requires managers to estimate future sales, future production levels, future costs etc, Sales forecasts determine production plans, which in turn determine the level of expenditures required for raw materials, direct labour and variable manufacturing overhead. In order to determine the level of expenditures at different production levels, knowledge of cost behaviour and distinguishing between fixed and variable costs is essential for making accurate cost estimates at the different levels of production and sales. Thus a financial plan will highlight expected production level and related expected costs. This financial plan can be used to monitor the actual performance as it is done. In case actual performance is different from the budgeted activity

level, corrective action can be taken by management. Thus, control is exercised by management through taking corrective actions. But, for the control function to work and succeed, costs should be divided into fixed and variable components which is achieved only under variable costing and not under absorption costing.

Absorption costing ignores cost behaviour and is not able to isolate and relate accurate costs to different sales and production volumes. It is not reliable because of the arbitrary allocations of manufacturing overhead. These allocations may not reflect accurate charging of manufacturing overhead to different production levels.

B) Managerial Decision - Making : Management require knowledge of cost behaviour under various operating conditions and business decisions. The identification and classification of costs as either fixed or variable, with semivariable expenses properly subdivided into their fixed and variable components, provide useful framework for the accumulation and analysis of costs and further making decisions. Relevant costs are required for a variety of short term decisions such as changes in production levels, make or buy, entry into new markets, product mix, plant expansion or contraction or special promotional activities. Therefore, projection of future costs and revenues for different activity levels and use of relevant cost decision making techniques are facilitated and highlighted in variable costing and not in absorption costing. The utility of variable costing rests upon the fact that, with in a limited volume range, fixed costs tend to remain constant in total when activity level changes. Under such conditions, only variable costs are relevant in ascertaining costs of additional output and sales or in other short-term decisions.

C) Product Pricing decision : Variable costing provide more useful information to management for pricing policies than absorption costing. It is rightly contended that the best or optimum price is that which produces the maximum excess of total sales revenue over total cost. The optimum production volume is that at which increase in total cost due to the addition of one more unit of volume is just equal to the increase in total revenue or a zero increase in total profit. The price at which this volume can be achieved is the optimum product price. A higher price will decrease the sales revenue, a lower price tends to increase the sales volume and leads to abnormal production costs due to overtime, production inefficiencies, etc. Variable costing serves as the basis of product pricing in many cases. Under variable costing, management has the data to determine when it is advisable to accept orders if other than normal conditions exist. In some cases, a sales order can be accepted even if it contributes partly to fixed costs. New short term business orders should be accepted as long as the variable cost of making and selling are recovered. Variable costs represent the minimum sales price under these conditions. Any price above this minimum selling price contributes an amount towards covering fixed costs and providing operation income. Variable costing provides data that emphasise these relationships. Knowledge of the contribution margin provides guidelines for the most profitable pricing policies. However, the full cost and not only the variable cost should be the basis of product pricings in the long-run. The full cost which includes variable manufacturing cost and fixed manufacturing cost incurred in the production process. In the long-run no cost remains constant and all costs are variable

D) Cost Control : For the purpose of cost control costs should be pooled into separate variable and fixed totals. Separation of variable and fixed costs supports the use of standards, budgets and responsibility reporting to help management in controlling costs. All costs are controllable in the long run by someone within a business enterprise. But they are not all controllable at the same level of management. For example, supervisors in production department are responsible for controlling the

use of direct materials in their departments. They have no control, however, over insurance costs related to the production department building. For a specific level of management, controllable costs are costs that it controls directly and non controllable costs are costs that another level of management controls. This distinction, as applied to specific levels of management, is useful in fixing the responsibility for incurrence of costs and then for reporting cost data to those responsible for cost control.

The variable costing includes only variable manufacturing costs, which varies with change in the volume of production in the cost of product and thus makes variable manufacturing costs controllable at cost centre level by operating management. Fixed production costs may not be controllable at department level and therefore should not be included in the production costs at cost centre level, as it is important to match control with responsibility. The fixed manufacturing costs are reported as a separate item in the variable costing income statement as they are easier to identify and control (by a Higher level of management) than when they are spread among units of product as in absorption costing. Similarly, under variable costing, each other variable and fixed operating expenses (e.g. variable and fixed selling and administrative expenses) are reported separately and thus become easier to identify and control than in absorption costing where they are not reported separately but combined together.

E) Inventory Changes do not affect Profit : In variable costing, profit is similarly a function of sales volume only. But under absorption costing sales and production (Production creates inventory) both influence profit of a period. Profit in variable costing is not affected by changes in inventory as it is in absorption costing. In absorption costing, profit may decline although sales have increased. When inventory levels fluctuate greatly, profits calculated under absorption costing may be distorted since stock changes will influence the amount of fixed manufacturing overheads charged to an accounting period.

F) Avoiding the Impact of Fixed Costs : Variable costing avoids the arbitrary apportionment of fixed factory overheads and also avoids problem of determining a suitable absorption basis which is needed for a predetermined overhead absorption rate. Fixed production costs are charged to the period in which they are incurred and are not carried forward in stock which may be unsaleable, resulting in earlier profits being overstated. It is argued that managerial decisions can be easily made if fixed production costs are separated and are not mixed in inventory or cost of sales. Since most fixed costs are committed and cannot be avoided, these costs should not be part of inventory.

G) Performance Evaluation of Managers : The evaluation of managers is often linked with the profitability of units they manage and control. The changes in income from one period to another and difference between the actual income and budgeted income are used to judge managerial performance and efficiency. For example, if a manager has worked hard and has increased sales while controlling costs simultaneously income will increase indicating the success and better performance of manager. The variable costing income statement does not generally show any association between sales and income. For example, under absorption costing income may decrease although sales have increased or sales may decrease but income reported may be higher due to large inventory being created due to higher production. Variable costing always produces an increase in income corresponding to the improved sales performance.

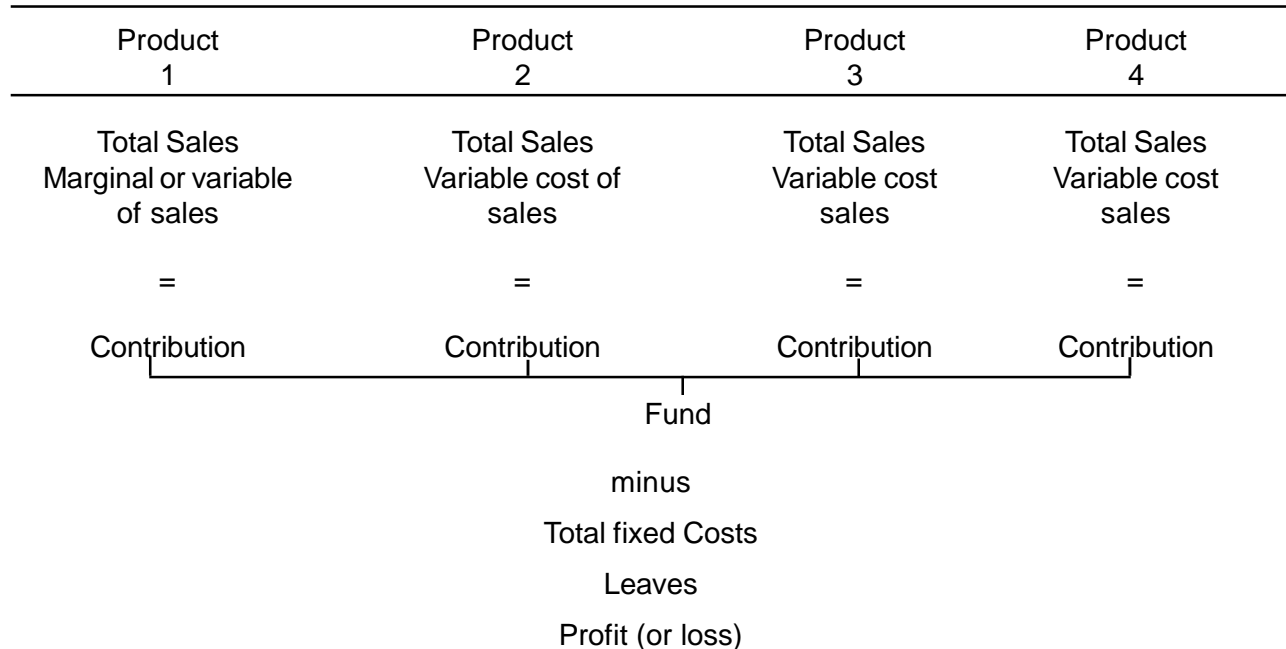
Furthermore, the variable costing can be used to evaluate the profit contributions of plants, product lines and sales territories. The separation of fixed and variable costings which are basis to variable costing is critical for making accurate evaluations. Thus, variable costing can make a significant contribution to management decision making in such and similar areas.

3.4 Absorption Costing and Variable costing :

Criteria	Absorption costing	Variable costing
1. Separation of Costs	Costs separated into those which can be traced to the cost centre (i.e. allocated costs and those which cannot be traced, which have to be apportioned using some arbitrary bases	Cost need to be separated into variable cost and fixed costs. This is not always an easy task
2. Product Costs :		
i) Variable production costs	Included	Included
ii) Fixed manufacturing costs	Included	Included
iii) Other costs	Written off direct to the profit and loss a/c, e.g. administration cost, selling cost and research and development expenditure, fixed and variable both.	All costs (except variable production costs are traced as period costs, i.e. written off in the period to which they relate
3. Stock valuation :		
i) Variable costs	Included	Included
ii) Fixed manufacturing costs	Included (carried forward to next accounting period	Excluded (not carried forward to next a/c period)
4. Recovery of costs	Attempts to make sure that all manufacturing costs are recovered. However, there is likely to be an under or over-recovery of overheads because absorption rates have to be predetermined.	Uses only costs which can be traced to the product. Avoids having any under or over recovery of manufacturing overheads.
5. Profit	Computed as gross profit and net profit	computed as contribution and net profit
6. Decision Making	Unsuitable The costs can never really be described as accurate	Suitable The costs used are realistic and more accurate
7. Reporting	Recommended for external reporting	Recommended as being more meaningful for internal reporting
8. Makes use of budgeted figures	yes	yes

3.5 Profit Calculation Under Marginal Costing :

Profit is known as 'Net Margin'. Net Margin is arrived at after deduction fixed costs from total contribution or 'Gross Margin'. It may be noted that contribution is the difference between sales and marginal cost of sales. In short, fixed costs are not included in cost of goods sold or closing stock; they are written off to Marginal profit and Loss account of period. The argument in favour of this procedure is that no one makes Profit per unit manufactured; but profit is made out of total activity during a period. Units produced and sold will therefore, contribute to a 'profit pool' which will pay for the fixed charges and whatever will be left thereafter will represent net profit. Assuming that manufacturing company manufactures for products, the following diagram will demonstrate how profit is made.



It is also clear that no part of the fixed overhead is transferred to the next period by the addition of some arbitrary amount to the value of closing work in progress and finished goods.

3.6 Profit calculation under Absorption costing :

Under this technique of costing the following proforma is used for the ascertainment of profit :

INCOME STATEMENT		Rs	Rs
Sales			
Less : Cost of goods manufactured			
Direct material			
Direct labour			
Factory overheads :			
Variable			
Fixed (at actual production basis)			
Add : Value of opening stock			

Less : Value of closing stock at current year

Add : Under absorption or less overabsorption of fixed overheads

Gross profit

Less : Administration, selling and distribution overheads :

fixed

Variable

Net Income or Profit

3.7 Merits and Limitations of Absorption Costing :

Merits : The following are the main advantages of absorption costing :

1. It suitably recognises the importance of including fixed manufacturing costs in product of cost determination and framing a suitable pricing policy. In fact all costs (fixed and variable) related to production should be charged to units manufactured. Price based on absorption costing ensures that all costs are covered. Prices are well regulated where full cost is the basis.
2. It will show correct profit calculation in case where production is done to have sales in future (e.g., seasonal sales) as compared to variable costing.
3. It helps to conform with accrual and matching concepts which require matching costs with revenue for a particular period.
4. It has been recognised by various bodies as FASB (USA), ASC (UK) ASB (India) for the purpose of preparing external reports and for valuation of inventory.
5. It avoids the separation of costs into fixed and variable elements which cannot be done easily and accurately.
6. It discloses inefficient or efficient utilisation of production resources by indicating underabsorption or overabsorption of factory overheads.
7. It helps to make the managers more responsible for the costs and services provided to their centres/departments due to correct allocation and apportionment of fixed factory overheads.
8. It helps to calculate the gross profit and net profit separately in income statement.

Limitations :

1. Difficulty in comparison and control of cost : Absorption costing is dependent on level of output; so different unit costs are obtained for different levels of output. An increase in the volume of output normally results in reduced unit cost and reduction in output results in an increased cost per unit due to the existence of fixed expenses. This makes comparison and control of cost difficult.

2. Not helpful in managerial decisions : Absorption costing is not very helpful in taking managerial decisions such as selection of suitable product mix, whether to buy or manufacture, whether to accept the export order or not, choice of alternatives, the minimum price to be fixed during the depression, number of units to be sold to earn a desired profit, etc.

3. Cost vitiated because of fixed cost included in inventory valuation : under absorption costing, absorption of fixed cost is carried forward to the next period because closing stock is valued at cost of production which is inclusive of fixed cost.

4. Fixed cost inclusion in cost not justified : Many accountants argue that fixed manufacturing, administration and selling and distribution overheads are period costs and do not produce future benefits and, therefore, should not be included in the cost of product.

5. Apportionment of fixed overheads on arbitrary methods : The validity of product costs under this technique depends on correct proportionment of overhead costs. But in practice may overhead costs are apportioned by using arbitrary methods which ultimately make the product costs inaccurate and unreliable.

6. Not helpful for preparation of flexible budget : Under absorption costing no distinction is made between the fixed and variable costs. It is not possible to prepare flexible budget without making this distinction.

3.8 Place for Marginal Costing :

Fixed expenses remain constant in aggregate amount and do not vary with the increase or decrease in production upto a particular level of output. Just contrary to this variable expenses increase or decrease in production to increase or decrease in output and remain constant per unit of output. Fixed expenses per unit continue to vary with the increase or decrease in production because these expenses remain constant upto a certain level of production. Thus, fixed overheads lead to different costs per unit at different levels of production. On account of this, a special technique known as marginal costing has been developed which excludes fixed overheads entirely from the cost of production and gives us the same cost per unit upto a particular level of output. Thus, under this technique fixed expenses are not allocated to cost units but are charged against "fund" which arises out of excess of selling price over total variable costs.

3.9 Definition Of Marginal Costing :

According to CMA Terminology Marginal costing is the ascertainment of marginal cost and of the effect on profit or changes in volume or type of output by differentiating between fixed costs and variable costs. In this technique of costing only variable costs are charged to operations, processes or products, leaving all indirect costs to be written off against profits in the period in which they arise.

It is clear from the above that only variable costs form part of product cost in the technique of marginal costing because only variable costs are changed if output is increased or decreased and fixed costs remain the same.

Marginal costing is different from direct costing. Direct costing is the practice of charging all direct costs to operations, processes or products, leaving all indirect costs to be written off against profit in the period in which they arise. Thus in direct costing some fixed costs could be considered to be direct costs in appropriate circumstances but fixed cost is never taken in marginal cost.

3.10 Nature of Marginal Costing :

The following are the main features of marginal costing :

1. It is a technique of costing which is used to ascertain the marginal cost and to know the impact of variable cost on the volume of output.
2. All costs are classified into fixed and variable cost on the basis of variability. Even semi fixed is segregated into fixed and variable cost.
3. Variable cost alone are charged to production. Fixed costs recovered from contribution.
4. Valuation of stock of work in progress and finished goods is done on the basis of marginal cost.
5. Selling price is based on marginal cost plus the contribution.
6. Profit is calculated by deducting marginal cost and fixed cost from sales.
7. Cost volume profit (or Break Even) Analysis, is one of the integral part of marginal costing.
8. The profitability of product/department is based on contribution made available by each product/department.

3.11 Merits And Limitations of Marginal Costing :

The following are the main advantages of marginal costing :

- (1). It is simple to understand and easy to operate.
- (2). The valuation of closing stock under marginal costing is done at marginal cost and thus prevents the illogical carry forward of fixed costs of one period to be next one as part of value of closing stock.
- (3). There is no problem of computing fixed overhead recovery rates and their under or over recovery as fixed overheads are charged against the contribution.
- (4) In marginal costing, it is established that profit is a function of sale and not of production as profit depends on sales volume and not on production volume. This can be verified by preparing a profit statement under marginal costing.
- (5) It facilitates control over variable costs by avoiding arbitrary apportionment or allocation of fixed costs.
- (6) It is very useful tool of profit planning. It guides the management about the profitability at various levels of production and sales.
- (7) It is very Casiable technique in decision making. It provides information to management in making decisional like make or buy, selling price fixation, export decision etc.
- (8) It provides the management with useful techniques like break even analysis p/v ratio etc.
- (9) It helps in cost control by concentrating on variable cost as the fixed cost is non controllable in the short period.

- (10). It helps in evaluation of performance of different departments, divisions and salesmen.
- (11) It is a valuable adjunct to standard costing and budgetary control.

Limitations of Marginal Costing : Marginal costing technique has certain limitations which must be kept in mind while making use of this technique.

- (1) The separation of expenses into fixed and variable presents certain technical difficulties where as marginal costing technique assumes that all expenses can be divided into fixed and variable. In fact, no variable cost is completely variable and no fixed cost is completely fixed. Actually most of the expenses are semi variable and it is difficult to segregate them into fixed and variable.
- (2) Time taken for the completion of jobs is not given due attention because marginal cost excludes fixed expenses which are connected with time. Fixed expenses should be considered if the suitable comparison of two jobs is to be made.
- (3) With the development of technology, fixed expenses have increased and their impact on production is much more than that of variable expenses. So, a system of costing which ignores fixed expenses is less effective because a significant portion of the cost representing fixed expenses is not taken care of.
- (4) It is possible that a concern using marginal costing technique may value work-in-progress and finished stocks at marginal cost. The arguments against valuing these items at marginal costs are as follows :
 - a) Balance sheet will not exhibit a true and fair view because work-in-progress and finished stock will be shown at marginal costs which do not include fixed expenses. Thus finished stock and work-in-progress will be undershoot in the balance sheet.
 - b) In case of loss by fire, full loss on account of stock destroyed by fire cannot be recovered from the insurance company because valuation of stock will not take fixed expenses into consideration.
5. Marginal costing technique does away with the difficulties involved in the apportionment of overheads because fixed expenses are deducted from total contribution. But the problem of apportionment of variable costs still arises.
6. Marginal costing technique is difficult to apply in contract or ship building industry where the value of work-in-progress is high in relation to turnover. If fixed expenses are not included in the valuation of work-in-progress, losses may occur every year till the contract is completed, while on the completion of the contract there may be huge profits.
7. Cost control can be better achieved with the help of other techniques such as budgetary control and standard costing as marginal costing technique does not provide any standard for the evaluation of performance which is provided by standard costing and budgetary control.

8. Marginal costing technique cannot be successfully applied in cost plus contracts unless a high percentage over the marginal cost is charged from the contractee to cover fixed costs and profits.

3.12 Income Determination Under Absorption Costing And Marginal Costing:

As we have seen that there are different formats for calculating the income under marginal costing and absorption costing. The following can be possible cases :

(1) Where there is production but no sales : Under this case, the income under absorption costing may reflect profit though no sales has been made. This is due to the fact that fixed manufacturing overheads have been over absorbed above normal capacity production than its actual fixed manufacturing overheads, but variable income statement will show loss as there are no sales. Though no sales have been made but income statement will show gross profit equal to the amount of over absorption of fixed manufacturing overheads. Thus profit under absorption costing is influenced by various factors as quantity of production units, units sold, selling price, cost of production etc.

Illustration 3.1

The following data related to xyz company :

Normal capacity 40,000 units per month

variable cost per unit Rs. 10

Actual production 44,000 units

Sales nil

Fixed manufacturing overheads Rs. 1,00,000 per month or Rs. 2.50 per unit at normal capacity.

Other fixed expenses Rs 8,000

You are required to prepare income statement under (1) Absorption costing (2) Marginal costing

Solution :

(Income Statement)

(absorption costing)

		Rs.
Sales		-----
Less : Variable cost @ RS. 10 per unit	4,40,000	
Fixed manufacturing overheads for 44,000 units @ Rs.2.50	1,10,000	
Cost of goods manufactured	5,50,000	

Less : Closing inventory	5,50,000
Cost of goods sold	nil
Less : overabsorption of overheads (4000 x 2.50)	(-) 10,000
Gross profit	10,000
Less : Other expenses fixed	-8,000
Net Income	2,000

Income Statement (marginal costing)

	Rs.	Rs.
Sales		nil
Less : Variable cost	4,40,000	
Cost of goods manufactured for 44,000 units @ Rs. 10 per unit	4,40,000	
		nil
		nil

Income Statement (Marginal Costing)

	Rs.	Rs.
Sales		nil
Less : Variable cost :		
Cost of goods manufactured for 44,000 units @ Rs. 10 per unit	4,40,000	
Less : Closing inventory	4,40,000	
Cost of goods sold		nil
Contribution		nil
Less : fixed manufacturing overhead	1,00,000	
other fixed expenses	8,000	1,08,000
Net loss		1,08,000

(2) When production is Equal to Sales : When production and sales are equal i.e., there is no opening or closing stock or when the inventory of finished goods does not fluctuate from period to period, net income will be the same under absorption costing and marginal costing techniques.

Illustration : 2 The following data related to xyz company

Output sales 40,000 units.

Sale price per unit Rs. 15.

material and labour cost per unit Rs. 8

Production overheads :

Variable Rs. 2 per unit

fixed Rs. 50,000

other fixed overheads Rs. 1,00,000

Prepare income statement under (1) Absorption costing

(2) Marginal costing

Solution :-

Income Statement (Absorption costing)

	Rs.	Rs.
Sales (40,000 units @ Rs. 15 per unit)		6,00,000
Less : cost of goods manufactured		
Material and labour cost	3,20,000	
Variable manufacturing overheads	80,000	
Fixed manufacturing overheads	50,000	
		4,50,000
Gross profit		1,50,000
Less : other fixed overheads		1,00,000
Net income		50,000

(2) Income Statement (Marginal costing)

	Rs.	Rs.
Sales		6,00,000
Less : Variable cost : material & labour cost	3,20,000	
Variable manufacturing overheads	80,000	
		4,00,000
Contribution		2,00,000
Less : fixed cost		
Manufacturing overheads	50,000	
other fixed cost	1,00,000	
		1,50,000
Net Income		50,000

(3) When sales are less than production :

When closing stock is more than the opening stock i.e., production exceeds sales, profit will be higher in absorption costing as compared to marginal costing. It will be more clear from the following:

Illustration : The following data related to xyz Ltd., which makes and sells computers.

Production 1,00,000 units

sales 80,000 units

selling price per unit Rs. 15

Direct materials Rs 2,50,000

Direct labour Rs 3,00,000

Factory overheads : fixed Rs. 2,50,000

variable Rs. 1,00,000

Selling and distribution overheads :

Variable Rs. 1,00,000

Fixed Rs. 2,00,000

you are required to calculate income statement using absorption and marginal costing. Account briefly for the difference in net profit between two income statements.

Solution :

(1) Income Statement (Absorption costing)

	Rs.	Rs.
Sales (80,000 Rs.15)		12,00,000
Less : cost of goods manufactured		
direct material	2,50,000	
direct labour	3,00,000	
factory overheads variable	1,00,000	
Fixed	2,50,000	
	9,00,000	
Less : Closing stock $\left(\frac{20,000}{1,00,000} \times 9,00,000 \right)$		
	1,80,000	7,20,000
Gross Profit		4,80,000
Less : selling & distribution expenses :		
Fixed	2,00,000	
Variable	1,00,000	3,00,000
Net profit		1,80,000

(2) Income Statement (Marginal Costing)

	Rs.	Rs.
Sales (80,000 Rs. 15)		12,00,000
Less : Variable cost :		
Direct material	2,50,000	
Direct labour	3,00,000	
Variable factory overheads	1,00,000	

	6,50,000	
Less : closing stock $\left(\frac{20,000}{1,00,000} \times 65,000 \right)$	1,30,000	
	5,20,000	
Add : Variable selling & distribution expenses	1,00,000	6,20,000
Contribution		5,80,000
Less : fixed factory overheads	2,50,000	
fixed selling & distribution expenses	2,00,000	
		4,50,000
Net profit		1,30,000

The difference in profits Rs. 50,000 (i.e., Rs. 1,80,000 - Rs. 1,30,000) is due to difference in valuation of closing stock. The value of closing stock in absorption costing is Rs. 1,80,000 whereas this value is Rs. 1,30,000 in marginal costing.

(4) When sales exceeds Production : When closing stock is less than the opening stock i.e., sales exceeds production, profit in marginal costing will be higher as compared to absorption costing. This will be more clear from the following.

Illustration : 4 : From the following data of X Ltd. prepare income statement under absorption costing and marginal costing.

opening stock 10,000 (units) (Valued at marginal cost Rs. 61,900 and total cost Rs. 72,000)

Units produced 60,000 units

closing stock 4,000

Variable cost 3,57,000

Units sold 66,000 units

Factory overheads (fixed) 70,200

selling cost : Variable Rs 3,40,000

Fixed Rs 50,000

Selling price per unit Rs. 20

Solution :

(1) Income Statement (Absorption costing)

	Rs.	Rs.
Sales (Rs. 20 x 66,000)		13,20,000
Less : Cost of goods manufactured :		
Variable cost	3,57,000	
Fixed manufacturing overheads	70,200	
	4,27,200	
Opening stock	72,000	
	4,99,200	
Less : closing inventory $\left(\frac{4,000}{60,000} \times 4,27,000\right)$	28,480	
		4,70,720
gross profit		8,49,280
Less : selling cost fixed	50,000	
Variable	3,40,000	3,90,000
Net income		4,59,280

(2) In Come Statement (Marginal costing)

	Rs.	Rs.
Sales		13,20,000
Less : Variable cost	3,57,000	
add : opening stock	61,900	
	4,18,900	
Less : closing stock $\left(\frac{3,57,000}{60,000} \times 4,000\right)$	23,800	
	3,95,100	

Variable selling cost	3,40,000	7,35,100
Contribution		5,84,900
less : fixed factory cost	70,200	
Fixed selling cost	50,000	1,20,000
Net income		4,64,700

The net profit ascertained under the absorption costing will not be the same as under the marginal costing because of :

(1) Difference in stock valuation : Stock of work-in-progress and finished goods are valued at a marginal cost not including fixed costs under the marginal costing method whereas in the absorption costing they are valued at cost of production which includes fixed costs. In other words the valuation of stocks will be done at lower figure in the marginal costing as compared to the absorption costing therefore, profits are under these two techniques of costing will differ.

(2) Over or under absorption of overheads : In absorption costing method, there can never be hundred percent absorption of fixed overheads because of the difficulty in forecasting costs and volume of output. There will be either over absorption or under absorption whereas in the marginal costing method, the actual amount of fixed overheads is wholly charged to profit and loss account. Hence profits under the two techniques will differ,

Absorption Costing

Illustration :5

Excel Ltd. is manufacturing three products X,Y,and Z. The costs of manufacture are as follows:

Product	X	Y	Z
Direct Material per unit	30	40	50
Direct labour per unit	20	30	40
Selling price per unit	100	150	200
Output	10,000 units	10,000 units	10,000 units

The total overheads are Rs. 12,20,000 out of which 90,000 are fixed and the rest variable. It is decided to apportion these costs over different products in the ratio of output. You are required to prepare a statement showing the cost and profit of each product according to Absorption costing.

Solution :**Statement of cost and profit under absorption costing :**

Items	Product X	Y	Z
	Rs.	Rs.	Rs.
Sales	10,00,000	15,00,000	20,00,000
Direct Material cost	3,00,000	4,00,000	5,00,000
Direct Labour cost	2,00,000	3,00,000	4,00,000
Variable overheads	10,000	10,000	10,000
Fixed overheads	30,000	30,000	30,000
Total costs	5,40,000	7,40,000	9,40,000
Profits	4,60,000	7,60,000	10,60,000

3.13 Marginal Costing And Differential Costing :

Marginal costing is sometimes confused with differential costing. The term 'Differential costing' means a technique used in the preparation of adhoc information in which only cost and income differences between alternative courses of action are taken into consideration. Thus, in case of differential costing a comparison is made between the cost differential and income differential between two or more situations and decision regarding adopting a particular course of action is taken if it is on the whole profitable. This is illustrated with the following illustration.

Illustration : 6 : Pioneer Manufacturing company, makers of a specialised line of toys, receives an order for 2,000 units of toy Battle tank, from a large mail order house at a price of Rs. 3 per unit.

The company sells this type of toy to its other customers at Rs. 5 each but it has surplus capacity and can take the special order without adversely affecting its regular operations for the coming month.

The income statement of the company for the preceding month is as follows

Net sales :10,000 units @ Rs. 5	50,000
Costs	Rs.
Direct Material : Rs 1.50 per unit	15,000
Direct Labour Rs. 1 per unit	10,000
Factory overhead	10,000

Selling and Administration Expenses	10,000
Total costs	45,000
Net profit	5,000

Direct material and direct labour costs to be incurred on the special order are estimated to be of the same amount per unit as for the regular business. Special tools costing Rs. 500 would be required to meet the specifications of the mail-order house.

You are required to prepare a differential cost analysis for deciding about the acceptance of the order.

Solution :

Differential Cost Statement

	Existing Situation	Proposed Situation	Net increase/ Decrease
	10,000 units	12,000 units	2,000 units
1. Sales	Rs. 50,000	56,000	6,000
2. Costs :			
Direct Material	15,000	18,000	3,000
Direct Labour	10,000	12,000	2,000
Factory Overhead	10,000	10,000	---
Selling & Adm. Expenses	1,00,000	10,000	----
Special Tools	-----	500	500
Total costs	45,000	50,500	5,500
Profit (1-2)	5,000	5,500	500

In the above case, differential costs are Rs. 5,500 while differential sales are Rs. 6,000. Thus acceptance of order from a large mail order house gives an extra profit of Rs. 500. The order may be accepted provided it does not adversely affect the present sales at Rs. 5 per unit.

In case of Differential costing, the change in total costs (both fixed and variable) is taken into account. The term 'Differential cost' means the net increase or decrease in total cost resulting from variation in production. The differential cost is termed as 'Incremental Cost' when the cost increases and Decremental cost when the cost decreases. Thus, Differential costing, Incremental costing and Decremental costing are alternative terms and they are different from Marginal Costing and Direct costing.

The difference between Marginal costing and Differential costing can be summarised as follows:

1. Differential costing can be used both in case of Absorption costing and Marginal costing.
2. In case of Marginal costing, the entire fixed costs are excluded while in the case of Differential costing such fixed costs which are relevant for decision making are considered.
3. Differential costs are worked out separately on analysis statement while marginal costs may be embodied in the accounting system itself.
4. In Marginal costing the contribution and the profit volume ratio are the main yardsticks for the purposes of performance evaluation and decision making. While in case of Differential costing the differential costs are compared with incremental or decremental revenue as the case may be.

The manner of application of differential costing is somewhat different from that of marginal costing, under differential costing, differential costs of various alternatives are compared with the differential revenues and the decisions are taken on the bases of maximum net gain. While evaluating the viability of different projects, making a choice out of several alternative proposals, Differential costing helps in a better way than Marginal costing. If under Marginal costing, while deciding about the profitability of products or making cost - benefit analysis fixed costs are also considered at some stage, it takes the shape of Differential costing.

Hence, practically the purpose of applying the two techniques is the same here also we have not made any difference in the application of these techniques to the problems which management has to face in its routine or otherwise decision making process.

Marginal Cost : The Institute of cost and works Accountants, London, defined marginal cost as the amount at any given volume of output by which aggregate costs are changed, if the volume of output is increased or decreased by one unit of output. It is the additional cost of producing one additional unit. It arises from the production of additional increments of output.

Illustration - 7 : A factory produces plastic cans. The variable cost of the can is Rs. 5. The fixed costs are Rs. 5,000 per annum. Presently 200 cans are produced annually. The cost sheet of 200 cans would be :

	Rs.
Variable cost (200 x Rs. 5)	1,000
Fixed cost	5,000
Total cost	6,000

If the production is increased by one plastic can, the cost sheet of 201 cans would be :

	Rs.
Variable cost (201 x 5)	1,005
Fixed cost	5,000
Total cost	6,005

Marginal per unit is, therefore, Rs. 5 (the cost of producing one more unit). Marginal cost, thus consists of prime cost plus variable overheads. It should also be remembered that marginal cost takes into account only variable cost and excludes the fixed cost. Within the capacity of an organisational increase of one unit in production, obviously, will cause an increase in variable costs only. The following illustration will make this clear.

Illustration - 8 : Following information relates to a factory, manufacturing good quality fountain pens.

Production	Direct units Rs.	Labour Material Rs.	other Rs.	Fixed Variable Rs.	Total cost costs Rs.
500	1,000	750	500	1,000	3,250
1,000	2,000	1,500	1,000	1,000	5,500
1,500	3,000	2,250	1,500	1,000	7,750
2,000	4,000	3,000	2,000	1,000	10,000
2,500	5,000	3,750	2,500	1,000	12,250

Calculate the marginal cost of production :

Solution:

Marginal cost of production

Production Units	Total costs a		Fixed costs b		Marginal cost c=a-b	
	Total Rs.	Per units Rs.	Total Rs.	Per unit Rs.	Total Rs.	Per unit Rs.
500	3,250	6.50	1,000	2.00	2,250	4.50
1,000	5,500	5.50	1,000	1.00	4,450	4.50
1,500	7,750	5.17	1,000	0.67	6,750	4.50
2,000	10,000	5.00	1,000	0.50	9,000	4.50
2,500	12,250	4.90	1,000	0.40	11,250	4.50

The above table shows that with an increase in production the total cost per unit is decreasing. This happens because the fixed overheads which are constant at all levels of output are apportioned over large outputs. Hence, cost of output per unit goes on declining with every increase in volume of output. It will be seen that while the marginal cost of production per unit remains constant (at Rs. 4.50), the fixed cost per unit decreases from Rs. 2 to Rs. 0.40. Marginal cost has been calculated thus:

Marginal cost = Direct Material cost + Direct Labour cost + Direct Expenses + Variable overheads

(or)

Marginal Cost = Total cost - Fixed cost

3.14 Marginal Costing Equation

Contribution : Contribution represents the difference between sales and variable costs. Contribution is also called 'Gross Margin.'

Contribution = Selling price - Variable cost

(or)

Fixed cost + Profit or loss

Profit/Loss = contribution - fixed cost

Marginal Cost Equation : The algebraical expression of contribution is known as marginal cost Equation. It can be expressed as follows :

$$S - V = F + P = C$$

Where

S = Selling price

V = Variable cost

f = Fixed cost

P = Profit

C = Contribution

Illustration - 9

From the following information, find out the amount of profit earned during the year using marginal cost technique.

Fixed cost Rs. 5,00,000

Variable cost Rs. 10 per unit

Selling price Rs. 15 per unit

Output level 1,50,000 units

Solution :

Contribution = Selling price - Variable cost

Rs. 22,50,000 - 15,00,000

(1,50,000 x 15) - (1,50,000 x 10)

= Rs. 7,50,000

Contribution = Fixed cost + Profit

Rs 7,50,000 = 5,00,000 + Profit

Rs 7,50,000 - 5,00,000 = Profit

Profit = 2,50,000

Profit / Volume Ratio (P/V Ratio) : The profitability of business operations could be found out by calculating the profit - volume - ratio. It is the ratio of contribution to sales. It is also known as marginal - income ratio, contribution sales ratio or variable - profit ratio. The ratio can be shown in the form of a percentage also.

$$\begin{aligned} \text{P/V Ratio} &= \frac{\text{Contribution}}{\text{Sales}} \quad \text{or} \quad \frac{\text{Sales} - \text{Variable cost}}{\text{Sales}} \\ &= \frac{C}{S} \quad \text{or} \quad \frac{S - V}{S} \quad \text{or} \quad \frac{F + P}{S} \\ &= 1 - \frac{\text{Variable costs}}{\text{Sales}} \end{aligned}$$

The ratio can also be shown by comparing the change in contribution or change in profit to change in sales. Any increase in contribution obviously, would mean increase in profit, as fixed expenses are assumed to be constant at all levels of production.

$$\text{P/V Ratio} = \frac{\text{Change in Contribution}}{\text{Change in sales}} = \frac{\text{Change in Profit}}{\text{Change in sales}}$$

The importance of p/v ratio lies in its use for evaluating the profitability of alternative products, of proposals. A higher ratio shows greater profitability. Management should, therefore, try to increase p/v ratio by widening the gap between the selling price and the available costs. This can be achieved by increasing sale price, reducing variable costs or switching over profitable products.

3.15 Premises of Marginal Costing :

The technique of marginal costing is based upon the following assumptions :

1. All elements of cost-production, administration and selling and distribution can be segregated into fixed and variable components.
2. Variable cost remains constant per unit of output irrespective of the level of output and thus fluctuates directly in proportion to changes in the volume of output.
3. The selling price remain unchanged or constant at all levels of activity.
4. Fixed costs remain unchanged or constant for the entire volume of production.
5. The volume of production or output is the only factor which influences the costs.

3.16 Utility of P/V Ratio :

Some of the uses to which p/v ratio can be put are listed below :

1. Determination of variable costs for any volume of sales. This done by deduction of p/v ratio from 100 percent and then use the percentage to arrive at total variable cost.

ratio of Variable costs to sales (V/S) = 1 - P/V ratio

(or)

S - C/S ratio

2. Ascertainment of the profitability for each

- (a) Line of product
- (b) sales areas
- (c) Method of sales eg., sales through wholesalers or retailers
- (d) Individual factories
- (e) Separate companies
- (f) Calculation of the desired volume of output, profit or the other material facts.

The relevant formulae are given below :

$$\text{Break - even point (in revenue)} = \frac{\text{Fixed cost}}{\text{p/v ratio}}$$

$$\text{Target Volume (in revenue)} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}}$$

3.17 Improvement of P/V Ratio :

Management has to aim at increasing the p/v ratio. This may be done (a) by reducing variable costs or (b) by raising prices. If a composite p/v ratio (average ratio for a number of products) is being considered, an effort should be made to improve the sales mixture. This is possible by increasing the volume of products with a high p/v ratio, and reducing the volume of those with a low p/v ratio. It may be noted that a change in fixed costs does not influence p/v ratio.

3.18 Marginal Costing And Planning For Profit : (A managerial use)

The basic objective of running any business organisation is to earn profits. Profits determine the financial position, liquidity and solvency of the company. Profits serve as a yardstick for judging the competence and efficiency of the management. Profit planning is, therefore, a fundamental part of the overall management function and is a vital part of the total budgeting process. The management determines the profit goals and prepares budgets that will lead them to the realisation of the these goals. Profit planning can be done only when the management has the information about the cost of the products both fixed and variable and the selling price at which it will be in a position to sell the products of the company. The concept of marginal costing as explained in the preceding pages is extensively applied by the management in profit planning.

The profit is affected by the several factors. Some of the important factors are as under :

- (i) Selling price of the products,
- (ii) Volume of sales,
- (iii) Variable costs per units,
- (iv) Total fixed costs and
- (v) Sales makes (or) mix of different products.

The management can achieve the target profit by varying one or more of the above variables.

Illustration : 10

A firm has Rs. 10,00,000 invested in its plant and sets a goal of a 15% annual return on investment. Fixed costs in the factory presently amount to Rs. 4,00,000 per year and variable costs amount Rs. 15 per unit produced. In the past year the firm produced and sold 50,000 unit at Rs. 25 each and earned a profit of Rs. 1,00,000. How can management achieve their target profit goal by varying different variables like fixed costs, variable cost, quantity sold or increasing the selling price per unit.

Solution : Profit To be Earned Is 1,50,000 (i.e., 15% Rs. 10,00,000) The equation of profit can be put as follows :

$$(\text{Profit} - \text{Quantity S.P. perunit}) - (\text{Quantity} \times \text{variable cost perunit}) - \text{Fixed costs.}$$

a. Achievement of target profit by varying fixed costs :

Let the fixed costs be X

$$1,50,000 = (50,000 \times \text{Rs. } 25) - (50,000 \times \text{Rs. } 15) - x$$

$$\text{(or) } 1,50,000 = (\text{Rs. } 12,50,000) - (\text{RS. } 7,50,000) - x$$

$$\text{(or) } X = \text{Rs. } 12,50,000 - 7,50,000 - 1,50,000$$

$$\text{(or) } X = \text{Rs. } 3,50,000$$

The present fixed costs are Rs. 4,00,000. The management can earn the target profit of Rs. 1,50,000 by reducing the fixed costs by Rs. 50,000 (i.e., Rs. 4,00,000 - Rs. 3,50,000)

b. Achievement of the target profit by varying variable costs :

Let the variable cost be x per unit.

$$\text{Rs. } 1,50,000 = (50,000 \times \text{Rs. } 25) - (50,000 \times X) - \text{Rs. } 4,00,000$$

$$\text{(or) } 1,50,000 = \text{RS. } 12,50,000 - 50,000 \times - \text{Rs. } 4,00,000$$

$$\text{(or) } 50,000 \times = \text{Rs. } 12,50,000 - \text{Rs. } 4,00,000 - \text{Rs. } 1,50,000$$

$$\text{(or) } 50,000 \times = 7,00,000$$

$$\text{(or) } X = \text{Rs. } 14$$

The present variable cost per unit is Rs. 15 per unit. The management can earn the target profit of Rs. 1,50,000 by reducing the variable cost by Rs. 1 per unit (i.e., Rs. 15 - Rs. 14)

c. Achievement of the target profit by varying quantity sold :

Let the quantity sold be X

$$\text{Rs. } 1,50,000 = (X \times \text{Rs. } 25) - (x \times \text{Rs. } 15) - \text{Rs. } 4,00,000$$

$$\text{(or) } 1,50,000 = 25x - 15x - \text{Rs. } 4,00,000$$

$$\text{(or) } 10x = 5,50,000$$

$$\text{(or) } x = 55,000$$

The present value of sales are 50,000 units. The management can earn the target profit of Rs. 1,50,000 by increasing the units sold by 5,000.

d. Achievement of the target profit by varying selling price :

Let the selling price be X

$$\text{Rs. } 1,50,000 = (50,000 \times X) - (50,000 \times \text{Rs. } 15) - \text{Rs. } 4,00,008$$

$$\text{(or) } 1,50,000 = 50,000 \times \text{Rs. } 7,50,000 - \text{Rs. } 4,00,000$$

$$\text{(or) } -50,000 \times = -7,50,000 - \text{Rs. } 4,00,000 - 1,50,000$$

$$\text{(or) } -50,000 \times = -13,00,000$$

$$\text{(or) } \quad \times \quad = \quad \text{Rs. } .26$$

The present selling price is Rs. 25 per unit. The management can earn the target profit of Rs. 1,50,000 by increasing the selling price by Rs. 1 per unit.

3.19 Margin of Safety : [M/s] :

The margin of safety is the difference between the total sales (actual or projected) and the break - even sales. It may be expressed in monetary terms or as a percentage of actual sales.

1. Margin of safety (M/s) = Actual sales - Break - even sales (monetary terms)

$$2. \text{ Margin of safety (in units) } = \frac{\text{Profit}}{\text{Contribution per unit}}$$

$$3. \text{ Margin of safety (in percentage terms) } = \frac{\text{Actual sales} - \text{Break - even sales}}{\text{Actual sales}} \times 100$$

4. Margin of safety can also be calculated with the help of p/v ratio as under :

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}}$$

The size of margin of safety is an extremely valuable guide to the strength of a business. If it is large, this means that there can be substantial falling off sales and yet a profit can still be made. On the other hand, if the margin is small, any loss of sales may be serious matter. If the margin of safety is unsatisfactory, possible steps to rectify the matter are listed below :

1. Increase in the selling price - for this to be possible the company must be in a very strong and favourable position. It should be influence the price charged. The demand must be inelastic, otherwise the same quantity will not be sold.

2. Reduce fixed costs.

3. Reduce variable costs

4. Substitution of existing products by more profitable lines

5. Increase the volume of output.

Illustration - 11 : A Company earned profit of Rs. 30,000 during the year 1994-95. If the marginal cost and selling price of a product are Rs. 8 and Rs. 10 per unit respectively, find out the amount of 'Margin of safety'.

Solution :

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}}$$

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{\text{Rs. 2}}{\text{Rs. 10}} \times 100$$

$$= 20\%$$

Margin of safety

$$= \frac{\text{Rs. 30,000}}{20\%}$$

$$= 1,50,000$$

3.20 Break Even Analysis : (Cost volume - Profit Analysis)

Break-even analysis is a specific method of presenting and studying the relationship among costs, volume and profits. (Hence, it is also known as, Cost Volume Profit Analysis C-V-P Analysis). It is an important tool of financial analysis whereby the impact on profit of the change in volume, price, costs and mix can be found out with a certain amount of accuracy. A business is said to break - even when its total sales are equal to its total costs. Break-even point is a point of no profit or no loss. At this point contribution is equal to fixed cost.

$$1. \text{ B.E.P (in units)} = \frac{\text{Fixed cost}}{\text{contribution per unit}}$$

$$= \frac{\text{Fixed cost}}{\text{Selling price per unit} - \text{Variable cost per unit}}$$

$$2. \text{ B.E.P (Sales)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} \times \text{S.P. per unit}$$

$$3. \frac{\text{Fixed cost}}{\text{Total contribution}} \times \text{Total sales}$$

$$= \frac{F \times S}{S - v}$$

4. Fixed cost

$$1. \frac{\text{Variable cost per unit}}{\text{S.P. per unit}}$$

$$= \frac{\text{Fixed cost}}{\text{P/V Ratio}}$$

$$5. \text{ B.E.P} = \frac{\text{Fixed cost}}{\text{Fixed cost} + \text{Net profit}} \times \text{sales}$$

At break - even point, the desired profit will be zero. Where the volume of output/sales is to be calculated so as to earn desired amount of profit, the amount of desired profit has to added to the fixed cost.

$$\text{units to earn a desired profit} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}}$$

$$\text{Sales to earn a desired profit} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V Ratio}}$$

Illustration - 12 :

From the following information calculate break - even point.

Production in Units	=	10,000
Sales Price	=	Rs. 5 per unit
variable costs	=	Rs. 20,000
Fixed costs	=	RS. 12,000

Solution :

$$1. \text{ Break-Even point (in units)} = \frac{\text{Fixed cost}}{\text{S.P.Per unit} - \text{Variable cost per unit}}$$

$$= \frac{12,000}{5-2} = 4,000 \text{ units}$$

2. Break-Even point (in volume)

$$= \frac{\text{Fixed cost}}{1 - \frac{\text{Variable cost per unit}}{\text{S.P. per unit}}}$$

$$= \frac{12,000}{1 - \frac{2}{5}} = \text{Rs. } 20,000$$

Cash Break - Even Point : In the present competitive world of business it may be difficult for new industrial units to achieve the break-even point in the initial years. Thus the concept of cash break-even point has emerged. The cash break-even point may be defined as that point of sales volume at which total revenue is equal to total cash cost. At this point, cash contribution (which is calculated after making adjustment for variable portion of depreciation, etc.) Equals the cash fixed cost, i.e., fixed cost excluding depreciation and differed expenses. This point enables the management to determine the level of activity below which the liquidity position of the firm would be adversely affected. Thus cash break-even point may be calculated as below :

$$\text{Cash Break - Even point (in units)} = \frac{\text{Cash Fixed cost}}{\text{Cash contribution per unit}}$$

Illustration - 13 :

From the following information calculate the cash Break - Even point.

Selling price per unit	Rs. 40
Variable cost per unit	Rs. 40
Depreciation included	Rs. 5
In above per unit	
Fixed cost	Rs. 1,00,000

Depreciation included
in the fixed cost Rs. 25,000

Solution :

Cash Fixed cost = Rs. 1,00,000 - 25,000 = Rs. 75,000

Cash contribution per unit = Rs 40 - (30-5) = Rs. 15

Cash Break - Even point = $\frac{\text{Cash Fixed cost}}{\text{Cash contribution per unit}}$

$$= \frac{75,000}{15} = 5,000 \text{ units}$$

Cash Break - Even Point = Rs. 5,000 x 40 = Rs. 2,00,000

Composite Break - Even Point :

So far as we have dealt with break - even point of firms producing single product. We can also calculate the composite break - even point for a firm producing several products, as below ;

Composite Break - even point = $\frac{\text{Total Fixed cost}}{\text{Composite p/v Ratio}}$

and composite p/v ratio = $\frac{\text{Total contribution}}{\text{Total sales}} \times 100$

Illustration - 14 :

From the following information of a company producing three products, you are required to compute (a) composite P/V Ratio (b) Composite Break - even point :

Product	Sales Revenue	Variable cost
X	Rs. 20,000	Rs. 10,000
Y	40,000	Rs. 14,000
Z	60,000	Rs. 36,000

Fixed cost : Rs. 50,000

Solution :

Product	Sales Revenue (Rs.)	Variable cost (Rs.)	Contribution (S.V) (Rs.)	P/V Ratio (C/s x 100)
X	20,000	10,000	10,000	50%
Y	40,000	14,000	26,000	65%
Z	60,000	36,000	24,000	40%
Total	1,20,000	60,000	60,000	50%

$$\begin{aligned} \text{(a) Composite P/V Ratio} &= \frac{\text{Total Contribution}}{\text{Total Sales}} \times 100 \\ &= \frac{60,000}{1,20,000} \times 100 \end{aligned}$$

$$\begin{aligned} \text{(b) Composite Break - Even point} &= \frac{\text{Total Fixed costs}}{\text{Composite P/V Ratio}} \times 100 \\ &= \frac{50,000}{50\%} \\ &= \text{Rs. } 1,00,000 \end{aligned}$$

Break-Even Chart : A break - even chart is a graphical representation of marginal costing. It is considered to be one of the most useful graphic presentation of accounting data. It is a readable reporting device that would otherwise require voluminous reports and tables to make the accounting data meaningful to the management. This chart shows the inter-relationship among cost, volume and profit. It shows the break-even point and also indicates the estimated cost and estimated profit or loss at various volumes of activity. These have been explained with the help of the following illustration:

Illustration - 15 :

From the following data, calculate the break-even point of profit if output is 50,000 units by drawing a break-even chart.

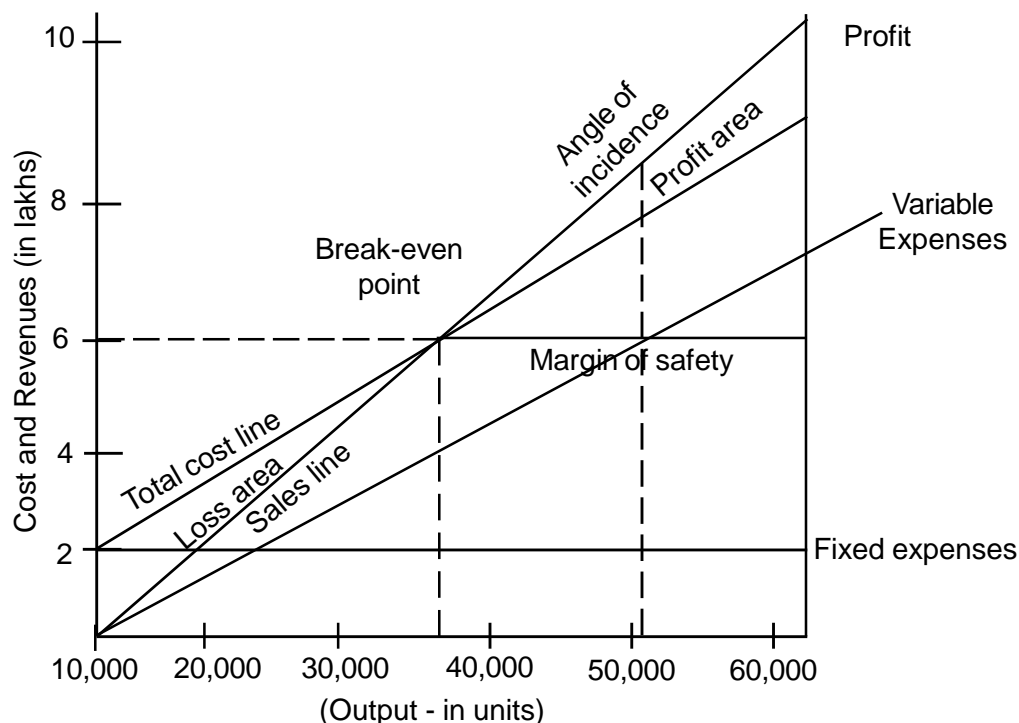
Production Units	Fixed Expenses (Rs)	Variable Cost (Rs.)	Selling Price (Rs.)	Total Cost (Rs.)	Total Sales (Rs)
10,000	1,50,000	10	15	1,50,000	0
20,000	1,50,000	10	15	2,50,000	1,50,000
30,000	1,50,000	10	15	3,50,000	3,00,000
40,000	1,50,000	10	15	4,50,000	4,50,000

50,000	1,50,000	10	15	5,50,000	6,00,000
60,000	1,50,000	10	15	6,50,000	7,50,000
60,000	1,50,000	10	15	7,50,000	9,00,000

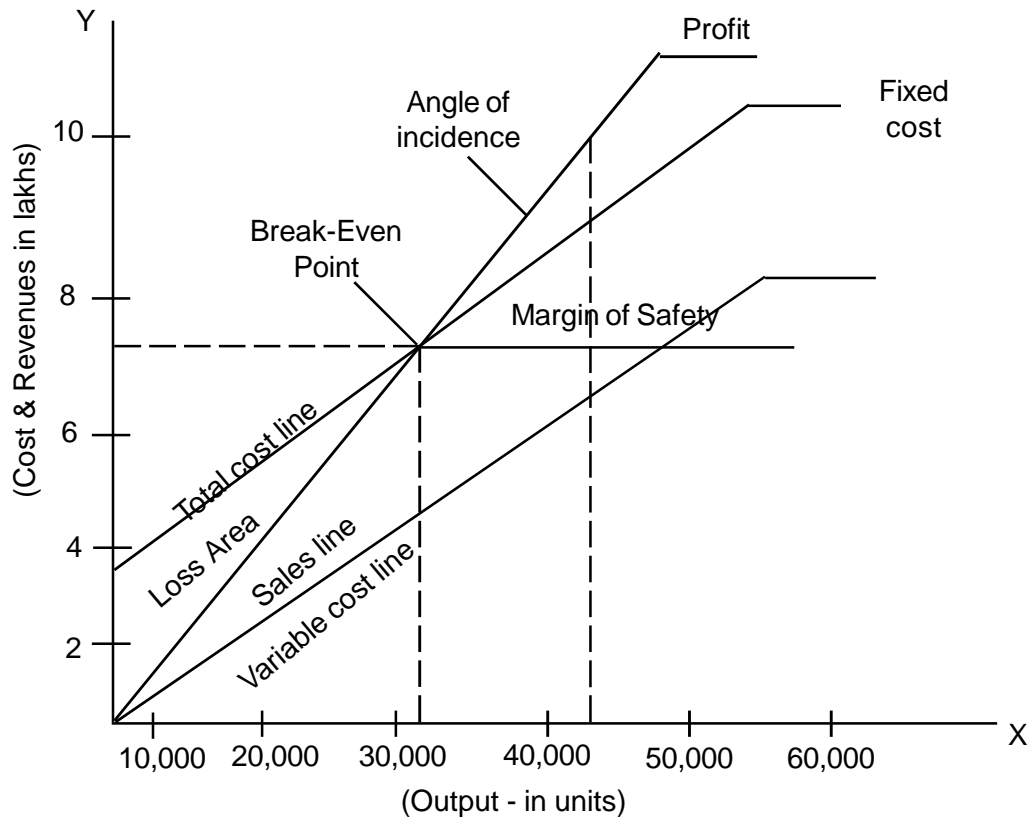
Solution :

First method : On the x-axis of the graph is plotted the number of units produced, sold and on the Y - axis are shown costs and sales revenues.

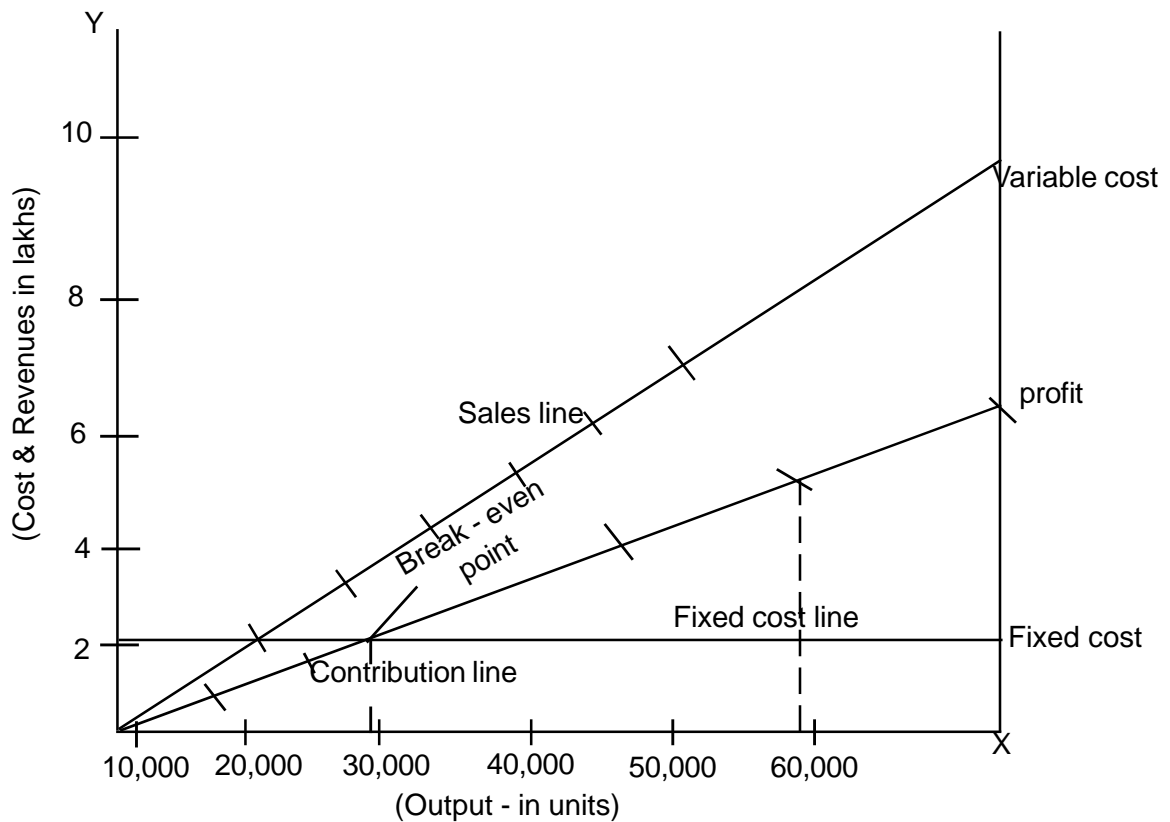
The fixed cost line is drawn parallel to x-axis. This line indicates that fixed expenses remain the same with any volume of production. The variable costs for different levels of activity are plotted over the fixed cost line. The variable cost line is joined to fixed cost line at zero volume of production. This line can also be regarded as the total cost line because it starts from the point where fixed cost has been incurred and variable cost is zero. sales values at various levels of output are plotted, Joining and the resultant line is the sales line. The sales line will cut the total cost line at a point where the total costs are equal to total revenues and this point of intersection of two lines is known as break-even point, the point of no profit or no loss. The number of units to be produced at the break-even point is determined by drawing a perpendicular to the x-axis from the point of intersection and measuring the horizontal distance from the zero point to the point at which the perpendicular is drawn. The sales value at break even point is determined by drawing a perpendicular to the Y-axis from the point of intersection and measuring the vertical distance from the zero point to the point at which perpendicular is drawn. Loss, profits are as have been shown in the chart which show that if production is less than the break-even point, the business shall be running at a loss and if the production is more than the break-even level profit shall result.



Second Method : A variation of the first method is that variable cost line is plotted first and then fixed cost line over the variable cost line. The latter line is the total cost line because it is drawn over the variable cost line and represents the total cost (variable and fixed) at various levels of output. This method is more helpful to the management for decision making because it shows the recovery of fixed costs at various levels of production before profits are realised. Contributions at various levels of production are automatically disclosed in the chart.



Third Method : Under this method, the fixed cost line is drawn parallel to the x-axis. The contribution line is drawn from the origin and this line goes up to with the increase in output. The sales line is plotted as usual. The question of interaction of sales line with cost line does not arise because the total cost line is not drawn in this method. In this method, break-even point is that point where the contribution line cuts the fixed cost line. At this point, contribution is equal to fixed expenses and there is no profit, no loss.



If the contribution is more than the fixed expenses, profit shall arise, If contribution is less than the fixed expenses, loss shall arise. In this example of Rs. 1,00,000 when the output is 50,000 units, At this level of output contribution is 2,50,000 (i.e. 50,000 units @ Rs. 5) and fixed cost is Rs. 1,50,000 resulting Rs. 1,00,000 i.e., contribution minus fixed costs :

Arithmetical Vericfication :

$$\text{Break Even Point} = \frac{\text{Fixed Expenses}}{\text{Contribution per unit}}$$

$$= \frac{\text{Rs. 1,50,000}}{\text{Rs. 5}} = 30,000 \text{ units of output or 30,000 units S.P}$$

$$= 30,000 \times \text{Rs. 15} = \text{Rs. 4,50,000 sales}$$

Profit when the output is 50,000 units

Contribution for 50,000 units @ Rs. 5 = Rs. 2,50,000

Less : Fixed Expenses = Rs. 1,50,000

Profit Rs. 1,00,000

(e) Angle of Incidence : This is the angle formed at the break-even point at which the sales line cuts the total cost line. This angle indicates the rate at which profits are being made. A large angle of incidence is an indication that profits are being made at a high rate. On the other hand, a small angle indicates a low rate of profit and suggests that variable costs form the major part of the cost of production. A large angle of incidence with a high margin of safety indicates the most favourable position of a business and even the existence of monopoly conditions.

(f) Assumptions Underlying Break-Even Chart :

1. All costs can be separated into fixed and variable costs.
2. Fixed costs will remain constant and will not change with the change in level of output.
3. Variable costs will fluctuate in the same proportion in which the volume of output varies. In other words, prices of variable cost factors i.e., wages rates, price of material etc. will remain unchanged.
4. Selling price will remain constant even though there may be competition or change in volume of production.
5. The number of units produced and sold will be the same so that there is no opening or closing stock.
6. There will be no change in operating efficiency.
7. There is only one product or in the case of many products, product mix will remain unchanged.
8. Product specifications and methods of manufacturing and selling will not change.

(g) Advantages of Break Even Charts : And Limitations:

1. Information provided by the break-even chart can be understood by the management more easily than contained in the profit and loss a/c and the cost statements because a break-even chart is the simple presentation of cost, volume and profit structure of the company. It summarises a great mass of detailed information in a graph in such a way that its significance may be grasped even with a cursory glance.
2. A break-even chart is useful for studying the relationship of cost, volume and profit. The chart is very useful for taking managerial decisions because it shows the effect on profits of changes in fixed costs, variable costs, selling price and volume of sales.
3. The chart is very useful for forecasting costs and profits at various volumes of sales.
4. A break-even chart is a tool for cost control because it shows the relative importance of the fixed costs and the variable costs.
5. Profitability of various products can be studied with the help of these charts and a most profitable product mix can be adopted. Profits at different levels of activity can also be ascertained.

6. The profit potentialities can be best judged from a study of the position of the break-even point and the angle of incidence in the break-even chart. Low break-even point and large angle of incidence in the break-even chart indicate that fixed costs are low and margin of safety is high. It is a sign of financial stability. In such a case, some monopolistic conditions prevail and high profits are earned over a large range of production activity. Low break-even point and small angle of incidence show that fixed costs are low and margin of safety is high, but rate of profit is not high because of absence of conditions. High break-even point and large angle of incidence show that fixed costs are high and margin of safety is low.

A small fall in volume may put the business into losses and a small increase in volume may give a high profit because of large angle of incidence. Last, high break-even point and small angle of incidence is the worst position because it indicates a low margin of safety and a low rate of profit.

7. It is helpful in the determination of sale price which would give desired profits or a B.E.P.
8. It is helpful in knowing the effect of increase or reduction in selling price.

Limitations :

1. A break-even chart is based on a number of assumptions (discussed earlier) which may not hold good. Fixed costs vary beyond a certain level of output. variable cost do not vary proportionately if the law of deminishing or increasing return is applicable in the business. Sales revenues do not vary proportionately with changes in volume of sales due to reduction in selling price as a result of competition or increased production.

In the break-even chart we have seen that the total cost line and the sales line look straight lines. This is possible on only with a number of assumptions. But in practice, the total cost line and the sales line are not straight lines because the assumption do not hold good.

2. A limited amount of information can be shown, in a break even chart. A number of charts will have to be drawn up to study the effects of changes in fixed costs, variable costs and selling prices.
3. The effect of various product mixes on profits cannot be studied from a single break-even chart.
4. A break-even chart does not take into consideration capital employed which is a very important factor in taking managerial decisions. Therefore, managerial decisions on the basis of break-even chart may not be reliable.

Inspite of the above limitations, the break-even chart is useful managerial device for analysing the problems, if it is constructed and used by those who fully understand its limitations.

Profit Volume Graph : Profit volume graph is simplified form of break-even chart and is an improvement over the break even chart as it clearly shows the relationship of profit to volume of sales. This graph suffers from the same limitations with which break even chart suffers. It is possible to construct a P/V graph for any data relating to a business from which a break even chart can be drawn. construction of this graph is relatively simple and the procedure of construction is as follows :

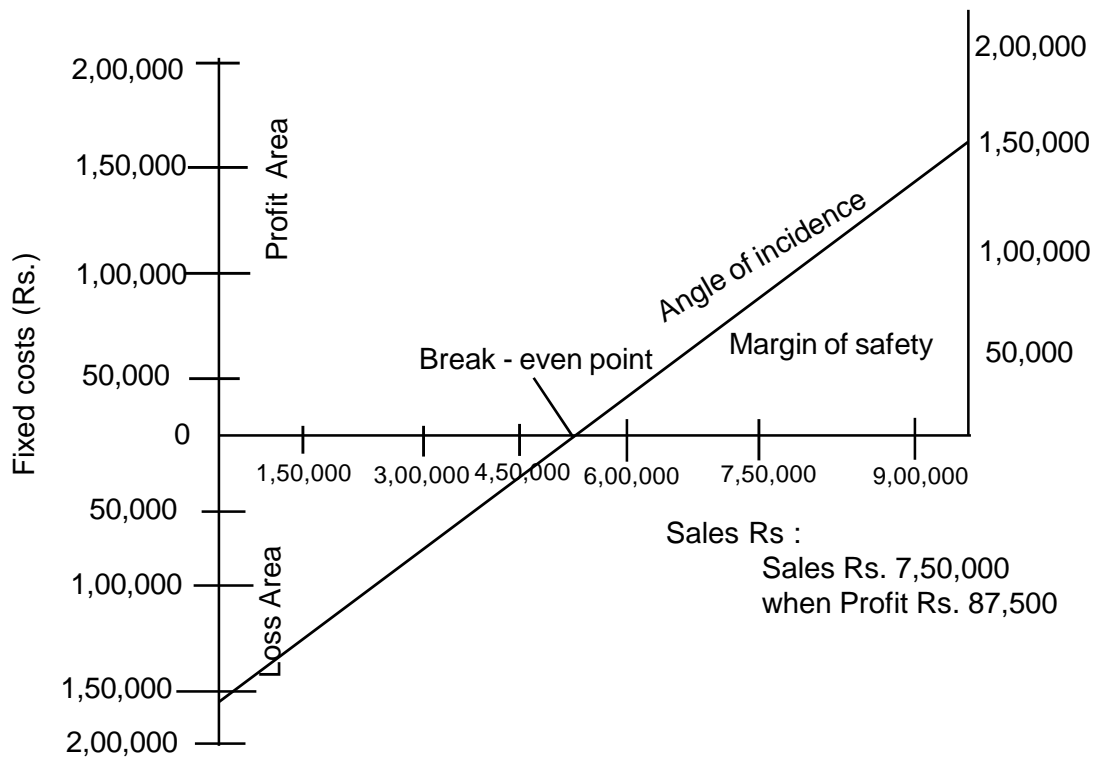
1. A scale for sales on horizontal axis is selected and other scale for profits and fixed cost or loss on the vertical axis is selected. The area below the horizontal axis is the loss area and that above it is the profit area.
2. Points of profits of corresponding sales, are plotted and joined. The resultant line is the profit / loss line

Illustration : Prepare a p/v graph from the following data :

Units produced	=	60,000
S.P. per unit	=	15
Variable cost per unit	=	10
Fixed costs	=	1,50,000

Show the expected sales on the graph when the profit to be earned is Rs. 87,500

Solution :



Arithmetic verification :

$$\begin{aligned} \text{Sales (in units)} &= \frac{\text{Fixed Expenses} + \text{Pr ofit}}{\text{Contribution per unit}} \\ &= \frac{1,50,000 + 87,500}{5} = \frac{2,37,500}{5} \\ &= 47,500 \text{ units} \end{aligned}$$

$$\text{Sales} = 47,500 \text{ units @ Rs. 15} = \text{Rs. } 7,12,500$$

Illustration - 16 : The following figures relates to one year's working at 100 percent capacity level in a manufacturing business :

	Rs.
Fixed overheads	1,20,000
Variable Overheads	2,00,000
Direct wages	1,50,000
Direct materials	4,10,000
Sales	10,00,000

Represents the above figures on a break-even chart and determine from the chart, the break-even point. Verify your results by calculations :

Solutions :

Cost and Sales at various capacity levels :

Percent Capacity	Fixed Overheads	Variable Costs	Total Costs	Sales Rs.
----	1,20,000	-----	1,20,000	-----
20	1,20,000	1,52,000	2,72,000	2,00,000

$$\left(7,60,000 \times \frac{20}{100} \right)$$

$$\left(10,00,000 \times \frac{20}{100} \right)$$

40	1,20,000	3,04,000	4,24,000	4,00,000
		$\left(7,60,000 \times \frac{40}{100}\right)$		$\left(10,00,000 \times \frac{40}{100}\right)$
60	1,20,000	4,56,000	5,76,000	6,00,000
		$\left(7,60,000 \times \frac{60}{100}\right)$		$\left(10,00,000 \times \frac{60}{100}\right)$
80	1,20,000	6,08,000	7,28,000	8,00,000
		$\left(7,60,000 \times \frac{80}{100}\right)$		$\left(10,00,000 \times \frac{80}{100}\right)$
100	1,20,000	7,60,000	8,80,000	10,00,000
		(Given)		(Given)

Arithmetical Verification :

Total Variable cost	Rs.
Direct Materials :	4,10,000
Direct Wages	1,50,000
Variable overheads	2,00,000
Marginal Cost :	<u>7,60,000</u>

Contribution = Sales - Marginal cost

$$= \text{Rs. } 10,00,000 - \text{RS. } 7,60,000$$

$$= 2,40,000$$

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{2,40,000}{10,00,000}$$

$$= \frac{24}{100} \text{ or } 24\%$$

$$\text{Break-Even Point} = \frac{\text{Fixed Expenses}}{\text{P/V Ratio}}$$

$$= \frac{1,20,000}{\frac{24}{100}}$$

$$= 1,20,000 \times \frac{100}{24}$$

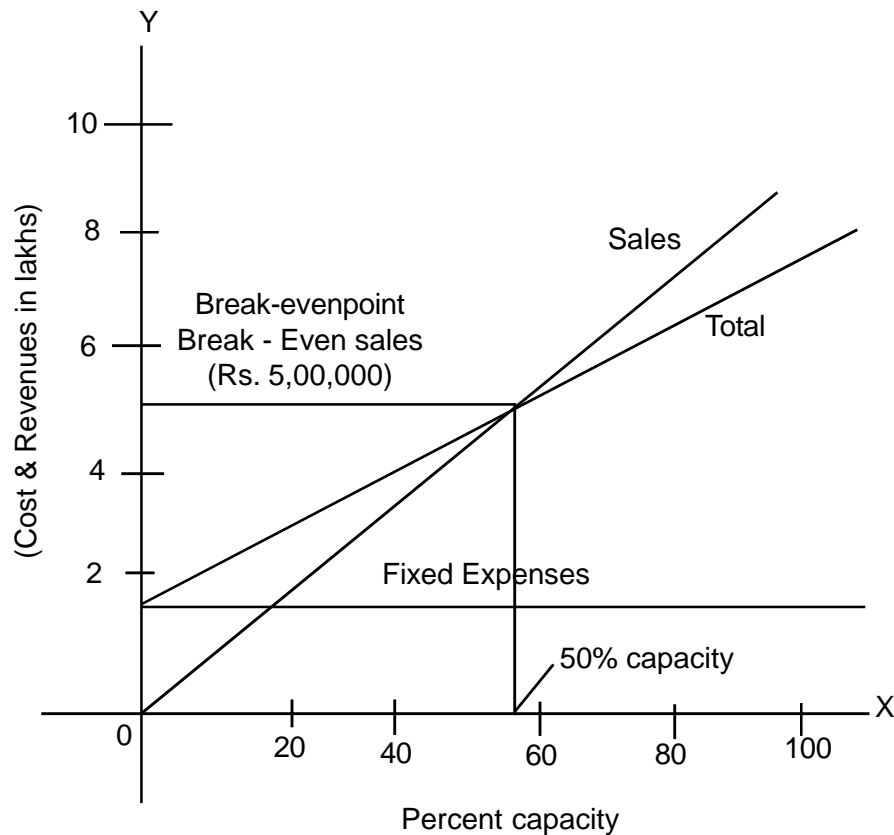
$$= \text{Rs. } 5,00,000$$

At Rs. 10,00,000 sales, 100% capacity is reached.

At Rs. 5,00,000 sales, 50% capacity is reached.

Hence, break-even point is reached at a 50% capacity utilisation.

Break Even Chart :



3.22 Problems :

- a) Find out the BEP sales if budgeted, output is 80,000 units, fixed cost is Rs. 4,00,000, selling price is Rs. 20 per unit and variable cost per unit is Rs. 10
- b) Calculate selling price, if marginal cost is Rs. 2,400 and p/v ratio is 20%
- c) Find out margin of safety, if profit is Rs. 20,000 and P/V ratio is 40%
- d) From the following data calculate a) Break even point expressed in amount of sales in rupees and b) number of units that must be sold to earn a profit of Rs. 1,60,800 per year.

Selling price - Rs. 20 per unit

Variable manufacturing cost - Rs. 11 per unit

Variable selling cost - Rs. 3 per unit

Fixed factory overheads - Rs. 5,40,000 per year

Fixed selling cost - Rs. 2,52,000 per year

e) Nikitha manufacturing ltd. Budgets production of 3,00,000 units at a variable cost of Rs. 10 each. The fixed costs are Rs. 20,00,000. The selling price is fixed to yield 20% on cost. You are required to calculate a) P/V ratio and b) Break even production units.

f) Find p/v ratio, if fixed cost is Rs. 10,000 & Break even sales are Rs. 25,000

g) From the following calculate a) Contribution per unit b) Margin of safety and c) Volume of sales to earn a profit of Rs. 24,000. Total fixed costs - Rs. 18,000 ;

h) Total variable cost - Rs. 100 per unit Total fixed cost - Rs. 96,000

Calculate (a) Break - even units and value and (b) sales to earn a profit of Rs. 20 per unit.

Solution :	Per unit
	Rs.
(a) Selling price	20
Less : Variable cost	10
Contribution	<u>10</u>

$$\text{Break-even point (in units)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$= \frac{4,00,000}{10}$$

$$= 40,000 \text{ units or Rs. } 8,00,000 \text{ (40,000 x 20)}$$

(b) P/V ratio i.e. contribution to sales ratio is 20%, then 80% of the sales will be variable cost.

$$\therefore \text{Sales} = \text{Variable cost} \times \frac{100}{8}$$

$$= \text{Rs. } 2,400 \times \frac{100}{8} = \text{Rs. } 3,000$$

$$\text{(c) Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{20,000}{40\%} = \text{Rs. } 50,000$$

(d)	per unit
	Rs.
Selling price	20
Less : Variable cost	14
Contribution	6

$$\text{a) Break even point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$= \frac{7,92,000}{6} = 1,32,000 \text{ units or Rs. } 26,40,000$$

$$\text{b) Sales} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{7,92,000 + 1,60,000}{6}$$

$$= \frac{9,52,800}{6} = 1,58,800 \text{ units}$$

(e) Sales = Fixed cost + Variable cost + profit

$$= 20,00,000 + 30,00,000 + 20\% \text{ of } 50,00,000$$

$$= \text{Rs. } 60,00,000.$$

	Rs.	Per unit (Rs.)
Sales	60,00,000	20
Less : Variable cost	30,00,000	10
Contribution	30,00,000	10

a) P/V ratio $\frac{\text{Contribution}}{\text{Sales}} \times 100$

$$= \frac{30,00,000}{60,00,000} \times 100 = 50\%$$

b) Break-even units = $\frac{\text{Fixed cost}}{\text{Contribution per unit}}$

$$= \frac{20,00,000}{10} = 2,00,000 \text{ units}$$

(f) Break-even sales = $\frac{\text{Fixed cost}}{\text{P/V ratio}}$

(or)

$$\text{P/V ratio} = \frac{\text{Fixed cost}}{\text{Break-even sales}} \times 100$$

$$= \frac{10,000}{25,000} \times 100$$

$$= \frac{2}{5} \text{ or } 40\%$$

G)	Total	Per unit
	Rs.	Rs.
Sales	50,000	2.50
Less : Variable cost	30,000	1.50
Contribution	20,000	1.00
Less : Fixed cost	18,000	0.90
Profit	2,000	0.10

$$\text{P/V ratio} = \frac{20,000}{50,000} \times 100 = 40\%$$

a) Contribution per unit = Rs. 1.00

$$\text{b) Margin of Safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{2,000}{40\%} = 5,000/-$$

$$\begin{aligned} \text{c) Sales} &= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V ratio}} \\ &= \frac{18,000 + 24,000}{40\%} = \frac{42,000}{40\%} = 1,05,000/- \end{aligned}$$

$$\begin{aligned} \text{(h) a) Break - even point} &= \frac{\text{Fixed costs}}{\text{Contribution per unit}} \\ &= \frac{96,000}{100 (200 - 100)} = 960 \text{ units or } 1,92,000 \text{ (i.e., } 960 @ 20/-) \end{aligned}$$

$$\text{b) Sales} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}}$$

Suppose N units are sold.

$$N = \frac{96,000 + 20N}{100}$$

$$100 N = 96,000 + 20 N$$

$$80 N = 96,000$$

$$N = \frac{96,000}{80}$$

$$= 1,200 \text{ units}$$

Problems on Concepts :

2 (a). Given the following, calculate P/V ratio and profit when sales are Rs. 20,000

(i) Fixed cost Rs. 4,000

(ii) Break - even point Rs. 10,000

b) Given the following, find the margin of safety sales :

(i) Profit earned Rs. 24,000

(ii) Selling Price per unit Rs. 10

(iii) Marginal cost per unit Rs. 7

c) Discuss the influence of fixed cost, variable cost and selling price on profit volume (P/V ratio), break - even point (BEP) and profit

d) From the following data, find out (i) Sales and (ii) new break-even sales, if selling price is reduced by 10%

Fixed cost - 4,000 ; Break-even sales - 20,000

Profit - 1,000 ; selling price per unit - 20

e) From the following data, compute break-even sales and margin of safety :

Sales - 10,00,000 : Fixed cost - 3,00,000 profit 2,00,000

f) From the following data, calculate Break even point :

Selling price per unit - 20, Variable cost per unit - 15,

Fixed overheads - 20,000

If Sales are 20% above BEP, determine the net profit.

g) The fixed costs amount to 1,50,000/- and percentage of variable costs to sales is given to be

$66\frac{2}{3}\%$. If 100% capacity sales at normal are 9,00,000/- find out the break - even point and the percentage sales when it occurs. Determine profit at 80% capacity sales.

Solution :

$$\text{a) p/v ratio} = \frac{\text{Fixed cost}}{\text{Break - Even sales}} = \frac{40,000}{10,000} \times 100 = 40\%$$

$$\text{Profit} = (\text{Sales} \times \text{P/V ratio}) - \text{Fixed cost}$$

$$= (20,000 \times 40\%) - 4,000$$

$$= 8000 - 4000 = 4,000/-$$

	Per unit
(b)	Rs.
Sales	10
Less : Marginal cost	7
Contribution	3

$$\text{Margin of Safety (in Units)} = \frac{\text{Pr ofit}}{\text{Contribution per unit}} = \frac{24,000}{3} = 8,000 \text{ units}$$

$$\text{Margin of safety (Value)} = 8,000 \times 10/- = 80,000/-$$

(or)

$$\text{Margin of safety} = \frac{\text{Pr ofit}}{\text{P/V ratio}} = \frac{24,000}{30\%} = 80,000/-$$

$$\text{(c) P/V ratio} = \frac{\text{Sales} - \text{Variable cost}}{\text{Sales}} \times 100$$

(or)

$$= \frac{\text{Contribution}}{\text{Sales}} \times 100 \text{ (or) } \frac{\text{Fixed cost} + \text{Pr ofit}}{\text{Sales}} \times 100$$

$$\begin{aligned} \text{BEP (units)} &= \frac{\text{Fixed cost}}{\text{SP per unit} - \text{Variable cost per unit}} \\ &= \frac{\text{Fixed cost}}{\text{Contribution per unit}} \end{aligned}$$

$$\begin{aligned} \text{BEP (Value)} &= \frac{\text{Fixed cost} \times \text{Selling price per unit}}{\text{Contribution per unit}} \\ &= \frac{\text{Fixed cost}}{\text{P/V ratio}} \end{aligned}$$

$$\begin{aligned} \text{Profit} &= \text{Selling price} - \text{Variable cost} - \text{Fixed cost} \\ &= \text{Contribution} - \text{Fixed cost} \end{aligned}$$

(d) i) Fixed cost = 4,000 i.e., contribution at BEP Sales

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{B.E. Sales}} \times 100 = \frac{4,000}{20,000} \times 100 = 20\%$$

$$\text{Sales} = \frac{\text{Fixed cost} + \text{Profit}}{\text{P/V ratio}} = \frac{5,000}{20\%} = 25,000$$

(ii) New selling price = 20 - 10% = 20 - 2 = 18/- per unit

Variable cost = 80% of 20 = 16/- per unit

New Contribution = 18 - 16 = 2/- per unit

$$\text{New P/V ratio} = \frac{2}{18} \times 100 = 11\frac{1}{9}\%$$

$$\therefore \text{New Break-even sales} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{4000}{11\frac{1}{9}\%} = 36,000/-$$

(e) Contribution = Fixed cost + profit

$$= 3,00,000 + 2,00,000 = 5,00,000$$

$$P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{5,00,000}{10,00,000} \times 100 = 50\%$$

$$\therefore \text{Break - Even sales} = \frac{\text{Fixed cost}}{P/V \text{ ratio}} = \frac{3,00,000}{50\%} = 6,00,000$$

$$\text{Margin of safety} = \frac{\text{Profit}}{P/V \text{ ratio}} = \frac{2,00,000}{50\%} = 4,00,000$$

Margin of safety = Actual sales - B.E. Sales

$$= 10,00,000 - 6,00,000 = 4,00,000$$

(f) Selling - 20 per unit, Variable cost - 15 per unit contribution - 5 per unit

$$\therefore P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{5}{20} \times 100 = 25\%$$

$$\text{BE Sales} = \frac{\text{Fixed cost}}{P/V \text{ ratio}} = \frac{20,000}{25\%} = 80,000$$

New sales = 8,000 + 20% of 80,000

$$= 80,000 + 16,000 = 96,000$$

Profit = (Sales x P/V ratio) - Fixed cost

$$= \left(96,000 \times \frac{25}{100} \right) - 20,000 = 24,000 - 20,000 = 4,000$$

(g) Percentage of variable costs to sales is $66 \frac{2}{3}$ i.e., $\frac{200}{3}$

Percentage of contribution to sales in 100 - $\frac{200}{3} = \frac{100}{3}$

$$P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}}$$

$$= \frac{100}{3} \times \frac{1}{100} = \frac{1}{3} \text{ or } \frac{1}{3} \times 100 = 33 \frac{1}{3}\%$$

$$\text{BEP} = \frac{\text{Fixed expenses}}{\text{P/V ratio}} = \frac{1,50,000}{\frac{1}{3}}$$

$$= 1,50,000 \times \frac{3}{1} = 4,50,000$$

100% capacity sales = 9,00,000

$$\therefore \text{BEP occurs at } \frac{4,50,000}{9,00,000} \times 100 = 50\%$$

Profit at 80% capacity sales :

100% capacity sales 9,00,000

$$\therefore 80\% \text{ Capacity sales } 9,00,000 \times \frac{80}{100} = 7,20,000$$

Rs.

Variable costs at 80% capacity sales

(66 2/3% of 7,20,000) 4,80,000

Fixed costs 1,50,000

Total costs 6,30,000

Sales 7,20,000

Profit at 80% capacity sales 90,000

Problems on Concepts :

3) a) Summit Ltd has earned contribution of 2,00,000 and net profit of 1,50,000 on sales of 8,00,000. What is its margin of safety ?

b) If margin of safety is 2,40,000 (40% of sales) and p/v ratio is 30% of Amit Ltd. Calculate its :

(i) Break-even sales (ii) Amount of profit on sales of 9,00,000

c) Anand company sells its product at 15/- per unit. In a period, if it produces and sells 8,000 units, it occurs a loss of 5/- per unit. If the volume is raised to 20,000 units, it earns a profit of 4/- per unit. Calculate break-even point both in terms of rupees as well as in units.

d) A company earned a profit of 30,000 during the year 2002-03. If the marginal cost and selling price of a product are 8/- and 10/- per unit respectively, find out the amount of 'Margin of safety'.

e) C&Co, a manufacture of glass bottles, reports its monthly profit on absorption costing basis. The accountant has been criticised for reporting widely different profits from month to month. To counteract this criticism he has put forward the following reason :

"It eliminates the distortion of interim profit statements which occur when there are seasonal fluctuations in sales volume although production is at a fairly constant level". Comment briefly on the accountants reason.

f) The p/v ratio of Bajaj co. dealing in precision instruments is 50% and the margin of safety is 40%

You are required to work out the break - even point and net profit if the sale volume is 50 lakhs.

g) Comment of the economic soundness of the following firms :

	Firm A Rs.	Firm B Rs.
Current sales volume	3,00,000	3,00,000
Break even sales volume	2,00,000	2,00,000
Margin of safety	1,00,000	1,00,000
Fixed cost	1,00,000	60,000

h) A company has a p/v ratio of 40%. By what percentage must sales be increased to offset :

Sol : 10% reduction in selling price (ii) 20% reduction in selling price :

$$(a) P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{2,00,000}{8,00,000} \times 100 = 25\%$$

$$\text{Margin of safety} = \frac{\text{Profit}}{P/V \text{ ratio}} = \frac{1,50,000}{25\%} = 6,00,000$$

$$(b) \text{Margin of safety} = \frac{\text{Profit}}{P/V \text{ ratio}}$$

(or)

$$\text{Profit} = \text{Margin of safety} \times p/v \text{ ratio}$$

$$= 2,40,000 \times 30\% = 72,000$$

$$\text{Total sales} = \frac{\text{Margin of Safety}}{40\%} = \frac{2,40,000}{40\%} = 6,00,000$$

$$\begin{aligned}\text{Contribution} &= \text{Sales} \times \text{p/v ratio} \\ &= 6,00,000 \times 30\% = 1,80,000\end{aligned}$$

$$\begin{aligned}\text{Fixed cost} &= \text{Contribution} - \text{profit} \\ &= 1,80,000 - 72,000 = 1,08,000.\end{aligned}$$

$$\text{(i) Break even sales} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{1,08,000}{30\%} = 3,60,000$$

$$\begin{aligned}\text{(ii) Profit} &= (\text{Sales} \times \text{p/v ratio}) - \text{Fixed cost} \\ &= (9,00,000 \times 30\%) - 1,08,000 \\ &= 2,70,000 - 1,08,000 = 1,62,000\end{aligned}$$

$$\begin{aligned}\text{(c) Average cost at 8,000 units volume} &= \text{Selling price per unit} + \text{loss component per unit} \\ &= 15 + 5 = 20\end{aligned}$$

$$\begin{aligned}\text{Average cost at 20,000 unit volume} &= 15 - 4 = 11\end{aligned}$$

$$\text{Total cost at 8,000 units volume} = 8,000 \times 20 = 1,60,000$$

$$\text{Total cost at 20,000 units volume} = 20,000 \times 11 = 2,20,000$$

$$\text{Variable cost per unit} = \frac{\text{Change in total cost}}{\text{Change in volume of production}}$$

$$= \frac{60,000}{12,000} = 5$$

$$\begin{aligned}\text{Fixed cost} &= \text{Total cost} - \text{Variable cost} \\ &= 1,60,000 - 40,000 = 1,20,000\end{aligned}$$

$$P/V \text{ ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{10}{5} \times 100 = 66\frac{2}{3}\%$$

$$\text{BEP (Rupees)} = \frac{\text{Fixed cost}}{P/V \text{ ratio}} = \frac{1,20,000}{66\frac{2}{3}\%} = 1,80,000$$

$$\text{BEP (in units)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{1,20,000}{10} = 12,000 \text{ units}$$

(d)	per unit
	Rs.
Selling price	10
Less : Marginal cost	8
Contribution	2

$$P/V \text{ ratio} = \frac{2}{10} \times 100 = 20\%$$

$$\text{Marginal of safety} = \frac{\text{Profit}}{P/V \text{ ratio}} = \frac{30,000}{20\%} = 1,50,000$$

(e) This statement is not valid because absorption costing will tend to produce a more stable profit profile. When production is constant but sales fluctuate. This is because the fixed production overhead is carried forward in stock for charging against the sales when they are made.

Under marginal costing principle fixed production overhead is treated as period cost and is written off as it is incurred. Therefore when sales fluctuate due to the constant change of fixed overhead reported profit vary widely. An example when sales are low the fixed overhead charge will be relatively high and profit will fall significantly.

(f) Calculation of sales at BEP :

	Rs.
Sales	50,00,000
Less : Marginal of safety 40%	
(i.e., $50,00,000 \times \frac{40}{100}$)	20,00,000

Sales at BEP 30,00,000

P/V ratio 50%

∴ Contribution or fixed expenses at BEP

(50% of 30,00,000) 15,00,000

Calculation of net profit at sales volume of 50,00,000

Rs.

Contribution on 50,00,000 sales 25,00,000

$\left[\text{Sales} \times \text{p/v ratio i.e., } 50,00,000 \times \frac{50}{100} \right]$

Less : Fixed expenses 15,00,000

Profit 10,00,000

(g)	Firm A Rs.	Firm B Rs.
Break even sales	2,00,000	2,00,000
Fixed cost or contribution	1,00,000	60,000

(At BEP contribution is equal
to fixed cost)

P/V ratio $\left[\frac{\text{Contribution}}{\text{Sales}} \times 100 \right]$	$\left[\frac{1,00,000}{2,00,000} \times 100 \right]$	$\left[\frac{60,000}{2,00,000} \times 100 \right]$
	50% Rs.	30% Rs.
Current sales volume	3,00,000	3,00,000
contribution on current sales volume (i.e., Sales x P/V ratio)	1,50,000 (3,00,000 x 50%)	90,000 (3,00,000 x 30%)
Less : Fixed cost	1,00,000	60,000
Profit	50,000	30,000

Comment : Firm A is more sound as compared to firm B because it gives excess profit of 20,000 (i.e., 50,000 - 30,000). It is because of higher p/v ratio of 50%. Higher the p/v ratio, better it is. Firm A will start earning profit @ 50% on sales after BEP. Whereas firm B will earn profit @ 30% on sales in excess of break-even sales.

(h) Suppose selling price per unit is Rs. 1 and units sold are 100.

	Present Position	After reduction of 10% in selling price	After reduction of 20% in selling price
	Rs.	Rs.	Rs.
Sales	100	90	80
Less: Variable cost	60	60	60
Contribution	40	30	20

Total sales in order to offset decrease in selling price

$$= \frac{\text{Sales} \times \text{present contribution}}{\text{New contribution}} \qquad \frac{90 \times 40}{30} = 120 \qquad \frac{80 \times 40}{20} = 160$$

% increase in sales 20% 60%

Maintaining Present profit :

(4) : A company is manufacturing three products A,B, and C. The data regarding costs, sales and profit are as follows :

Product	Sales	Selling price	Variable cost	Contribution
	Units	Perunit	perunit	perunit
A	2,000	Rs.5	Rs. 2	Rs. 3
B	1,000	Rs. 5	Rs. 3	Rs.2
C	1,000	Rs. 5	Rs. 3	Rs. 2

The fixed costs are Rs. 5,000. The company wants to change the sales mix from the existing proportion of 2:1:1 to 2:2:1 of A,B and C respectively.

You are required to calculate the number of units of each products which the company should sell to maintain the present profit.

Solution :

Present Profit

Total contribution (Rs. 6,000 + Rs. 2,000 + Rs. 2000)	Rs. 10,000
Less : Fixed costs	5,000
Profit	5,000

Number of units to be sold for profit of Rs. 5,000 as per new mix : If the number of units to be sold of product C is taken as X

Units sold of product B	= 2X
Units sold of product A	= 2X
Total sales in Rs.	= 5X + 10X + 10X = 25X
Variable costs in Rs.	= 3X + 6X + 4X = 13X
Total Sales	= Total cost + profit
25X	= 13X + 5,000 + 5,000
12X	= Rs. 10,000
X	= 833.33 units

Number of units to be sold

A	1,667.66	or	1,667
B	1,666.66	or	1,667
C	833.33	or	833

Verification

Total Contribution

A	1,667 x Rs. 3	=	Rs. 5,001
B	1,667 x Rs. 2	=	3,334
C	833 x Rs.2	=	1,666
			10,001

Less : Fixed costs	5,000	
Profit	5,001	or Rs. 5,000

Desired Level of Profit :

(5) The price structure of a cycle made by the hero company ltd. is as follows :

	per cycle
	Rs.
Materials	60
Labour	20
Variable overheads	20
	<hr/>
	100
Fixed overheads	50
Profit	50
Selling price	200

This is based on the manufacture of one lakh cycles per annum. The company expects that due to competition they will have to reduce selling prices, but they want to keep the profits intact. What level of production will have to be reached, i.e., how many cycles will have to be made to get the same amount of profit if :

(a) the selling price is reduced by 10%

(b) The selling price is reduced by 20%

Solution :

Fixed overheads	=	Rs. 50 per cycle
Present profit	=	Rs. 50 per cycle
Total number of cycles	=	1 lakh
Fixed costs	=	50 x 1 = Rs. 50 lakhs
Total present profit	=	Rs. 50 lakhs.

$$\begin{aligned} \text{Desired Sales} &= \frac{\text{Fixed cost} + \text{profit}}{\text{P/V ratio}} \\ &= \frac{\text{Fixed cost} + \text{profit}}{\text{Contribution per unit}} \end{aligned}$$

(a) If the selling price is reduced by 10%

$$\begin{aligned} \text{New selling price} &= 200 - 10\% = 200 - 20 \\ &= \text{Rs. } 180 \end{aligned}$$

$$\begin{aligned} \text{Hence, Desired Sales} &= \frac{50,00,000 + 50,00,000}{180 - 100} \\ &= \frac{1,00,000}{80} \\ &= 1,25,000 \text{ cycles.} \end{aligned}$$

(b) If the selling price is reduced by 20%

$$\begin{aligned} \text{New selling price} &= 200 - 20\% = 200 - 40 \\ &= \text{Rs. } 160 \end{aligned}$$

$$\begin{aligned} \text{Desired sales} &= \frac{50,00,000 + 50,00,000}{160 - 100} \\ &= \frac{1,00,000}{60} \\ &= 1,66,667 \text{ cycles.} \end{aligned}$$

Desired profit :

(6) Calculate from the following data :

(i) The amount of fixed expenses

(ii) The number of units to break - even

(iii) The number of units to earn a profit of Rs. 40,000

The selling price per unit can be assumed at Rs. 100

The company sold in two successive periods 7,000 units and 9,000 units and has incurred a loss of Rs. 10,000 and earned Rs. 10,000 as profit respectively.

Solution :

	Period I	Period - II
Sales	Rs. 7,00,000	Rs. 9,00,000
Profit / Loss (-)	Rs. 10,000	Rs. 10,000

Thus for an additional sales of Rs. 2,00,000 there is an additional contribution of Rs. 20,000 which has wiped off the loss or Rs. 10,000 of period I and earned a profit of Rs. 10,000 in period II

$$\text{P/V ratio} = \frac{\text{Change in contribution}}{\text{Change in Sales}} \times 100$$

$$= \frac{20,000}{2,00,000} \times 100 = 10\%$$

$$\text{Contribution of period I} = 7,00,000 \times \frac{10}{100} = \text{Rs. } 70,000 \text{ less of period I (given)}$$

(i) Fixed cost

$$\text{Contribution} = \text{Fixed cost} \pm \text{profit / Loss.}$$

$$\text{Fixed cost} = \text{Contribution} \pm \text{Loss / Profit}$$

$$\text{(ii) Break - Even point} = \frac{\text{Fixed cost}}{\text{P/V ratio}}$$

$$= \frac{80,000}{\frac{10}{100}} = \frac{80,000 \times 100}{10} = \text{Rs. } 8,00,000$$

$$\begin{aligned} \text{Number of Units to break - even} &= \frac{\text{Break - Even Sales}}{\text{Selling price per unit}} \\ &= \frac{8,00,000}{100} = 8,000 \text{ units} \end{aligned}$$

(iii) Number of units required to earn a profit of Rs. 40,000

$$\begin{aligned} &= \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V Ratio}} \\ &= \frac{80,000 + 40,000}{10\%} \\ &= \frac{1,20,000 \times 100}{10} = \text{Rs. } 12,00,000 \end{aligned}$$

Selling Price at a Reduced B.E.P.

(7) : From the following particulars, find out the break-even point :

The break-even point	Rs.
Variable cost per unit	15.
Fixed Expenses	54,000
Selling price per unit	20

What should be the selling price per unit, if the break-even point should be brought down to 6,000 units ?

solution :

$$\begin{aligned} \text{Contribution per unit} &= \text{S.P} - \text{Variable cost per unit} \\ &= 20 - 15 = \text{Rs. } 5 \end{aligned}$$

$$\begin{aligned} \text{a) B.E.P} &= \frac{\text{Fixed Expenses}}{\text{Contribution per unit}} \\ &= \frac{54,000}{5} = 10,800 \text{ units} \end{aligned}$$

b) What should be the selling price per unit, if the break-even-point should be brought down to 6000 units.

$$\text{B.E.P.} = \frac{\text{Fixed Expenses}}{\text{Contribution per unit}}$$

$$\text{or } 6,000 = \frac{54,000}{\text{Contribution per unit}}$$

$$\text{or Contribution per unit} = \frac{54,000}{6,000}$$

$$= \text{Rs. } 9$$

$$\text{Contribution} = \text{S.P.} - \text{V.C}$$

$$\text{Or, } 9 = \text{S.P.} - 15$$

$$\text{Or, S.P.} = 24/- \text{ Rs.}$$

B.E.P and percentage :

(8) : The fixed costs amount to Rs. 50,000 and the percentage of variable costs to sales is given to be 66 2/3%. If 100% capacity sales are Rs. 3,00,000 find out the break-even point and the percentage sales when it occurred. Determine profit at 80% capacity.

Solution :

$$\text{Percentage of Variable cost to sales } 66 \frac{2}{3}\% \text{ i.e., } \frac{200}{3}$$

$$\text{Percentage of contribution to sales is } 100 - \frac{200}{3} = \frac{100}{3}$$

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{100}{3} \times \frac{1}{100} \times 100 = \frac{100}{3} = 33 \frac{1}{3}\%$$

$$\text{Break - even sales} = \frac{\text{Fixed cost}}{\text{P/V Ratio}}$$

$$= \frac{50,000}{33\frac{1}{3}\%} = \frac{50,000}{100} \times 300 = \text{Rs. } 1,50,000$$

100% Capacity sales = Rs. 3,00,000

Hence, B.E.P. occurs at $\frac{1,50,000}{3,00,000} \times 100 = 50\%$ capacity

Profit at 80% capacity

At 100% capacity sales are Rs. 3,00,000

80% capacity sales $3,00,000 \times \frac{80}{100} = \text{Rs. } 2,40,000$

Total contribution at 80% capacity $= 2,40,000 \times \frac{100}{3} \times \frac{1}{100}$

= Rs. 80,000

Fixed Expenses = Rs. 50,000

Profit at 80% capacity = Rs. 30,000

Problem on BEP and Sales For A Desired profit M/s.

(9) : From the following illustration calculate the break - even point and turnover required to earn a profit of Rs. 36,000

Fixed overheads Rs. 1,80,000 Selling price Rs.20

Variable cost per unit Rs. 2

If the company is earning a profit of Rs. 3,60,000 express the 'margin of safety' available to it.

Solution :

1. Break - even point :

Contribution per unit :

Selling price per unit	Rs. 20
Variable cost per unit	Rs. 2
Contribution	Rs. 18
Fixed overheads	Rs. 1,80,000

$$\text{B.E.P.} = \frac{\text{Fixed overheads}}{\text{Contribution per unit}}$$

$$= \frac{1,80,000}{18} = 10,000 \text{ units}$$

(or)

$$= \text{Sales of Rs. 2,00,000}$$

2. Turnover required to earn profit of Rs. 36,000 :

$$= \frac{\text{Fixed overheads} + \text{Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{1,80,000 + 36,000}{18}$$

$$= \frac{2,16,000}{18}$$

$$= 12,000 \text{ units or sales of Rs. 2,40,000.}$$

3. Margin of Safety :

	Units	Rs.
Actual sales	12,000	2,40,000
Sales at break-even point	10,000	2,00,000
Margin of safety	2,000	40,000

(or)

$$\text{Margin of Safety} = \frac{\text{Net profit}}{\text{P/V ratio}}$$

$$= \frac{36,000}{90\%}$$

$$= \frac{36,000 \times 1000}{90}$$

$$= \text{Rs. } 40,000$$

Sales to B.E.

(10) : From the following information ascertain by how much the value of sales must be increased by the company voltas ltd, to break - even :

	Rs.
Sales	3,00,000
Fixed cost	1,50,000
Variable cost	2,00,000

Solution :

$$\text{Break - even point} = \frac{\text{Fixed cost} \times \text{Sales}}{\text{Sales} - \text{Variable cost}}$$

$$= \frac{1,50,000 \times 3,00,000}{3,00,000 - 2,00,000}$$

$$= \frac{1,50,000 \times 3,00,000}{1,00,000}$$

$$= \text{Rs. } 4,50,000$$

Hence, sales to be increased by the voltas to break-even are = Rs. 4,50,000 - 3,00,000
= 1,50,000/- Rs.

Desired Sales

(11) Anant company has annual fixed costs of 14,00,000. In 2003 sales amounted to 60,00,000 as compared with 45,00,000 in 2002 and profit in 2003 was 4,20,000 higher than in 2002 :

(i) At what level of sales does the company break - even ?

(ii) Determine profit / loss on a present sales volume of 80,00,000

(iii) If there is reduction in selling price in 2004 by 10% and the company desires to earn the same profit as in 2003, what would be the required sales volume ?

Sol :

$$\text{P/V ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} \times 100 = \frac{4,20,000}{15,00,000} \times 100 = 28\%$$

$$(i) \text{ BEP} = \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{14,00,000}{28} \times 100 = 50,00,000$$

(ii) Profit = (Sales x p/v ratio) - Fixed cost

$$= \left(80,00,000 \times \frac{28}{100} \right) - 14,00,000 = 8,40,000$$

(iii) Contribution in 2003 = 28% x 60,00,000 = 16,80,000.

This has to be maintained.

In 2003, the sales volume and contribution consequent upon 10% reduction in price are :

Rs.

Sales 54,00,000

Contribution 10,80,000

(16,80,000 - 10% of 60,00,000)

$$\text{P/V ratio} = \frac{10,80,000}{54,00,000} \times 100$$

$$= 20\%$$

$$\text{Required sales volume} = \frac{\text{Contribution}}{\text{P/V ratio}}$$

$$= \frac{16,80,000}{20\%}$$

$$= 84,00,000$$

Profit when sales change :

(12) An analysis of swapna Manufacturing company led to the following information :

Cost Element :	Variable costs (% of sales)	Fixed costs Rs.
Direct Materials	32.8	
Direct labour	28.4	
Factory overheads	12.6	1,89,000
Distribution Expenses	4.1	58,400
General & Administrative expenses	1.1	66,700

Budgeted sales for the next year are 18,50,000

You are required to determine,

- (i) The break - even sales volume,
- (ii) The profit at the budgeted sales volume
- (iii) The profit, if actual sales -
 - a) Drop by 10%
 - b) Increase by 5% from budgeted sales.

Sol :

Percentage of Variable cost to sales is 79% calculated as follows :

Direct materials	32.8% of sales
Direct labour	28.4% of sales
Factory overheads	12.6% of sales
Distribution Expenses	4.1% of sales
General & Administrative expenses	1.1% of sales
Total variable cost	79% of sales

Percentage of Contribution to sales = $100 - 79 = 21$

(contribution = Sales - Variable cost)

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{21}{100} \text{ or } 21\%$$

$$\begin{aligned} \text{(i) Break-even sales volume} &= \frac{\text{Fixed costs}}{\text{P/V ratio}} \\ &= \frac{1,89,000 + 58,400 + 66,700}{\frac{21}{100}} \\ &= 3,15,000 \times \frac{100}{21} = 15,00,000 \end{aligned}$$

(ii) Profit at budgeted sales of 18,50,000

Percentage of contribution to sales = 21

∴ Contribution at budgeted sales of 18,50,000

$$= 18,50,000 \times \frac{21}{100} = 3,88,500$$

Profit = contribution - Fixed Expenses = 3,88,500 - 3,15,000 = 73,500

(iii) (a) Profit if actual sales drop by 10%

Budgeted sales 18,50,000

Less : 10% Decline 1,85,000

Actual sales 16,65,000

Contribution @ 21% of sales = 16,65,000 × $\frac{21}{100}$ = 3,49,650

Less : Fixed expenses = 3,15,000

Profit = 34,650

(b) Profit if actual sales increase by 5% from budgeted sales

Budgeted sales 18,50,000

Add : 5% increase	92,000	
Actual sales	19,42,500	
Contribution @ 21% on sales =	$\frac{19,42,500 \times 21}{100}$	= 4,07,925
Less : Fixed Expenses		= 3,15,000
Profit		= 92,925

Effects of Changes in Selling Price : Management is generally confronted with a problem of analysing the effect of changes in sales price upon the profitability of the concern. It may be required to reduce the prices on account of competition, depression, expansion programme or government regulations. The effect of changes in sales prices can be easily analysed with the help of contribution technique.

(13) : The following data are available from the records of a company :

Sales	Rs. 60,000
Variable cost	Rs. 30,000
Fixed cost	Rs. 15,000

You are required to :

- Calculate p/v ratio, Break-even point and margin of safety at this level.
- Calculate the effect of 10% increase in sale price :
- Calculate the effect of 10% decrease in sale price :

Solution :

$$(a) \text{ p/v ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$\begin{aligned} \text{Contribution} &= \text{Sales} - \text{Variable cost} \\ &= \text{Rs. } 60,000 - 30,000 = \text{Rs. } 30,000 \end{aligned}$$

$$\text{p/v ratio} = \frac{30,000}{60,000} \times 100$$

$$= 50\%$$

$$\begin{aligned} \text{Break - Even point} &= \frac{\text{Fixed cost}}{\text{P/V ratio}} \\ &= \frac{15,000 \times 100}{50} \\ &= \text{Rs. } 30,000 \end{aligned}$$

$$\begin{aligned} \text{Margin of safety} &= \text{Present sales} - \text{Sales at B.E.P} \\ &= \text{Rs. } 60,000 - 30,000 \\ &= \text{Rs. } 30,000 \end{aligned}$$

(b) Effect of 10% increase in sales price :

$$\text{Sales} = \text{Rs. } 60,000 + 10\% = \text{Rs. } 66,000$$

$$\text{P/V ratio} = \text{Contribution} / \text{Sales} \times 100$$

$$\begin{aligned} &\frac{66,000 - 30,000}{66,000} \times 100 \\ &= 54.55\% \end{aligned}$$

$$\begin{aligned} \text{Break - even point} &= \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{\text{Fixed cost}}{\text{Total contribution}} \times \text{Total sales} \\ &= \frac{15,000}{36,000} \times 66,000 \\ &= \text{Rs. } 27,500 \end{aligned}$$

$$\begin{aligned} \text{Margin of Safety} &= \text{Actual sales} - \text{Sales at BEP} \\ &= 66,000 - 27,500 \\ &= \text{Rs. } 38,500 \end{aligned}$$

(c) Effect of 10% decrease in sales price :

$$\text{Sales} = \text{Rs. } 60,000 - 10\% = \text{Rs. } 54,000$$

$$\begin{aligned} \text{P/V ratio} &= \frac{\text{Contribution}}{\text{Sales}} \times 100 \\ &= \frac{54,000 - 30,000}{54,000} \times 100 \\ &= \frac{24,000}{54,000} \times 100 \\ &= 44.44\% \end{aligned}$$

$$\begin{aligned} \text{Break - Even point} &= \frac{\text{Fixed cost}}{\text{Total contribution}} \times \text{Sales} \\ &= \frac{15,000}{24,000} \times 54,000 \\ &= \text{Rs. } 33,750 \end{aligned}$$

$$\begin{aligned} \text{Margin of Safety} &= \text{Actual Sales} - \text{Sales at B.E.P} \\ &= 54,000 - 33,750 \\ &= \text{Rs. } 20,250. \end{aligned}$$

Effect of Changes :

(14) : The following details are obtained from Godrej Co. Ltd for a calendar year :

Present production and sales	8,000	units
Selling price per unit	Rs. 20.00	
Variable cost per unit :		
Direct materials	Rs. 5.00	
Direct labour	Rs. 2.50	
Variable overhead	100 %	of direct labour cost

Fixed cost (total) Rs. 40,000

(a) Calculate p/v ratio, break - even point and margin of safety from the above particulars.

(b) Find the effect on p/v ratio, break-even point and margin of safety of changes in each of the following :

(i) 10% increase in selling price :

(ii) 10% increase in variable cost :

(iii) 10% decrease in fixed cost, and

(iv) 10% decrease in sales volume.

Solution :

Particulars	(a)	(b)			
		(i)	(ii)	(iii)	(iv)
P/V ratio (Contribution ÷ Sales)	$\frac{10}{20} = \frac{1}{2}$ or 50%	$\frac{12}{22} = \frac{6}{11}$ or 54.55%	$\frac{9}{20}$ or 45%	No Effect on P/V ratio	No effect on p/v ratio
Break-even sales	Rs. 40,000	Rs. 40,000	Rs. 40,000	Rs 36,000x $\frac{2}{1}$	No effect
(Fixed cost ÷ p/v Ratio	$x \frac{2}{1} =$ Rs. 80,000	$x \frac{11}{6} =$ Rs. 73,333	$x \frac{20}{9} =$ Rs. 88,888	= Rs. 72,000	on BEP
Margin of safety (Total sales - BE sales)	Rs. 1,60,000 -80,000= Rs. 80,000 or 50%	Rs.1,76,000 -73,333= Rs. 1,0,2,667 or 58.33%	Rs.1,60,000 88,888 = Rs. 71,112 or 44.44%	Rs. 1,60,000 -72,000= Rs. 88,000 or 55%	Rs.(7,200x20) -80,000 = Rs. 64,000 or 44.44%

(15) : The following data are obtained from the records of a videocon company :

	First year	Secod year
	Rs.	Rs.
Sales	80,000	90,000
Profit	10,000	14,000

Calculate :

- (a) p/v ratio
 (b) Break - even point :
 (c) Profit or loss when sales amount to Rs. 50,000, and
 (d) Sales required to earn a profit of Rs. 19,000

Solution :

	Sales	Profit
	Rs.	Rs.
(a) Second year	90,000	14,000
First year	90,000	10,000
Change	10,000	4,000

Assuming that the change in fixed cost is nil, the marginal cost equation can be used as follows:

$$S - V = F + P$$

$$10,000 - V = 0 + 4,000$$

$$V = 6,000$$

$$P/V \text{ ratio} = \frac{S - V}{S} \times 100 = \frac{10,000 - 6,000}{10,000} \times 100 = 40\%$$

$$\text{Alternatively, } p/v \text{ ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} = \frac{4,000}{10,000} = \frac{2}{5} \text{ or, } 40\%$$

(b) Break - Even point = $\frac{\text{Fixed cost}}{P/V \text{ ratio}}$. This formula can now be applied after determining fixed cost. Applying marginal cost Equation -

$$C = F + P$$

$$\text{or } F = C - P$$

Thus, $F = 40\% \text{ of Rs. } 80,000 - 10,000$

$$= \text{Rs. } 32,000 - 10,000 = \text{Rs } 22,000$$

$$\begin{aligned} \text{Alternatively, } F &= 40\% \text{ of Rs. } 90,000 - 14,000 \\ &= \text{Rs. } 36,000 - 14,000 = \text{Rs. } 22,000 \end{aligned}$$

$$\text{Break - Even point} = \frac{\text{Rs. } 22,000}{40\%} = \text{Rs. } 55,000$$

(c) Sales Rs. 50,000

P/V ratio 40%

$$\therefore \text{Contribution} = 40\% \text{ of } 50,000 = \text{Rs. } 20,000$$

We know

$$C = F + P$$

$$\text{Rs } 20,000 = 22,000 + P$$

$$\text{or, } P = (-) \text{ Rs. } 2,000$$

When sales are Rs. 50,000, loss would be Rs. 2,000

(d) To earn a profit of Rs. 19,000 required contribution

$$\text{Rs. } 22,000 + 19,000 = \text{Rs. } 41,000 (\because C = F + P)$$

$$\therefore \text{Required Sales} = \frac{\text{Required Contribution}}{\text{P/V ratio}} = \frac{\text{Rs. } 41,000}{40\%} = \text{Rs. } 1,02,500$$

Marginal Costing As A Managerial Decision Making Tool :

Marginal costing technique may be applied in various fields as an aid to management, in arriving at many important policy decisions. These can be stated as :

1. Profit Planning (Also discussed earlier) : There are four important ways to improve the profit performance of a business :

a) by increasing volume, b) by increasing selling price c) by decreasing variable costs and d) by decreasing fixed costs. Profit planning is the planning of future operations so as to obtain maximum profit. The contribution ratio shows the relative profitability of various sectors of the business whenever there is change in selling price, variable costs or product mix.

(16) : (1) : Two business concerns Y Ltd. and Z Ltd. sell the same type of product in the same type of market.

Their budgeted profit and loss accounts for the coming year are as follows :

	Y Ltd.		Z Ltd.	
	Rs.		Rs.	
Sales	1,50,000		1,50,000	
Less : Variable costs	1,20,000		1,00,000	
Fixed costs	15,000	1,35,000	35,000	1,35,000
Budgeted net profit	15,000		15,000	

You are required to :

- Calculate the break - even point of each business :
- Calculate the sales volume at which each business will earn Rs. 5,000 of profit ;
- State at which business is likely to earn greater profit in conditions.

of : (i) Heavy demand for the product

(ii) low demand for the product and briefly give your reasons.

Solution :

(a) For calculation of break - even points, p/v ratio of y ltd. and Z ltd. should be found out.

$$\begin{aligned} \text{P/V ratios} &= \frac{\text{Contribution}}{\text{Sales}} \\ &= \frac{\text{Fixed expenses} + \text{profit}}{\text{Sales}} \end{aligned}$$

$$\text{P/V ratio of Y Ltd.} = \frac{15,000 + 15,000}{1,50,000} = \frac{1}{5} \text{ or } 20\%$$

$$\text{P/V ratio of Z Ltd.} = \frac{35,000 + 15,000}{1,50,000} = \frac{1}{3} \text{ or } 33\frac{1}{3}\%$$

$$\text{Break - even point} = \frac{\text{Fixed expenses}}{\text{P/V ratio}}$$

$$Y = \frac{1500}{\frac{1}{5}} = 15000 \times \frac{5}{1} = \text{Rs. } 75,000$$

$$Z = \frac{35,000}{\frac{1}{3}} = 35,000 \times \frac{3}{1} = \text{Rs. } 1,05,000$$

(b) The sales volume when desired profit is Rs. 5,000

$$Y \text{ Ltd.} = \frac{15,000 + 5,000}{\frac{1}{5}} = \text{Rs. } 20,000 \times \frac{5}{1} = \text{Rs. } 1,00,000$$

$$Z \text{ Ltd.} = \frac{35,000 + 5,000}{\frac{1}{3}} = \text{Rs. } 40,000 \times \frac{3}{1} = \text{Rs. } 1,20,000$$

(c) In conditions of heavy demand concern with larger p/v ratio can give / earn greater profits because of greater contribution. Thus, Z Ltd. is likely to earn greater profit.

(ii) In conditions of low demand a concern with lower break-even point is likely to earn more profits because it will start earning profits at lower level of sales. In this cases y ltd. will start earning profits when its sales reach the level of Rs. 75,000 whereas z ltd. will start earning profits when its sales reach the level of Rs. 1,05,000. Therefore, in case of low demand, break-even point should be reached as earlier as possible so that the concern may start earning profits.

$$(b) \text{ Sales volume} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{p/v ratio}}$$

17 (2) : Rama factory produces 24,000 units. The cost sheet give the following information :

	Rs.
Direct materials	2,40,000
Direct wages	1,68,000
Variable overheads	96,000
Semi-variable overheads	56,000
Fixed overheads	1,60,000
Total cost	7,20,000

The product is sold at Rs. 40 per unit. The management proposes to increase the production by 3,000 units for sale in the foreign market. It is estimated that the semi-variable overheads will increase by Rs. 2,000. But the product will be sold at Rs. 28 per unit in the foreign market. However, no additional capital expenditure will be incurred. The management seeks your advice as a cost accountant.

Solution :**Profitability Statement**

	24,000 units		Addl. 3,000 units	
	Per unit Rs.	Total Rs.	Perunit Rs.	Total Rs.
Sales	40	9,60,000	28	84,000
Less : cost of production	10	2,40,000	10	30,000
Direct material	7	1,68,000	7	21,000
Variable overheads	4	96,000	4	12,000
Semi-variable overheads	2.33	56,000	0.66	2,000
Fixed overheads	6.66	1,60,000	-----	-----
	30	7,20,000	21.66	65,000
Profit	10	2,40,000	6.33	19,000

Comment :

It is better to increase the production by 3,000 units for sale in the foreign market at Rs. 28 per unit. The marginal cost per unit beyond 24,000 units will be only Rs. 21.66, thus leaving a profit of Rs. 6.33 per unit even if sold at Rs. 28 per unit in the foreign market. The additional profit, as result of increasing production from 24,000 units to 27,000 units would be Rs. 19,000. Thus, the total profit would be Rs. 2,59,000 (2,40,000 + 19,000)

Direct material	8	10		
Direct wages	12	12		
Variable overheads	4	4		
			24	26
Contribution per unit			6	4
Output per hour			50 units	100 units

Contribution per hour	300	400
Total machine hour per annum	2,000	2,000
Total contribution	6,00,000	8,00,000

Hence, production of Machine Y is more profitable.

2. Better Machine To Produce :

Sometimes the management has to choose from among alternatives methods of production eg., machine work or hand work. The same product may be produced either by employing machine No. 1 or machine No. 2, and the management may be confronted with the problem of choosing one among them. In such circumstances, technique of marginal costing can be applied and the method which gives the highest contribution can be adopted keeping in view, of course, the limiting factor.

(19)

Product A can be manufactured either by machine X or machine Y., Machine X can produce 50 units of 'A' per hour and machine Y, 100 units per hour. Total machine hours available are 2000 hours per annum. Taking into consideration the following cost data, determine the profitable method of manufacture.

	per unit of Product A	
	Machine X	Machine Y
Direct material	8	10
Direct wages	12	12
Variable overheads	4	4
Fixed overheads	5	5
	29	31
Selling price	30	30

Solution :

Profitability Statement :

	Machine X Rs.	Machine Y Rs.
Sale price per unit	30	30

Less :

Material Cost

3. Better Level of Activity :

The technique of a marginal costing also helps the management in determining the optimum level of activity. To make such a decision, contribution at different levels of activity can be found, and the level of activity which gives the highest contribution will be the optimum level. The level of production can be raised till the marginal cost does not exceed the selling price.

(20)

Coromandal factory engaged in manufacturing plastic buckets is working at 40% capacity and produces 10,000 buckets per annum.

The present cost break-up for one bucket is as under :

Material	Rs. 10
Labour cost	Rs 3
Overhead	Rs.5 (60 % fixed)

The selling price is Rs. 20 per bucket.

If it is decided to work the factory at 50% capacity, the selling price falls by 3%. At 90% capacity the selling price falls by 5% accompanied by a similar fall in the prices of material.

You are required to calculate the profit at 50% and 90% capacities and also calculate Break-even points for the capacity productions -

Solution :

$$\text{Output at 40\% capacity} = 10,000 \text{ units}$$

$$\text{Output at 50\% capacity} = \frac{10,000 \times 50}{40}$$

$$= 12,500 \text{ units}$$

$$\text{Output at 90\% capacity} = \frac{10,000 \times 90}{40}$$

$$= 22,500 \text{ units}$$

Profitability Statement at 50% and 90% Capacities

	50% capacity		90% capacity	
	Per unit Rs.	Total Rs.	Per unit Rs.	Total Rs.
Sales	19.40	2,42,500	19.00	4,27,500
	$20 - \frac{3 \times 20}{100}$		$20 - \frac{5 \times 20}{100}$	
(b) Variable costs :				
Materials	10.00	1,25,000	9.50	2,13,750
			$10 - \frac{5 \times 10}{100}$	
Wages	3.00	37,500	3.00	67,500
Variable overhead (40% of Rs. 5)	2.00	25,000	2.00	45,099
Total variable cost	15.00	1,87,500	14.50	3,26,250
Contribution (a-b) = c	4.40	55,000	4.50	1,01,250
(d) Fixed overheads (60% of Rs. 5 = 10,000 x 5)		30,000		30,000
Profit (c-d)		25,000		72,250

$$\text{Break - even point} = \frac{\text{Fixed expenses}}{\text{Contribution per unit}}$$

$$\text{B.E.P. at 50\% capacity} = \frac{30,000}{4.40} = 6,818 \text{ units}$$

$$\text{B.E.P. at 90\% capacity} = \frac{30,000}{4.50} = 6,667 \text{ units}$$

4. Introduction of A New Product :

Some times, product may be added to the existing lines of products with a view to utilise idle facilities, to capture a new market or for any other purpose. The profitability of this new product has to be found out initially. Usually, the new product will be manufactured if it is capable of contributing something towards fixed costs and profits after meeting its variable costs.

(21)

(a) A concern manufacturing product "X" has provided the following information :

Sales - 75,00/- Variable overheads - 10,000/-

Direct materials - 30,000/- Fixed overheads - 15,000/-

Direct labour - 10,000/-

In order to increase its sales by Rs. 25,000 the concern wants to introduce the product 'Y', and estimates the costs in connection there with as under :

Direct materials - 10,000/-

Direct labour - 8,000/-

Variable overheads - 5,000/-

Fixed overheads - NIL

Advise whether the product 'Y' will be profitable or not.

Solution :

Marginal cost Statement

	X Rs.	Y Rs.	Total Rs.
Sales	75,000	25,000	1,00,000
Less : Marginal Cost			
Direct materials	30,000	10,000	40,000
Direct labour	10,000	8,000	18,000
Variable overheads	10,000	5,000	15,000
	50,000	23,000	73,000
Contribution	25,000	2,000	27,000
Fixed cost			15,000
Profit			12,000

Commentary : If product Y is introduced, the profitability of product x is not affected in any manner. On the other hand, product Y provides a Contribution of Rs. 2,000 towards fixed cost and profit. Therefore, Y should be introduced.

Better Product.

(22) Comment on the relative profitability of the following two products :

Production cost per unit

	Product X Rs.	Product Y Rs.
Materials	200	150
Wages	100	200
Fixed overheads	350	100
Variable overheads	150	200
Profit	200	350
Selling price	1,000	1,000
Output per week	200 units	100 units

Solution :

Comparitive statement of profitability

Particulars	Product X Rs.	Product Y Rs.
Sale price per unit	1,000	1,000
Less : Variable cost per unit	450	550
Contribution per unit	550	450
Less : Fixed cost per unit	350	100
Profit per unit	200	350
Total Profit	40,000	35,000
P/V ratio (Contribution / sales)	55%	45%

Commentary : Product x gives maximum contribution per unit and product y gives maximum profit per unit. If the output in terms of units is the limiting factor, product X should be preferred. If there is no limit regarding units of output, product Y should be preferred.

5) Limiting Factor : A concern would produce and sell only those products which offer maximum profit. This is based on the assumption that it is possible to produce and quantity without any difficulty and sell likewise. However, in actual practice, this seems to be unrealistic as several constraints come in the way of manufacturing as well as selling. Such constraints that come in the way of management's efforts to produce and sell in unlimited quantities are called 'Key factors' or limiting factors'. The limiting factors may be materials, labour, plant capacity, or demand. Management must ascertain the extent of the influence of the key factors for ensuring maximisation of profit. Normally, when contribution and key factors are known, the relative profitability of different products process can be measured with the help of the following formula :

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key factors}}$$

(23) Problem :

(1) From the following data, which product would you recommended to be manufactured in a factory, time being the key factor ?

	Per unit of product x Rs.	Per unit of Product Y Rs.
Direct material	24	14
Direct labour at Rs. 1 per hour	2	3
Variable overheads at Rs. 2 perhour	4	6
Selling price	100	110
Standard time to produce	2 hours	3 hours.

Solution :

	product x Per unit Rs.	Product Y Per unit Rs.
Selling price	100	110
Less : Marginal cost	Rs.	Rs.
Direct Materials	24	14
Direct labour	2	3

Variable overhead	4	30	6	23
		70		87
Standard time to produce		2 hours		3 hours
Contribution per hour		$\frac{70}{2} = \text{Rs. } 35$		$\frac{87}{3} = \text{Rs. } 29$

Comment :

Contribution per hour of product x is more than that of product Y by Rs. 6. Therefore, product x is more profitable and is recommended to be manufactured.

(24) : (a) The following particulars are extracted from the records of voltas ltd company :

	per unit	
	product X	product Y
Sales	Rs. 100	Rs. 120
Consumption of material	2 kg	3 kg.
Material cost	Rs. 10	Rs. 15
Direct wages cost	Rs. 15	Rs. 10
Direct expenses	Rs. 5	Rs. 6
Machine hours used	3	2
Overhead expenses :		
Fixed	Rs. 5	Rs. 10
Variable	Rs. 15	Rs. 20

Direct wages per hour is Rs. 5 Comment on profitability of each product (both use the same raw material)

When :

- (i) Total sales potential in units is limited ;
- (ii) Total sales potential in value is limited ;

(iii) Raw Material is in short supply

(iv) Production capacity (in terms of machine hours) is the limiting factor

(b) Assuming Raw material as the key factor, availability of which is 10,000 kg., and maximum sales potential of each product being 3,500 units, findout the product mix which will yield the maximum profit.

Solution :

	per unit	
	Product A	Product B
	Rs.	Rs.
Direct materials	10	15
Direct Labour	15	10
Direct expenses	5	6
Prime cost	30	31
Variable overheads	15	20
Marginal cost	45	51
Sales	100	120
Contribution	55	69
P/V ratio	0.55	0.575
Contribution per kg. of materials	27.50	23.00
Contribution per machine hour	18.33	34.50

Thus, profitability of each product will be determined on the basis of the principle; the higher the contribution per unit of limiting factor, the more profitable is the product. Accordingly, a statement of profitability under different conditions may be prepared thus.

Limiting Factor	Ranking of Products	Ranking Based on
(a) Sales volume	BA	Unit contribution
(b) Sales value	BA	P/V ratio
(c) Raw material	AB	Contribution per kg

(d) Production capacity
(machine hours)

BA

Contribution per
machine hour

Product preference will be in the same order as (a), (iii) subject to the condition that maximum demand for each or the two products is 3,500 units. In other words 3,500 units of more profitable product will be produced first. The balance available of raw materials will then have to be utilised for the production of less profitable product. Thus, the optimum product mix would be :

Product	Units	Raw materials per unit (kg)	Total raw materials required
A	3,500	2	7,000
B	1,000*	3	3,000
			10,000

Notes : $*(10,000 - 7,000) / 3 = 1,000$ units.

(25) : In summit factory producing two different kinds of articles, the limiting factor is the availability of labour. From the following information show which product is more profitable.

	Product A	Product B
	Cost per unit	cost per unit
	Rs.	Rs.
Materials	5.00	5.00
Labour		
6 hours @ Rs. 0.50	3.00	
3 hours @ Rs. 0.50		1.50
Overheads :		
Fixed - 50% of labour	1.50	0.75
Variable	1.50	1.50
Total cost	11.00	8.75
Selling price	14.00	11.00
Profit	3.00	2.25
Total production per month	500	600

Maximum capacity per month is 4,800 hours. Give the proof in support of your answer.

Solution :

	Product A (per unit) Rs.	Product B (per unit) Rs.
Selling price	14.00	11.00
Less : Variable cost :		
	A	B
	Rs.	Rs.
Materials	5.00	5.00
Labour	3.00	1.50
Variable expenses	1.50	1.50
	<u>9.50</u>	<u>8.00</u>
Contribution per unit	4.50	3.00
Labour hours required per unit	6 hours	3 hours
	$= \frac{4.50}{6}$	$= \frac{3}{3}$
Contribution per hour	= 0.75	= 1.00

(Hence product B is more profitable because of more contribution per hour)

Proof :

	Product A	Product B
Maximum capacity per month	4800 hours	4800 hours
Labour hours required per unit	6 hours	3 hours
Maximum capacity in units	$\frac{4,800}{6} = 800$	$\frac{4,800}{3} = 1600$
Materials	4,000	8,000
Labour @ Rs. 0.50 per hour for		

<i>M.Com</i>	3.89	<i>Product Costing...</i>
4,800 hours	2,400	2,400
Overheads :		
Fixed - 50% of labour	1,200	1,200
Variable @ Rs. 1.50 per unit	1,200	2,400
Total cost	8,800	14,000
Sales	11,200	17,600
	(800 x 14)	(1600 x 11)
Profit	2,400	3,600

6. Make or Buy Decisions :

A company might be having unused capacity which may be utilised for making component parts or similar items instead of buying them from the market. In arriving at such a 'make or buy' decision, the cost of manufacturing component parts should be compared with price quoted in the market. If the variable costs are lower than the purchase price, the component parts should be manufactured in the factory itself - Fixed costs are excluded on the assumption that they have been already incurred, and the manufacturing of components involves only variable cost. However, if there is an increase in fixed costs and any limiting factor is operating while producing components etc. that should also be taken into account.

(26)

(i) You are the Management Auditor of xyz co. ltd. The Managing Director of the company seeks your advice on the following problem :

The xyz ltd. produces a variety of products each having a number of component parts. Product 'B' takes 5 hours to produce on machine no. 99 working at full capacity. 'B' has a selling price of Rs. 50 and a marginal costs of Rs. 30 per unit. 'A - 10' a component part could be made on the same machine in 2 hrs. for marginal cost of Rs. 5 per unit. The supplier's price is Rs. 12.50 per unit should be the company make or buy 'A-10' ?

Assume that machine hour is the limiting factor.

Solution :

In this problem the cost of new product plus contribution lost during the time for manufacturing 'A-10' should be compared with the supplier's price to arrive at a decision.

	Rs.
'B' - Selling price	50.00
Marginal cost	30.00
	20.00

It takes 5 hours to produce one unit of B

∴ Contribution earned per hour on Machine no. 99 is Rs. $\frac{20}{5} = \text{Rs. } 4$

'A - 10' takes two hours to be manufactured on machine which is producing 'B'

If 'A - 10' is produced, contribution lost will be = 2 hrs x Rs. 4 = Rs. 8

Real cost of 'A-10' to the company = Marginal cost of 'A-10' plus contribution lost for using the machine for 'A-10'

$$= \text{Rs. } 5 + 8 = \text{Rs. } 13$$

This is more than the seller's price of Rs. 12.50 and so it is advisable for the company to buy the product from outside.

(27) A radio manufacturing company finds that while it costs Rs. 6.25 to make each component x 2,730, the same is available in the market at Rs. 4.85 each, with an assurance of continued supply. the break down of cost is :

Materials	Rs. 2.75 each
Labour	Rs. 1.75 each
Other variables	Rs. 0.50 each
Depreciation & other fixed costs	<u>Rs. 1.25 each</u>
Total	<u>6.25</u>

Should you make or buy ?

Solution :

Variable cost of manufacturing is Rs. 5 (6.25 - 1.25) but the market price is Rs. 4.85. If the fixed cost of Rs. 1.25 is also added, it is not profitable to make the component. Because there is a surplus of Rs. 0.15 even in variable cost, it is profitable to procure from outside.

(28)

Aryan Manufacturing company finds that while the cost of making a component No.1 in its own shop is Rs. 8 each, the same is available in the market at Rs. 6.50 with an assurance of continuous supply. Give your suggestions whether to make or buy this component. Give also your views in case the supplier reduces the price from Rs. 6.50 to Rs. 5.50. The cost data is as follows :

	Rs.
Materials	3.00
Direct labour	2.00
Other Variable overheads	1.00
Depreciation & other fixed expenses	2.00
	8.00

Solution :

Since the fixed costs are to be incurred whether we manufacture this component or not, the decision depends upon the marginal cost of making the component which is calculated as follows :

Marginal cost Of Component .1 (per unit)	Amount
	Rs.
Materials	3.00
Direct labour	2.00
Other variable expenses	1.00
	6.00

Comment : It is advisable to make the component itself if the marginal cost of making the component is lower than the purchase price because every component produced will give some contribution to the company. But in case the marginal cost is higher than the purchase price, it is better to buy the component from outside than to make it.

In the above example if the purchase price is Rs. 6.50 it is not advisable to buy the component from outside. We should rather make the component of our own because every component manufactured will give a contribution of 50 paise. But the company should not manufacture the component if it is available at Rs. 5.50 from outside. In that case it is better to buy than to make.

Illustration

29) Sumit company can purchase a separate part from an outside source @ Rs. 11 per unit. There is a proposal that the spare part be produced in the factory itself. For this purpose a machine costing 1,00,000 with annual capacity of 20,000 units & life span of 10 years will be required. A foreman with a monthly salary of 500/- will have to be engaged. Materials required will be Rs. 4 per unit. and wages 2.00/- per unit, variable overheads are 15% on direct labour. The firm can easily raise funds @ 10% p.a. Advise the firm whether the proposal should be accepted.

Sol :

Increase in Fixed costs :	Rs
Depreciation of machine	10,000
Salary of Foreman	6,000
Interest on capital	10,000
	26,000
Contribution per unit :	Rs.
Purchase price	11
Less : Variable cost :	
Materials	4.00
Wages	2.00
Variable overheads	3.00
	9
Contribution per unit	2

$$\text{Minimum volume} = \frac{26,000}{2} = 13,000 \text{ units}$$

Comments : In order to accept the proposal it is essential that the volume should be at least 13000 units.

If there is no idle capacity and making of the spare part in the factory involves the loss of other work, the loss of contribution arising from displacement of work should also be considered along with variable cost of production. The loss of contribution is found with reference to key or limiting factor. If the purchase price is higher than the total variable cost of production plus traceable fixed costs plus the loss of contribution of production, it will be more profitable to manufacture.

Illustration :

30) Rinootha ltd purchases 20,000 bells per annum from an outside supplier at 5/- each. The Management feels that these be manufactured and not purchased. A machine costing 50,000/- will be required to manufacture the item within the factory. The machine has an annual capacity of 30,000 units and life of 5 years. The following additional informations are available :

Material cost per bell will be 2.00

Labour cost per bell will be 1.00

Variable overheads - 100% of labour cost

You are required to advise whether

1) The company should continue to purchase the bells from the outside supplier or should make them in the factory &

2) The company should accept an order to supply 5,000 bells to the market at a selling price of 4.50 per unit ?

Sol :

(i) Statement showing the cost of manufacturing of one unit (bell) :

	Per unit
	Rs.
Material	2.00
Labour	1.00
Variable overheads	1.00
Marginal cost	4.00
Depreciation $\left[\frac{10,000}{20,000} \right]$	0.50
Total cost	4.50
Purchase cost / price	5.00
Saving per bell	0.50

∴ The company should manufacturing the bells resulting in a saving of 10,000/- annually for 20,000 bells.

(ii) Marginal cost per bell is 4.00/- as shown above. As depreciation of the machine is recovered on 20,000 bells, there will be no additional depreciation on the extra 5000 bells to be sold in the market. Further the machine has additional capacity too. Therefore, the company is advised to supply 5000 bells to market at 4.50/- per unit and make a profit of Rs. 0.50 per unit i.e, total profit Rs. 2,500

7. Alternative course of Action : When deciding between two alternative courses of action, it shall be kept in mind that what ever course of action is adopted, certain fixed expenses will remain unaffected. The criterion, therefore, which weighs is the effect of alternative course of action upon the marginal (i.e., variable) costs in relation to the revenue obtained. The course of action which yields the greatest contribution is the most profitable to be followed by the Management.

(31)

The cost per unit of three products, A,B & C of a concern is as follows :

	A Rs	B Rs.	C Rs
Direct materials	10	8	9
Direct labour	6	7	6
Variable expenses	4	5	3
Fixed expenses	3	3	2
Total cost	23	23	20
Profit	9	7	6
Selling price	32	30	26
Number of units produced	10,000	5,000	8,000

production arrangements are such that if one product is given up, the production of others can be raised by 50%. The directors propose that C should be given up because contribution in that case is lowest. Do you agree ?

Solution :

Fixed expenses under the present arrangement are 61,000/- calculated as follows :

	Rs
A - 10,000 units @ 3/- per unit	30,000
B - 5000 Units @ 3/- per unit	15,000

C - 8000 Units @ 2/- per unit	16,000
	<hr/>
	61,000

Fixed expenses remain same even though production arrangements may be changed.

Contribution per unit = Selling price - Marginal cost

Contribution per unit of product A = 32-20 = 12/-

Contribution per unit of product B = 30-20 = 10/-

Contribution per unit of product C = 26-18 = 8/-

There can be three production arrangements as follows :

(i) If product A is given up, the production of B&C will be increased by 50%

$$\text{B's output} = 5000 + \frac{50}{100} \times 5000 = 7,500 \text{ units}$$

$$\text{C's output} = 8000 + \frac{50}{100} \times 8000 = 12,000 \text{ units}$$

	Rs.
B's Contribution on 7,500 units @ 10	75,000
C's Contribution on 12,000 units @ 8	96,000
	<hr/>
Total contribution	1,71,000
Less : Total fixed expenses	61,000
	<hr/>
Total profit	1,10,000

(ii) If product B is given up, the production of A&C will be increased by 50%

$$\text{A's output} = 10,000 + \frac{50}{100} \times 10,000 = 15,000 \text{ units}$$

$$\text{C's output} = 8,000 + \frac{50}{100} \times 8000 = 12,000 \text{ units}$$

	Rs.
A's contribution on 15,000 units @ 12/-	1,80,000
C's contribution on 12,000 units @ 8	96,000
Total contribution	2,76,000
Less : Fixed Expenses	61,000
Total profit	2,15,000

(iii) If product C is given up. Production of A&B will be increased by 50%

$$\text{A's output} = 10,000 + \frac{50}{100} \times 10,000 = 15,000 \text{ units}$$

$$\text{B's Output} = 5,000 + \frac{50}{100} \times 5,000 = 7,500 \text{ units}$$

	Rs.
A's Contribution on 15,000 units @ 12	1,80,000
B's contribution on 7,500 units @ 10	75,000
Total contribution	2,55,000
Less : Fixed expenses	61,000
Total profit	1,94,000

Comment : From the three production arrangements, we see that profit is the maximum when product B is given up. Therefore, we do not agree with the directors that C should be given up and recommended that product B should be given up in order to have maximum profit.

Suitable Product Mix : Normally a business concern will select the product mix which gives the maximum profit. Product mix is the ratio in which various products are produced and sold. The marginal costing technique helps management in taking appropriate decisions regarding the product mix, i.e., in changing the ratio of product mix, so as to maximise profit. The technique not only helps in dropping unprofitable products from the mix but also helps in dropping unprofitable departments, activities etc. Consider the following examples :

(32) : Present the following information to show the management : (a) the marginal product cost and the contribution per unit ; (b) the total contribution and profits resulting from each of the following sales mixtures :

	Product	Per unit
Direct materials	A	10
	B	9
Direct wages	A	3
	B	2

Fixed expenses Rs. 800

Variable expenses are allocated to products as 100% of direct wages.

Sales price A - Rs.20; B - Rs. 15;

Sales mixtures :

- (a) 1000 units of product A and 2000 units of product B
- (b) 1500 units of product A and 1500 units of product B.
- (c) 2000 units of product A and 1000 units of product B.

Solution :

(a) Marginal cost statement	A	B
	Rs.	Rs.
Direct materials	10	9
Direct wages	3	2
Variable overheads (100%)	3	2
Marginal cost	16	13
Sales price	20	15
Contribution	4	2

(b) product mix choice	1000 A + 2000 B (i) Rs.	1500 A + 1500 B (ii) Rs.	2000 A + 1000 B (iii) Rs.
Total sales	(1000 x 20) + 2000 x 15 = 50,000	(1500 x 20) + 1500 x 15 = 52,500	(2000 x 20) + 1000 x 15 = 55,000
Less : Marginal cost	(1000 x 16) + 2000 x 13 = 42,000	(1500 x 16) + 1500 x 13 = 43,500	(2000 x 16) + 1000 x 13 = 45,000
Contribution	8,000	9,000	10,000
Less : fixed cost	800	800	800
Profit	7,200	8,200	9,200

There fore sales mixture (iii) will give the highest profit ; and as such, mixture (iii) can be adopted.

Problem on Best mix :

(32) : (2) : The management of a concern manufacturing two products X and Y, have the following independent possibilities before them :

(a) To produce and sell 16,000 additional units of Y but only if the production of X is reduced by 2000 units.

(b) To reduce the price of X by Rs. 0.20 per unit. This will result in a 25% increase in the sale of X without any change in the activity of Y.

(c) To produce and sell 55,000 units of x and 1,05,000 units of Y.

	Product X Rs.	Product Y Rs.	Total Rs.
Sales (in units)	50,000	1,00,000	
Sales (value)	2,50,000	8,50,000	
Cost of sales	1,50,000	6,00,000	

Gross margin	1,00,000	2,50,000	3,50,000
Selling and distribution expenses	60,000	1,50,000	
Net Profit	40,000	1,00,000	1,40,000

The direct costs include in the total costs amount to Rs. 1,20,000 for the product X and Rs. 3,40,000 for the product Y. Present the information to the management in a suitable form giving your recommendation.

Solution :

(a) Marginal cost statement :

Particulars	X	Y	Total
Sales (in units)	50,000	1,00,000	1,50,000
Sales (Value)	2,50,000	8,50,000	11,00,000
Direct costs	1,20,000	3,40,000	4,60,000
Contribution	1,30,000	5,10,000	6,40,000
Fixed costs	90,000	4,10,000	5,00,000
Net profit	40,000	1,00,000	1,40,000
Contribution per unit	2.60	5.10	

(B) New situation :

	(a)		(b)		(c)	
	x	y	x	y	x	y
Proposed	30,000 Rs.	1,16,000 Rs.	62,500 Rs.	1,00,000 Rs.	55,000 Rs.	1,05,000 Rs.
Contribution	78,000	5,91,699	1,50,000	5,10,000	1,43,000	5,35,000
Total contribution	6,69,600		6,60,000		6,78,500	
Contribution under the existing situation	6,40,000		6,40,000		6,40,000	
Increase in contribution	29,600		20,000		38,500	

Commentary : Since the proposal (c) gives the highest additional contribution, the same should be accepted.

Best Mix :

(34) : The directors of satyam company are considering sales budget for the next budget period. From the following information you are required to show clearly to management :

- (i) The marginal product cost and the contribution per unit ;
- (ii) The total contribution resulting from each of the following sales mixtures.

	product X	product Y
	Rs	Rs.
Direct materials	10	9
Direct wages	3	2
Fixed expenses (total) Rs. 800		
(variable expenses are allotted to product as 100% of direct wages)		
Selling price	20	15

Solution : Sales mixture

- (a) 100 units of product X and 200 of Y ;
- (b) 150 units of product X and 150 of Y ;
- (c) 200 units of product X and 100 of Y ;

Recommend which of the sales - mixtures should be adopted.

	product X	Product Y
	Rs.	Rs.
(i) Direct materials	10	9
Direct wages	3	2
Variable expenses	3	2

Marginal cost	16	13
Selling price	20	15
Contribution	4	2
P/V ratio	20%	13 1/2 %

(ii) Since the p/v ratio of product X is higher than that of Y, product X is more profitable and therefore, the mixture that takes into account the maximum number of product x would be the most profitable one, This is evident from the following statement.

Products	Contribution per Units Rs.	Sales Mixtures					
		(a)		(b)		(c)	
		Units	Contribution Rs.	Units	Contribution Rs.	Units	Contribution Rs.
X	4	100	400	150	600	200	800
Y	2	200	400	150	300	100	200
Total		300	800	300	900	300	1,000

Sales Mix (c) will yield highest contribution. There fore, it should be adopted.

The problem of product of sales mix is generally linked up with the problem of limiting factor. For principles under lying the selection of sales - mix of this nature, refer to the discussion under next heading.

Acceptance / Rejection of a foreign order :

(35) The cost sheet of a product is given as under :

Direct Materials	5.00
Direct wages	3.00
Factory overheads :	
Fixed	0.50
Variable	0.50
Administrative Expenses	0.75
Selling & Distribution overheads	

Fixed	0.25	
Variable	0.50	0.75
		10.50

The selling price per unit is 12/-

The above figures are for an output 50,000 units, the capacity of the firm is 65,000 units. A foreign customer is desirous of buying 15,000 units at a price of 10/- per unit. Advise the manufacturers whether the order should be accepted. What will be your advice if the order was from a local merchant.

Sol : Marginal cost or Additional cost for Additional 15,000 units.

	per unit	per 15,000 units
	Rs.	Rs.
Direct materials	5.00	75,000
Direct wages	3.00	45,000
Prime cost	8.00	1,20,000
Less : Variable overheads : Factory	0.50	7,500
Selling & Distribution	0.50	7,500
Marginal cost	9.00	1,35,000
Sales	10.00	1,50,000
Contribution	1.00	15,000

Comments : The order from the foreign customer will give an additional contribution of 15,000. Hence, the order should be accepted because additional contribution of 15,000/- will increase the profit by this amount because fixed expenses have already been met from the internal market.

The order from the local merchant should not be accepted at a price of 10/- which is less than normal price of 12/-. This price will affect relationship with other customers and there will be general tendency of reduction in the price.

Accepting the offer :

36) The ponds snow company manufactures and sells direct to customers 10,000 jars of 'ponds snow' per month at Rs. 1.25 per jar. The company's normal production capacity is 20,000 jars of snow per month. An analysis of cost for 10,000 jars snow :

Direct material	1,000
Direct labour	2,475
Power	140
Misc. Supplies	430
Jars	600
Fixed expenses of manf.,	
Selling & distribution	7,955
Total	12,600

The company has received an offer for the export under a different brand name of 1,20,000 jars of snow at 10,000 jars per month at 75 paise a jar. Write a short report on the advisability or otherwise of accepting the offer.

Sol :

	Present Position		Position after export order receipt	
	Rs.	Rs.	Rs.	Rs.
Sales price		12,500	(12,500 + 7,500)=	20,000
Less : Variable cost :				
Direct material	1000		2,000	
Direct labour	2475		4950	
Power	140		280	
Misc. supplies	430		860	
Jars	600	4,645	1200	9,290
Contribution		7,855		10,710
Less : Fixed cost		7,955		7,955
Profit (loss)		100		2,755

From the above statement it is clear that the offer for export should be accepted as it converts the loss of 100/- into a net profit of Rs. 2,755.

Acceptance or rejection of an offer :

(37) Neelkamal manufacturers ltd. Present the following information for the past year.

	Rs.
Material cost	1,20,000
Labour cost	2,40,000
Fixed overheads	1,20,000
Variable overheads	60,000
Units produced	12,000
Selling price	50 per unit

The available capacity is a production of 20,000 units per year. The firm has an offer for the purchase of 5,000 chairs at a price of 40/- per unit. It is expected that by accepting this offer there will be saving of Rs. 1 per unit in material costs on all units manufactured, the fixed overheads will increase by 35,000/- and the overall efficiency will drop by 2% on all production. Draft a report to the management giving your recommendations as to whether or not the offer should be accepted.

Sol :

	Present Position 12,000 units		Position after acceptance of offer 1700 units	
	Per unit Rs.	Total Rs.	Per unit Rs.	Total Rs.
Sales (A)	50	6,00,000	[12,000 x 50 + 5000 + 40]	8,00,000
Less : Variable cost :				
Material	10		9	
Labour	20		20.41	
Variable overheads	5		5.00	
Total variable cost (B)	35	4,20,000	34.41	5,84,970
Contribution (A-B)	15	1,80,000		2,15,030
Less : Fixed cost		1,20,000		1,55,000
Profit	--	60,000	----	60,030

Comments : Though there is a little increase of Rs. 30 in profit by accepting the offer but it is desirable to accept taking into consideration the possibilities of getting orders in future. But it should be ensured that there will not be general reduction in price because of the acceptance of this order.

Whether to explore or not the foreign market :

38) Abhay company annually manufactures 10,000 units of a product at a cost of 4/- per unit and there is home market for consuming the entire volume of production at the sale price of 4.25/- per unit. In the year 2002, there is a fall in the demand for home market which can consume 10,000 units only at a sale price of 3.72/-. The analysis of the cost per 10,000 units is :

	Rs.
Material	15,000
Wages	11,000
Fixed overheads	8,000
Variable overheads	6,000

The foreign market is explored and it is found that this market can consume 20,000 units of the product if offered at a sale price of 3.55 per unit. It is also discovered that for additional 10,000 units of the product cover initial 10,000 units the fixed overheads will increase by 10%. It is worth while to try to capture the foreign market ?

Sol :

Analysis of cost Data for 10,000 units

	Total	Cost per unit
	Rs.	Rs.
Material	15,000	1.50
Wages	11,000	1.10
Variable overheads	6,000	0.60
Marginal cost	32,000	3.20
Fixed overheads	8,000	0.80
	<u>40,000</u>	<u>4.00</u>

Comment : In 2002 selling price in the domestic market is 3.72/- per unit which is more than the marginal cost of 3.20 per unit. Therefore it is desirable to continue the sales in the domestic market because every unit of sale will be contributing Rs. 0.52 per unit towards fixed expenses. Similarly

sales in the foreign market at a selling price of 3.55/- per unit is advisable because selling price is more than marginal cost. Sale of 20,000 units in the foreign market will convert loss of Rs. 2,800 if sale is made only in the domestic market to a profit of 2600/- if sale of 20,000 units is made in the foreign market along with sale of 10,000 units in the domestic market as is evident from the table given below :

Statement showing advisability of selling in the foreign market

	Sale in home market 10,000 units Rs.	Sale in foreign market 20,000 units Rs.	Total Rs.
(1) Sale : 10,000 units @ 3.72 20,000 units @ 3.55	37,200	71,000	1,08,200
Material	15,000	30,00	45,000
Wages	11,000	22,000	33,000
Variable overheads	6,000	12,000	18,000
(2) Marginal cost	32,000	64,000	96,000
(3) Contribution (1-2)	5,200	7,000	12,200
(4) Fixed overheads	8,000	(a) 1,600	9,600
(5) Profit (3-4)	2,800 (loss)	5,400	2,600

Note :

(a) Increase in fixed overheads for 10,000 units additional - 10%

∴ Increase in fixed overheads for 20,000 units additional - 20%

$$\text{i.e., } \frac{20}{100} \times 8000$$

$$= 1600/-$$

Minimum Price Fixation :

(39) Problem : A toy manufacturer earns an average net profit Rs. 3 per piece in a S.P. of Rs. 15 by producing and selling 60,000 pieces at 60% of the potential capacity. Composition of his cost of sale is :

Direct Material : Rs. 4

Direct wages : Rs. 1

Works overhead	:	Rs 6 (50% fixed)
Sales	:	Rs. 1 (25% variable)

During the current year, he intends to produce the same number but anticipated that :

- His fixed charge will go up by 10%
- rates of direct labour will increase by 20%
- rates of direct material will increase by 5%
- S.P. cannot be increased.

Under these circumstances, he obtains an order for a further 20% of his capacity. What minimum price will you recommend for accepting the order to ensure the manufacturer an overall profit of Rs. 1,80,500 ?

Solution : Marginal cost for the current year.

Direct Material	Rs. 4.20
Direct Wages	1.20
Variable overheads :	
Works overhead	3.00
Sales overhead	0.25
Total Marginal cost	8.65
Contribution per unit	6.35
S.P	15.00

Statement of profit on sale of 60,000 units

	Rs.
Sales	9,00,000
Less : Variable cost (60,000 x 8.65)	5,19,000
Contribution	3,81,000

Less : Fixed costs :

Works overheads (1,80,000 + 18,000)		
Sales overheads	1,98,000	
(45,000 + 4,500)	49,500	2,47,500
Profit		1,33,500
Profit required	1,80,500	
Profit on 60,000 units	1,33,600	

Profit to be earned on 20,000 units Rs. 47,000.

Statement of Minimum S.P. per unit for an order of 20,000 units :

	Rs.
Variable cost (20,000 x 8.65)	1,73,000
Desired profit	47,000
Total Sales	2,20,000
S.P.per unit = $\frac{2,20,000}{20,000}$	

The above can be verified as under :

Sales 60,000 units x 15 = 9,00,000

20,000 units x 11 = 2,20,000

11,20,000

Less : Variable costs :

80,000 x 8.65 = 6,92,000

Fixed costs = 2,47,500

9,39,500

Profit

1,80,500

13) Equally Profitable Level :

(40) Problem : Wipro company has the option of buying one machine. Two machines are available. Machine E and machine F, from the information given below calculate (a) the break - even point for each, (b) the level of sales at which both are equally profitable; and (c) the range of sales at which one is more profitable than the other :

	Machine E	Machine F
Output p.a. (units)	10,000	10,000
Fixed costs p.a (Rs)	30,000	16,000
Profit at full capacity (Rs)	30,000	24,000

Both the machines will produce identical products. The annual market demand for such product is 10,000 units @ Rs. 10 per unit.

Solution :

	Machine E	Machine F
Sales (10,000 @ Rs 10)	Rs. 1,00,000	Rs. 1,00,000
Contribution (C=F+P)	Rs.60,000	Rs. 40,000
P/V ratio	60%	40%
(a) Break - even sales	Rs. 50,000	Rs. 40,000
or	5,000	or 4,000
	units	units
Contribution per unit	Rs. 6	Rs.4
Variable cost per unit	Rs. 4	Rs.6

(b) Unit selling price of the products produced by either of the machines being the same, both machines will be equally profitable at that level of activity where total cost (fixed plus variable) of production produced by each machine exactly equals.

Let X be the number of units where both the machines are equally profitable.

∴ In case of machine E, total costs would be : $4x + 30,000$

While in case of F, it would be : $6x + 16,000$

Since at this level of output total cost of production by each machine will be the same

$$4x + 30,000 = 6x + 16,000$$

$$\therefore x = 7,000 \text{ units}$$

Thus, at 7,000 units both the machines will be equally profitable.

(c) The break - even point of machine is 4,000 units while it is 5,000 for machine E. At 7,000 units both the machines are equally profitable. Thus, machine F is more profitable at an output range of 4,000 to 6,999. The p/v ratio of machine E is greater than that of F. Therefore, above 7,000 units the rate of profit earning by E would be greater than that of F. Thus, E would be more profitable at an output range 7,001 to 10,000 units.

Merged plants :

(41) Problem : Nandi chemicals limited has two factories with similar plant and machinery for manufacture of Soda Ash. The Board of Directors of the company has expressed the desire to merge them and to run them as one integrated unit. The additional fixed cost involved in the merger is estimated at Rs. 5 lakhs. Following data are available in respect of these two factories.

Factory	X	Y
Capacity in operation	60%	100%
	Rs.	Rs.
Turnover	120 lakhs	300 lakhs
Variable cost	90 lakhs	220 lakhs
Fixed cost	25 lakhs	35 lakhs

Find out :

- What should be the capacity of the merged factory to be operated for break - even ?
- What is the profitability of working 80% of the integrated capacity ? and
- What turnover will give an overall profit of Rs. 60 lakhs ?

Solution :

Factory	60%	100%		
	Rs.	Rs.		
Turn over	120 lakhs	200 lakhs		
Variable cost	90 lakhs	150 lakhs		
Fixed cost	25 lakhs	25 lakhs		
	Factory X	Factory Y		Merged factory (X+Y)
Capacity	100%	100%		100%
	Rs.	Rs.	Addl. cost Rs.	Rs.
Turn over	200 lakhs	300 lakhs		500 lakhs
Variable cost	150 lakhs	220 lakhs		370 lakhs
Fixed cost	5 lakhs	35 lakhs	5	65

$$(a) \text{ p/v ratio : } \frac{500 - 370}{500} = \frac{13}{50} \text{ or } 26 \%$$

$$\text{BEP} = \frac{\text{Fixed cost}}{\text{p/v ratio}} = 65,00,000 \times \frac{50}{13} \text{ Rs. } 250 \text{ lakhs}$$

$$\text{or, } \frac{250}{500} \times 100 = 50\% \text{ capacity level}$$

(b) At 80% capacity sales over BEP would be :

$$30\% \text{ of } 500 \text{ lakhs} = \text{Rs } 150 \text{ lakhs}$$

∴ Increase in contribution = Increase in profit (fixed cost remaining constant)

$$= \frac{13}{50} \times 1,50,00,000 = \text{Rs. } 39,00,000$$

(C) To earn a profit of Rs. 60 lakhs, required contribution

$$= \text{Rs. } 65 \text{ lakhs} + \text{Rs. } 60 \text{ lakhs} = \text{Rs. } 125 \text{ lakhs}$$

$$\therefore \text{Required sales} = \frac{\text{Required Contribution}}{\text{P/V ratio}} = \frac{1,25,00,000}{13} \times 50 = \text{Rs. } 4,80,76,923$$

Differential costing :

(42) Illustration : 'singer' Sewing Machine co ltd. Manufactures hand - operated sewing machines. Prepare a shcedule showing the differential costs and incremental revenue at each stage from the following data. At what volume the company should set its level of production ?

Output (No in Lakhs)	S.P per Machine (Rs.)	Total semi - fixed cost (Rs. in Lakhs)	Total variable cost (Rs in Lakhs)	Total fixed cost (Rs. in Lakhs)
0.60	240	30	83.6	28.4
1.20	220	30	163.6	28.4
1.80	200	34	255.6	28.4
2.40	180	34	315.6	28.4
3.00	160	40	355.6	28.4
3.60	140	40	380.6	28.4

Solution : Schedule showing the differential costs and incremental revenues :

Output (No. in lakhs) per machine	S.P. (Rs)	Sales Volume (Rs. in lakhs)	Incremental Revenue (Rs in lakhs)	Semi-fixed Cost (Rs in lakhs)	Variable Cost (Rs in lakhs)	Fixed cost (Rs in lakhs)	Total Cost (Rs in lakhs)	Differential Cost
0.60	240	144.0	----	30.0	83.6	28.4	142.0	----
1.20	220	264.0	120.0	30.0	163.6	28.4	222.0	80.0
1.80	200	360.0	96.0	34.0	255.0	28.4	318.0	96.0
2.40	180	432.0	72.0	34.0	315.6	28.4	378.0	60.0
3.00	160	480.0	48.0	40.0	355.6	8.4	424.0	46.0
3.60	140	504.0	24.0	40.0	380.6	28.4	449.0	25.0

It is the interest of the firm to increase the output so long as incremental revenue exceeds differential cost. But if the differential cost is more than the incremental revenue, it is not advisable to increase the output because it will reduce the profitability. The company should set its level of output at 3.0 lakhs units because upto this level incremental revenue exceeds differential cost.

(43) Illustration : Ram Dass pvt ltd, Nasik, is currently operating at 80 percent capacity. The p&L a/c shows the following :

Sales		Rs in lakhs
Cost of sales :		640
Direct Material	200	
Direct Expenses	80	
Variable overheads	40	
Fixed overheads	260	
		580
		60

The Managing Director has been discussing an offer from Middle East of a quantity which will require 50% capacity of the factory. The price is 10% less than the current price in the local market. Order cannot be split. You are asked by him to find out the most profitable alternative. The factory capacity can be augmented by 10% by adding facilities at an increase of Rs. 40 lakhs in fixed cost.

Solution : If the offer from Middle East is accepted then 50% of the production capacity will be utilised for processing this order. The balance of 50% (i.e. 100 -50) capacity plus 10% augmented capacity at an additional cost of Rs. 40 lakhs will be available for local sales. The incremental revenue and differential costs are compared below to know whether order should be accepted or not.

	(Rs. in lakhs)
Proposed sales	
Local - 60%	
For 80% value of sales in Rs. 640 lakhs	
There fore, for 60% value of sales will be $\frac{640 \times 60}{8}$	480
Middle East - 50% at 10% less than current price	360
$\left[\frac{640}{80} \times 50 = 400 \text{ lacs} - \frac{10}{100} \times 400 \text{ lacs} \right]$	
Total proposed sales	840
Less : present Revenue	640
Incremental Revenue	200

Differential cost :

Proposed cost for 110%

(i.e. 60% local + 50% Middle East)

Direct Materials	$\left(\frac{200}{80} \times 110\right)$	275
Direct Expenses	$\left(\frac{80}{80} \times 110\right)$	110
Variable Expenses	$\left(\frac{40}{80} \times 110\right)$	55
Fixed overheads	260 lacs	300
Add. Additional	40 lacs	740
Less : Present cost (as given)		580
Differential cost :		160

Incremental revenue of Rs. 200 lacs exceeds differential cost of Rs. 160 lacs by Rs. 40 lacs, so offer from Middle East should be accepted. It may be remembered that offer should be accepted only if there is a prospect of receiving similar orders in future also, otherwise the cost of additional facilities added to augment the output will become a burden on the future profit.

3.23 Key words (Marginal Costing)

Absorption Costing : The costing method under which all direct and indirect costs, including fixed factory overheads are charged to product costs.

Contribution margin : Total sales revenue less variable expenses.

Fixed costs : Costs which are not directly associated with production and remain constant for any relevant range of production.

Marginal cost : The variable cost of an additional unit of product or service.

Marginal costing : Also known as variable costing, is a technique where by marginal cost of product is ascertained. Only variable costs are charged to production. Fixed costs are written off against the revenue of the period in which they are incurred.

Period costs : Costs not related to manufacture of a product.

Product costs : Production costs incurred in the manufacture of a product.

Variable costs : Costs which are directly associated with production and which vary in proportion to volume.

Variable cost ratio : The percentage of variable costs to sales.

Angle of Incidence : The angle at which the sales line cuts the total cost line. If the angle is large, it indicates that profits are being made under loss favourable condition.

Break-even-chart : The graphical device to show cost - volume profit relationship and the point at which the total cost equals to the total sales revenue.

Break - even - point : The point in terms of rupees or units at which total cost equal to total revenue. So that there is neither profit nor loss.

Cost-volume-profit analysis : The relationship that volume has with costs and profits.

Margin of Safety : The excess of actual sales over break - even-sales. It indicates by how much sales may decrease before a company will suffer a loss.

Profit - volume graph (p/v graph) : A summary of break-even chart showing the impact of changes in sales volume on profit.

Total costs : The sum of the fixed costs plus the variable costs at a given volume.

Total sales Revenue : A measure of revenue derived by multiplying units sold by the price per unit.

Escapable or avoidable costs : These are costs which may be saved or eliminated by making a particular decision or selecting certain alternatives.

Incremental or differential costs : It is the difference between the total costs of the various available alternatives.

Opportunity costs : It is the measurement of what the financial benefits might have been or could have been had an alternatives choice been made.

Output of pocket costs : These are costs which will require a definite outlay of funds.

Product Mix : This refers the composition of the sales of various products relative to total sales.

Qualitative factors : These are the factors which cannot be expressed in terms of money.

Relevant costs : These are future costs that differ among alternatives.

Sunk costs : Those costs which are irrelevant for future decisions because the expenditure has already been made and cannot be changed irrespective of the alternative that is selected.

3.24 Self - assessment Questions / Exercises

1. Marginal costing is a very useful technique to management for cost control, profit planning and decision making. Explain.
2. Define marginal costing and explain its main features and useful contribution to the management in decision making.
3. "Marginal costs are primarily used in guiding decisions yet to be mad." By "Explain the statement giving examples.
4. How is marginal costing helpful in decision making ?
5. Sales of S. Chand and Co. were Rs. 30,000 producing a profit of Rs. 800 in a week. In the next week sales amounted to Rs. 38,000 producing Profit of Rs. 2,400. Find out the break even point.

b) What would be the volume of sales to derive a profit of Rs. 20,000 if the p/v ratio is 68% and fixed overheads for the period are Rs. 40,000.

c) A company has two projects to choose from. Project A break-even at Rs. 3,20,000 and project B break-even at Rs. 5,00,000. Which project is better to choose ? What could the difference be due to ?

6. Margin of safety = Rs. 8,000 which represents 40% of sales, p/v ratio = 50%. You are require to find i) Break - even sales ii) fixed cost, iii) Total profit.

b) From the following particulars calculate i) contribution per unit ii) p/v ratio iii) Break-even point in units (iv) what will be selling price per unit, if the break-even point is brought down to 10,000 units :

Selling price per unit	Rs. 20.
Variable cost per unit	Rs. 16
Fixed Expenses	Rs. 60,000

7. The sales turnover and profit during two years were as follows :

Year	Sales	Profit
2000	1,50,000	20,000
2001	1,70,000	25,000

Your are required to calculate : i) p/v ratio and fixed cost, ii) break even-point, iii) The sales required to earn a profit of Rs. 40,000 iv) The profit made when sales are Rs. 2,50,000 v) Margin of safety at a profit of Rs. 50,000 vi) Variable costs of the two periods.

8. There are two similar plants under the same management. The management desires to combine these two plants. The following particulars are available :

	Plant I	Plant II
Capacity operation	100%	60%
Sales	300 lakhs	120 lakhs
Variable costs	220 lakhs	90 lakhs
Fixed costs	40 lakhs	20 lakhs

Your are required to calculate :

- The capacity of the combined plant to be operated for the pupose of break - even and
- The profitability on working at 75% of the combined capacity.

9. In a factory producing two different products, the limiting factor is the availability of materials. From the following particulars, decide the product you recommend for priority :

	Product X	Product Y
	Cost per unit	Cost per unit
Material	25	40
Labour	10	15
Variable Expenses	5	6
Fixed Expenses	4	4
Total cost	44	65
Selling price	55	80
Profit	11	15

10. The following particulars are extracted from the records of a company :

	Per unit	
	Product A	Product B
Sales	Rs. 100	Rs. 120
Consumpton of material	2 kgs.	3 kgs

Material wages cost	Rs. 10	Rs. 15
Direct wages cost	Rs. 15	Rs. 10
Direct expenses	Rs. 5	Rs. 6
Machine hours used	3	2
Overhead expenses :		
Fixed	Rs. 5	Rs. 10
Variable	Rs. 15	Rs. 20

Direct wages per hour Rs. 5 comment profitability of each product (both use the same raw material) when :

- i) Total sales potential in units is limited ;
- ii) Total sales potential in value is limited ;
- iii) Raw material is in short supply ;
- iv) production capacity (in terms of machine hours) is the limiting factor.

Assuming raw material as the key factor availability of which is 10,000 kgs., and maximum sales potential of each product being 3,500 units, find the product mix which will yield the maximum profit.

11. From the following particulars, draw a break-even chart and find out the break-even point :

Variable cost per unit	10
Sales price per unit	15
Fixed expenses	40,000

What will be the selling price per unit if break-even point is brought down to 5,000 units.

12. The following is the market and cost analysis report of XYZ Ltd. company for a particular month - July 2003

Activity level	output (units)	Selling price (per unit) (Rs)	Avg. cost per unit (Rs)
60%	6,00,000	0.93	0.93
70%	7,00,000	0.92	0.81

80%	8,00,000	0.90	0.75
90%	9,00,000	0.86	0.73
100%	10,00,000	0.78	0.72

Determine the most advantageous production and price - level for the company.

Ans: [Most profitable level of output is 80% and price level is Rs. 0.90 per unit]

13. The Management of I.T.C Ltd. is worried about the performance of a Department A and wants to close the department. The following data have been collected from the accounts.

Items	Departments		
	A (Rs.)	B (Rs.)	C (Rs.)
Sales	40,000	60,000	1,00,000
Variable cost	36,000	48,000	60,000
Fixed cost [Apportioned on the basis of sales]	6,000	9,000	15,000
Total cost	42,000	57,000	75,000
Profit / Loss	(2000)	3000	25,000

(a) You are asked to advise to the management in respect of closure of department A

(b) Will advise be different, if fixed costs are found to be Rs. 10,000 relating to general fixed overheads and the balance as specifically allocated to A - Rs. 2,000, to B - Rs. 13,000 - and to C Rs. 5,000.

(Ans : (a) continue "A"; (b) "B" should be closed)

14. I Ltd. Manufactures three types of cotton cloth coarse, fine, superfine. There is a proposal for closing down the production of coarse cloth on account of loss incurred there on. The following figures are placed before you :

Items	Coarse	Fine	Super fine
Sales (Metres)	12,000	60,000	18,000
Price (per metre)	Rs. 3.50	Rs. 6.50	Rs. 9.50
Direct Material (per metre)	Rs. 1.50	Rs. 2.50	Rs. 3.50
Direct labour (percentage)	Rs. 1.00	Rs. 1.75	Rs. 2.25

Variable overheads			
(% of prime cost)	12%	16%	20%
Fixed overheads	Rs. 18,000	Rs. 54,000	Rs. 36,000

Give your advises (along with arguments) with regard to : (i) closing down the production of coarse cloth (Assuming that no part of the fixed cost can be saved)

(ii) Closing down the production of various types of cloth if raw - material price go-up by 5% in all cases. (Assuming that F.O.H for a particular type of cloth can be saved if the prod. of such cloth is close down.)

[Ans : 1) Production of coarse cloth should be continued]

(ii) Production of coarse cloth should be closed down]

15. Aravind company produces and sells three types of products P., Q & R the managing committee has decided to discontinue the prod. of Q. Since there is not much profit on it. From the information given below. Find out the profitability of the products and comment upon the decision of management committee :

Products	Selling price per unit	Direct mtrls per unit	Direct wages per unit		
			Depot.A	Depot.B	Deport C
P	300	60	20	15	10
Q	275	30	20	20	10
R	305	70	12	10	20

The absorption rates of overheads on Direct wages are :

	Dept A	Dept B	Dept C
Variable overheads	150%	120%	200%
Fixed overheads	200%	240%	150%

[Ans : Product Q is more profitable. (P/V ratio P - 42.33%, Q - 44% & R - 40 . 33%)

Mgt dec. is wrong. It should not be discontinued rather its production be increased]

15. Young India Ltd. Produces three products A, B & C. The budgeted output of three products is 210, 150 & 75 units per day respectively. The cost of production per unit is as under :

Elements of cost :	A Rs.	B Rs.	C Rs.
Direct material	16.50	12.00	16.50
Direct labour @ 3/- per hour	6.00	12.00	15.00
Prime cost	22.50	24.00	31.50
Production overheads	3.00	6.00	7.50
Production cost	25.50	30.00	39.00
Administrative O.H.	1.50	3.00	4.50
Selling over heads	1.50	1.50	3.00
Total cost	28.50	34.50	46.50
Selling price	31.50	39.00	55.00

50% of all overheads are variable. Direct labour is limiting factor. List out the product properties. If total labour hour per day available is 900 and potential demand is product A - 200, units B -150 units & C - 60 units. Suggest suitable production mix

(Ans : product properties C, A, B : Production mix : A - 200 units
B - 50 units &
C - 60 units)

17. Tanisha udyog ltd. Which manufactures three products furnishes the following information: you are required to set (i) a product mix which will give max. Overall profit keeping the short supply of raw materials in view and (ii) compute that max. profit.

Items	Product A	Product B	Product C
Profit volume ratio	10%	20%	40%
Max-sales potential	40,000 units	25,000 units	10,000 units
Raw materials as % of			
Variable cost	50%	50%	50%
Selling price per unit	Rs. 100	Rs. 75	Rs. 50

The fixed exp. are estimated at Rs 6,80,000. The co. uses a single raw - material in all 3 products. Raw material is in short supply and the company has a quota for supply of raw - materials of the value of Rs. 18,00,000 for the ensuing year for the manufacture of its products to meet its demand.

(Ans : (i) Contribution per rupee of material A Rs. 2.22, B - Rs. 0.50 and C - Rs. 1.33,

Product mix - A - 20,000 units

B - 25,000 units

& 10,000 units (ii) Max. profit Rs. 95,000)

18. From the following particulars of DCM Ltd. calculate p/v ratio and with the help of that ratio find out the following :

(a) Fixed cost (b) Contribution for both the period (c) Variable cost for 1995 & 1996 (d) profit when sales are Rs. 2,20,000 (e) Sale required to earn a profit of Rs. 40,000 (f) Sales to have a contribution of 80,000/-

Year	Sales (Rs.)	Profit (Rs)
1995	2,40,000	18,000
1996	2,80,000	26,000

(Ans : (a) P/V ratio 20%

(b) Fixed cost 30,000 Rs.

(c) Contribution for 1995 Rs 48,000 for 1996 Rs 10,000

(d) Variable cost for 1995 Rs. 92,000

for 1996 Rs. 24,000

(e) Sales Rs. 35,000

(f) Sales Rs. 4,00,000

19. From the information given below, indicate the number of units to be manufactured and sold to (a) Break - even (b) Earn a profit of 10,000/-

Fixed expenses - 1,00,000

variable cost - Rs 10 (per unit)

Selling price - Rs 15 (per unit)

What additional units would be necessary to increase the above profit by Rs. 5,000 ?

(Ans (a) B.E.P. in units 20,000 (b) 22,000 units : additional units 1000;)

20. The cost accountant of Lal Nigam Ltd. has ascertained that selling price of a product is Rs 20. per unit, variable cost is Rs. 15 per unit and break-even point is 21,600 units. Management has decided to treat 12,000 units as B.E.P because production department cannot produce more than this at the moment. What should be the selling price for 12,000 units of B.E.P ?

(Ans : Rs. 24 per unit)

21. M/s Usha Machines Ltd. has an installed capacity of 10,000 scooters (p.a) it is Currently operating at 50% of installed capacity for the coming year the budget runs as under :

Production and Sales	-	800 scooters
Cost :		(Rs in crores)
Direct materials	-	16.00
Direct wages	-	1.60
Factory overheads	-	2.40 (20% variable)
Administration overheads	-	1.00
Selling expenses	-	3.00 (40% variable)
Total cost	-	24.00
Profit	-	2.00
Sales	-	26.00

Calculate (a) capacity break - even & (b) output break - even

(Ans (a) 56.191. (b) 5.619 scooters)

Note : Rs. 4.72 crores

P = Rs 32,500 & V = Rs. 24,100)

22. You are given the following data of Sumeet Industries Ltd.

	Rs.
Sales	5,00,000
Variable cost	3,75,000
Contribution	1,25,000
Fixed cost	37,500
Profit	87,500

Calculate the following : (a) p/v ratio (b) Break even point

(c) Net profit from the sales of Rs 7,00,000

(d) Margin of Safety when profit is Rs 112,500

(e) Required sales to earn a profit of Rs 1,00,000

(f) Profit when margin of safety is Rs 4,00,000

(g) Additional sales required to cover an increase of Rs. 4,000

(p.o) in the sales mgr's salary.

(Ans. (a) 25% (b) 1,50,000 (c) Rs. 1,37,500 (d) Rs. 4,50,000 (e) 5,50,000 (f) Rs. 1,00,000 (g) Rs. 1,60,000)

23. There are two plants under the same management. The management wishes to merge these two plants and to run them as one integrated plant. The following particulars are made available.

	Plant I	Plant - II
Capacity in operation	60%	100%
Sales	Rs. 1,20,000	Rs. 3,00,000
Variable cost	Rs. 90,000	Rs. 2,20,000
Fixed cost	Rs. 25,000	Rs. 40,000

You are required to state : (a) what would be the capacity of merged plant to be operated for break-even ?

(b) What would be the profit on working at 75% of the merged plant ?

(c) What turnover would give an overall profit of Rs 60,000 ?

[Ans : (a) p/v ratio of merged capacity 26% B.E.P in Rs. 2,50,000 capacity B.E.P. 50% (b) Profit Rs. 32,500 (c) Rs. 4,80,769]

24. Two manufacturing companies, which have the following operating details decide to merge :

	Company A	company B
Capacity utilisation	90%	60%
Sales (Rs. in lakhs)	540	300
Variable costs (,,)	396	225
Fixed costs (,,)	80	50

Assuming that proposal is implemented, calculate :

(i) Break - even sales of merged companies and capacity utilisation at that stage.

(ii) Profit at 80% capacity utilisation after merger.

(iii) Sales of the merged companies to earn a profit of Rs. 75 lakhs.

(iv) When merged company is working at a capacity to earn a profit of Rs. 75 lakhs. What % increase in selling price is required to sustain an increase of 5% in fixed costs ?

[Ans : I. p/v ratio - 285/11% ; B. E.P. in Rs. 501.75 lakhs & Capacity 45.61% II Rs. 98 lakhs III Rs 791.23 lakhs iv 3.17%].

3.25 Further Readings :

1. Prasad N.K. : Principles and practice cost Accounting
2. Mittal and Mittal - Cost Accounting
3. Pandey I.M. Management Accounting.

Lesson - 4**COST ALLOCATION - COST ALLOCATION METHODS****ACCOUNTING****Objectives :**

- K objectives of this unit are to explain the concept of overheads, allocation, apportionment and absorption of overheads
- K to familiarise with you the procedures of allocation apportionment and absorption of various kinds of overheads

Structure :

- 4.1 **Concept : Overheads (OH)**
- 4.2 **Procedure for Accounting**
- 4.3 **Analysis**
- 4.4 **Standing order Nos and cost Accounting Nos.**
- 4.5 **Classification of OHs as per nature**
- 4.6 **Need for classification into Fixed and variable**
- 4.7 **Collection and Accumulation of OHs**
- 4.8 **Allocation of OHs**
- 4.9 **Apportionment of OHs**
- 4.10 **Allocation Vs Apportionment**
- 4.11 **Advantages of Departmentalisation of OHs**
- 4.12 **Secondary Distribution of OHs**
- 4.13 **Bases of Apportionment (For Secondary Distribution)**
- 4.14 **Methods of Apportionment for Secondary Distribution**
- 4.15 **Illustrations**
- 4.16 **Absorption of overheads**
- 4.17 **Methods of Absorption of OHs**

- 4.18 Under and over Absorption of OHs and Treatment
- 4.19 Administration OHs and Treatment
- 4.20 Selling and Distribution OHs
- 4.21 Analysis and Treatment of Selling & Distribution OHs
- 4.22 Key Words
- 4.23 Self - Assessment Questions / Exercises.
- 4.24 Further Readings.

OVER HEADS

4.1 Concept : Over Heads

Broadly speaking, any expenditure incurred over and above prime cost is known as overhead. Overhead has been defined in the Terminology as 'the total cost of indirect materials, indirect labour and indirect expenses'. The term 'indirect', in this connection, means that which cannot be allocated, but which can be apportioned to or absorbed by, cost centres or cost units. It is to be noted that various authors use a large number of terms for 'overhead' such as

Overhead expenses	Supplementary cost
Overhead cost	Non - productive cost
Overhead charges	Burden
On cost	Loading etc.

But the important fact is that it is the same thing. In some cases, it is difficult to establish the distinction between overhead cost, on the one hand, and direct material and direct labour, on the other. This is due to the fact that classification of a cost element into direct and indirect depends upon the nature of production, the size of the factory, the extent of automation, the degree of convenience, etc. For example in one shoe factory, the cost of thread used may be treated as direct material cost by charging it to the cost of each pair of shoes manufactured pair while in another factory it may be treated as overhead ; the management in the second factory may not consider it justified to have an elaborate system for identifying the costs to production units. Like wise, certain small labour operations may be treated as indirect labour in one factory as against direct labour treated in another.

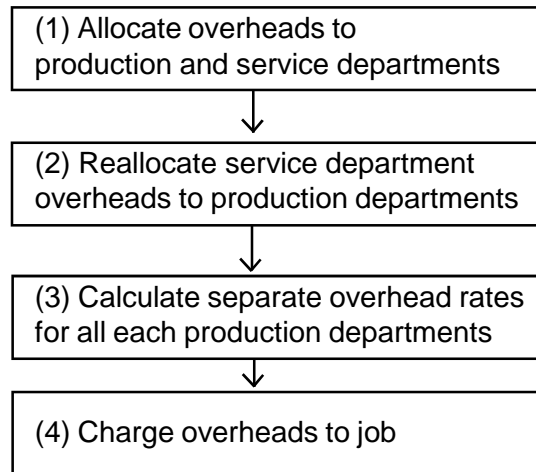
4.2 Procedure for Accounting and Control :

The procedure for accounting and control of overheads involves the following steps :

1. Classification and codification
2. Collection and accumulation.
3. Departmentalisation through allocation and apportionment (Primary Distribution)
4. Re-apportionment to producing departments.

5. Absorption or charge to production units.

The procedure for accounting and control of overheads is depicted in figure.



An overview of the overhead apportionment rate.

4.3 Analysis of Overheads :

It is the arrangement of items in logical groups having regard to their nature (subjective classification, e.g., sales, rent, rates, electricity, wages, etc.) or the purpose to be fulfilled (objective classification e.g. cost centre or cost unit). Overhead cost may be classified according to:

- i) Functions
- ii) Elements, and
- iii) Behaviour

I. Functional classification : Under this method classification is done with reference to the major functions of a concern. It, therefore includes :

- A. Production overheads
- B. Administration overheads
- C. Selling and Distribution overheads.

Overheads costs arise as a result of providing infrastructural facilities and they are common to all departments. However, for the purpose of more accurate determination of cost and effective control and decision making. The computation of cost of providing such facilities by each major function becomes necessary. The production overheads are related to manufacturing activities, the administrative overheads, with administrative functions of the organisation and selling and distribution overheads are related to marketing activities.

A. Production overheads : All costs incurred in the factory overhead and above direct material cost, direct labour and direct expenses are known as production overheads. In other words it is the total cost of factory indirect material, indirect labour and indirect expenses... Example of these costs are : consumable stores, lubricating oil, repairs and maintenance to plant and machinery, factory rent, salary of foremen, depreciation of plant and machinery use for production, expenses on keeping and handling stores, light, fuel power, etc.

B. Administration overheads : It refers to cost of management, and of secretarial, accounting and administrative services, which cannot be directly related to the production, marketing, research or development functions of the enterprise. In short, administration overhead includes all those costs which are incurred in the general and financial management of concern. Examples are : salaries payable to office staff, bank charges postage, stationary, telephone, depreciation of office building and machinery, retention fee of a legal practitioner, directors remuneration and so on.

C. Selling and distribution overhead : The Terminology uses the term marketing cost which is further analysed into a) Selling cost B) Publicity cost and c) Distribution cost. Selling and distribution overhead includes all such expenses which are incurred on functions like selling, advertising, transportation, warehousing, etc. Selling and distribution expenses are sometimes called after production costs as they are generally incurred after the production is over. As examples of selling and distribution overhead, the following may be mentioned :

Selling	Distribution
Salesmen's salaries and commission Expenses on show rooms, quotations etc.	Expenses of storage of finished products. secondary packing charges.
Cost of advertising such as cost of pamphlets, samples or free gifts, displays, exhibitions etc.	Insurance.
Market research expenses. After sales service cost. Bad debts.	Maintenance and depreciation of transport vans.
	Return transport (for goods on sales or return)

II. Elementise classification : This method of classification follows the definition of overhead. Under this method, overhead is broken down in to the following elements.

- i) Indirect material
- ii) Indirect labour
- iii) Indirect expenses.

It is important to note that production overhead is mainly susceptible to this classification. Few examples of production overheads are given below :

Indirect material : consumable stores, fuel, lubricating oil, cotton waste, small tools for general use, loss, deficiencies and deterioration of stores, etc.

Indirect labour : Salary of the foreman, supervisory staff and works manager, wages for maintenance workers, payment for overtime premium hours, idle time, leave and holidays, workmens compensation, employer's contribution to provident fund, wages for maintenance workers, miscellaneous allowances to labour, etc.

Indirect Expenses : Repairs and maintenance to plant and machinery, factory rent, depreciation of plant and machinery used for production expenses on keeping and handling stores, rent rates and taxes, insurance, training expenses, hospital dispensary and canteen expense, etc.

III. Behaviourwise classification : Some overheads charges tend to vary almost directly with the volume of production, some tend to remain practically unaltered whatever may be the volume of production, some again vary in part with the volume of production and in part they are practically invariable whatever may be the volume of production. Selling and distribution overhead also behave in a similar manner with change in sales volume. Based on this behaviour the overhead expenses may be classified into :

- a) Variable overhead
- b) Fixed overhead
- c) Semi variable or semi fixed overheads.

The above classification is important from the standing point of accounting and control.

Variable overhead : This represents the overhead expenses which tend to follow (in the short-term) the level of activity. The examples are : indirect material, indirect labour, power and fuel salesmen's commission etc. Since variable overheads are expected to vary directly with the volume, it follows that unit variable cost is likely to be constant at all levels while total variable cost will tend to vary directly with the volume.

Fixed overhead : This represents the overhead expenses while tend to remain unaltered by fluctuations in volume within a relevant range and during a defined period of time. Examples of fixed overheads are : rent and rates, insurance, depreciation of machinery and building, office expenses like postage, stationary, pay and allowances of managers, secretary and accountant, legal expenses bank charges, interest on capital, etc. since these expenses remain fixed in total, the incidence of fixed overhead on unit cost decreases with the increase in the volume of production and vice versa.

Illustration :

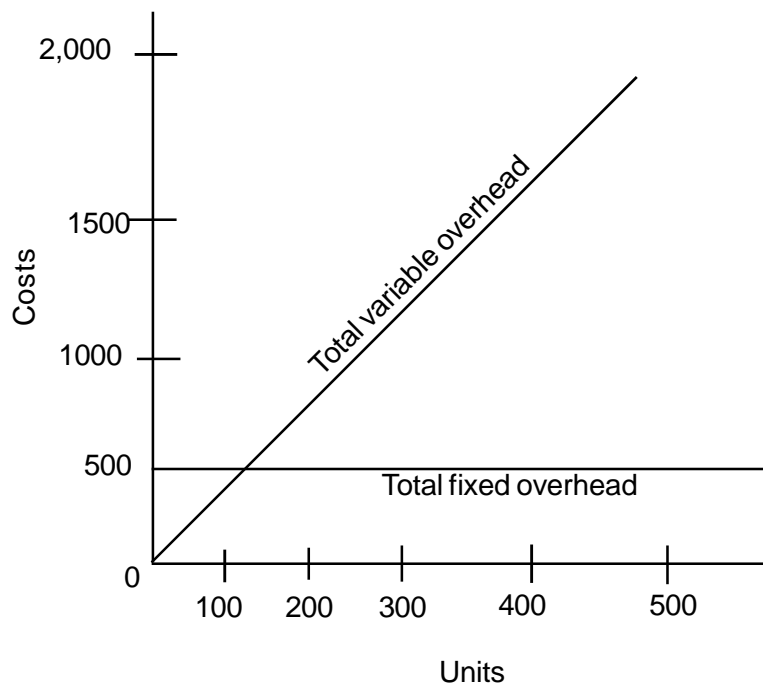
Range of output 100-500 units

Average variable overhead per unit Rs. 4

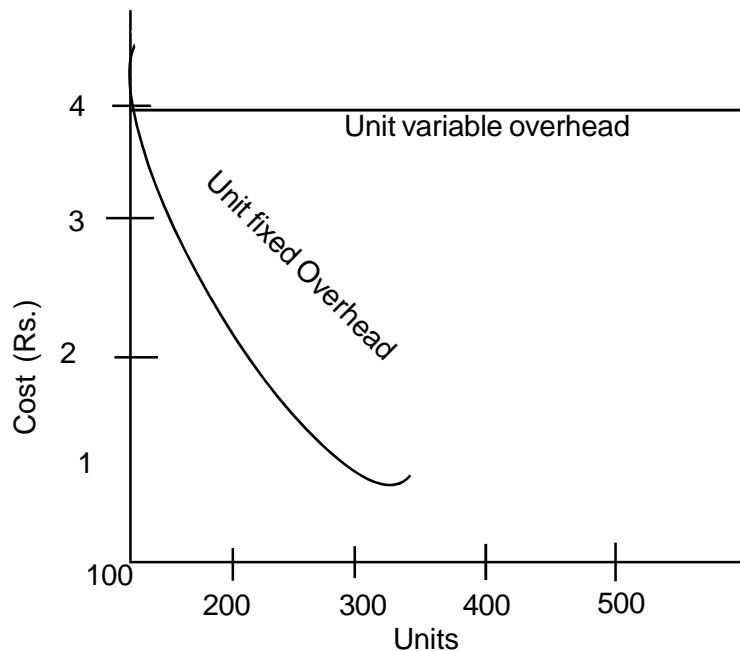
Total fixed over head Rs. 500

The following table will explain the nature of variable and fixed overheads.

Units	Overhead cost per unit			
	Total variable Overhead (Rs.)	Total fixed Overhead (Rs.)	Variable (Rs.)	Fixed (Rs.)
100	400	500	4	5.00
200	800	500	4	2.50
300	1,200	500	4	1.67
400	1,600	500	4	1.25
500	2,000	500	4	1.00

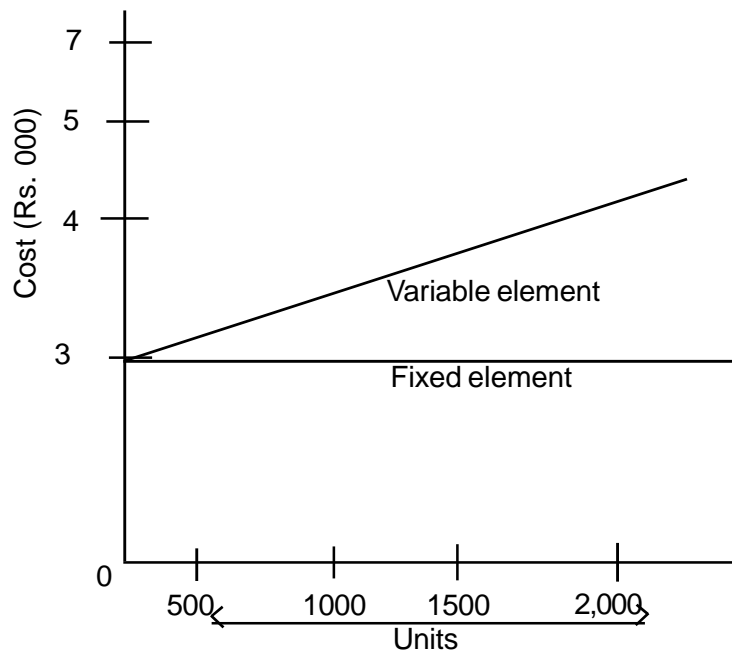


(a) Total overhead cost (Variable and Fixed) graph :



(b) Units Overhead Graph

semi - variable overhead : This represents partly variable and partly fixed overhead. Semi variable or semi - fixed overheads may remain fixed at certain levels of output while they vary at other levels, but not in direct proportion to the change in output. Examples are : repairs and maintenance, depreciation of plant and machinery, salary payable to a supervisor, telephone expenses. For instance in the case of depreciation, a certain percentage of can be attributable to lapse of time and hence fixed, another per centage can be attributable to use and accordingly, variable. Similarly, expenditure on maintenance is to a large extent fixed if production does not fluctuate widely. On the other hand, if production rises beyond a fixed limit, additional expenses on maintenance is necessary although such additional expenditure may not vary directly with production.



The semi variable overhead graph illustrates that the fixed portion of the semi variable overhead is Rs. 3,000 (line A) while the variable portion increases in a straight line (line B) indicating that for each increase in volume there is a corresponding increase in the variable portion of the overhead. This is what is often stated as being in linear relationship to the base. But in practice the fixed and variable elements may not behave exactly in the manner shown in the graph. As for example, the rate of variability in relation to volume does not take place indiscriminately from zero to 100%. In practice, fixed and variable costs are related to volume within appropriate or relevant ranges of operations and the fixed costs and the rate of variability will depend upon the particular range of operations under consideration.

4.4 Standing order Nos and Cost Accounting Nos.

In order to make effective analysis and control of the expenses, each of the production administration and selling and distribution overhead is classified into smaller sub-divisions so as to ensure that expenses of similar nature are grouped together under one head. This is done through a suitable list of "expenses headings". Cost accountants often refer to the expenses headings for production overhead as "standing order numbers" and those for administration and selling and distribution overhead as "cost Account Numbers". The method of compilation is, however, the same in each case. Principles to be borne in mind in this connection are :

- (i) They should be clearly defined, so that one is not confused with other.
- (ii) There must be enough headings to cover every circumstance,
- (iii) They should not be narrow in scope as to allow some items of expense to fall into a somewhat similar heading.

For the sake of convenient reference, the expense headings are to be given code numbers. The allocation of code numbers can be done in a number of ways, each factory having its own particular method depending upon the needs of the costing system. However, there are two well-tried and acceptable methods :

- a) Letter code method :
- b) The Mnemonic method
- c) The Decimal method

a) Letter code method

This method uses as codes the letters or alphabets to help the memory. For example

AD for Administration

RE for Repairs

MA for Maintenance

SAL for salaries

SA for Sales and so on.

b) The mnemonic method :

Under this method, letters may again be used in conjunction with numbers

c) The Decimal Method :

This is a system of numerical codes and is generally preferred for mechanical sorting and tabulating in conjunction with punch cards. A few examples are given :

Classification of Production Overhead

08 Service Departments

- 08 01 Stores
- 02 Tool - room
- 03 Boiler - house
- 04 Canteen, etc.
- 08 05 Boiler house
- 01 Stokers' wages
- 02 Coke
- 03 Water
- 04 Depreciation
- 05 Maintenance

For cost accounting numbers which are required for analysis of administration and selling and distribution overhead, it is necessary to make entirely separate classifications. But care must be taken to ensure that the reference numbers do not conflict with those adopted for production overhead. For example, if the last main number used in the classification of production overhead were, say 25, it would be advisable to leave a gap in the numbers and begin the classification of administration overhead with, say 45. For selling and distribution overhead classification similar care should be taken.

Classification of Administration overhead :

- 45 Salaries
- 45 01 Executive and Management
- 02 Clerks
- 03 others
- 45 01 Executive and Management
- 01 Managing Director

02 Accountant

03 Secretary and so on

Classification of selling and Distribution overheads

75 Salaries

76 Commissions

77 Advertising

78 Transport

75 Salaries

01 Salesmen

02 Divisional Sales Managers

03 Travellers

04 Clerks, etc.

77. Advertisements

02 Newspapers

03 Radios and television and so on

It should be emphasised that every enterprise has its own scheme of nomenclature compiled to suit its particular accounting organisation. Some enterprises, however, may be subject to uniform system of accounting.

4.5 Classification of overhead according to nature of Expenses :

In order to have effective analysis of the expenses in detail, each of the manufacturing, administration, selling and distribution overhead cost is classified into smaller sub divisions so that expenses of similar nature can be grouped together under one head. This is achieved through standing order Number or syllabus of work order number. These numbers are so called as they are listed on a permanent type of schedule or manual. Each standing order number denotes particular type of expenditure so that items of expenses of similar nature when incurred are suitably classified in one of these. A shedule or manual is maintained in the factory for enlisting all the standing order numbers. There is a positive need for having separate standing order numbers for fixed and variable overheads especially when departmental overheads are charged to products separately for fixed and variable overheads. Thus, there are two rates, one for fixed and the other for variable overhead. Separate rates are used for the following reasons :

1. Fixed costs being policy costs may not be recovered from costs under certain circumstances (as depression) but variable cost are to be recovered fully under normal circumstances.
2. Responsibility centres at higher management level are for controlling fixed costs but variable cost overheads responsibility centres are shop level.
3. Different bases may have to be adopted (some times labour hour basis or direct material cost basis) for recovering overheads from cost.
4. Marginal cost may be applied with benefit to have vital managerial basis.

The number of standing order numbers in a factory will depend on the size of factory, types of expenses and the extent of control necessary. A large variety or a number of types of expenditure in a factory will have larger number of standing orders.

For better control it is desirable to have smaller sub-division of the expenses. The essential requirements of an effective system of standing order numbers are :

1. These numbers should be clearly defined in order to understand the classification and correctly classify each item of expense.
2. No ambiguity should be there as the schedule or manual for which suitable remarks against the standing order numbers to assist in properly classifying each item of expenses is necessary.
3. System of standing order numbers should be according to the needs of the concern. It should not be too broad so as to lose its clarity and become useless for control purposes.
4. Code should be used for each heading as it helps to find items in a convenient way avoiding confusion and ultimately facilitating the collection of overheads.

4.6 Need for Classification of Overheads into Fixed / Variables :

The necessity (or advantages) for classifying the overhead into fixed and variable arises from the following :

- a. Fixation of selling price : This distinction is helpful in determining the price policy of a concern. Sometimes, different prices are charged for the same article in different markets to meet varying degrees of competition. However, the lowest selling price of an article in any market should atleast cover prime cost plus variable overheads. The corresponding fixed overheads may or may not be recovered if it is not practical to do so. Such fixed overheads may be recovered from sales in more favourable markets. If the selling price in a market does not cover the variable overheads, it is better not to sell goods in that market. Similarly in times of trade depression, it will be profitable for a manufacturer to sell his goods below the total cost, provided the selling price is in excess of variable cost. In this way he can recover a part of his fixed expenses and thus minimise his loss.
- b. Framing the Flexible Budget : Segregating the fixed overhead from the variable overhead will be helpful in framing the flexible budget for various levels of capacity utilisation. The behaviour of the cost will also be forcefully brought out.

- c. **Effective Cost control** : Fixed expenses are incurred by management decisions and as such can be controlled by the top management while the variable expenses can be controlled by the lower levels of management. By segregating these, the lower levels of management will know the types of expenditure which is with in their control.
- d. **Helps Management Decisions** : In management decisions regarding the utilisation of capacity, this segregation will be found useful. After all the concept of fixed or variable expenditure is in relation to a particular rate of output. For example, supervisory salary may have to be doubled if a new shift is to be started. In such a case, the management has to see whether the production of the second shift will be able to bear such an increase in the cost of production. Similarly decisions like fixation of price during depression, for export, for special order or the extra amount to be spent if an additional activity is undertaken or an alternative course is adopted, can be taken easily after classification of expenses into fixed and variable.
- e. **Marginal Costing and Break-Even Charts** : For the technique of marginal costing, preparation of break - even charts and study of cost - volume - profit relationship, segregation of cost into fixed and variable is quite essential.
- f) **Method of Absorption of overheads** : Different methods may be adopted for determination of absorption rates for fixed and variable overheads. The fixed overhead rate serves as a measure of utilisation of the facilities while the extent of idle capacity is indicated by under absorption

In short, classification of overhead into fixed and variable is highly helpful to the management for the efficient running of the factory. It is not only helpful for cost finding but also for cost control and managerial decision making.

The classification of costs into fixed and Variable is not perfect as it is based on one assumption that costs are influenced only by volume is not true. But there are many other factors which influence costs as production specification, product mix, method of production, technology plant and equipment, productivity, organisation structure, management policies and price indices etc. Moreover the linearity assumption is far from the actual reality.

4.7 Collection And Accumulation of Overheads :

There are four main sources of overheads :

1. Invoices - for collection of indirect expenses like rent, insurance etc.
2. Stores issue requisitions for collection of indirect materials cost
3. Wage Analysis Book for collection of indirect wages.
4. Journal Entries for collection of those overhead items which do not result in current cash outlay and need some adjustment eg depreciation charge in lieu of rent, outstanding rent etc.

Primary Distribution Summary or Departmentalisation of overheads :

The process of allocation and apportionment of overheads to cost centres or cost units is called Departmentalisation, or primary distribution of overheads. The plant is divided into segments called

departments or cost centres to which expenses are charged. The main reasons for dividing a plant into a separate departments are :

1. Closer control of overhead costs. Closer control is possible because departmentalisation makes the incurrence of expenses the responsibility of a foreman or supervisor.
2. More accurate costing of jobs and products.
3. Control and proper utilisation of the services centres.
4. For appropriate rates of absorption of overhead expenses.
5. For cost estimation and budgets.
6. For ascertainment of the cost of work-in-progress and transfer of goods from the one process to another.

Departments with in a factory are either production departments or service departments. Production departments include those departments that are directly engaged in manufacturing activity and contribute to the content and form of the finished product. Typical examples are cutting, assembly and finished departments. Service departments, as their name suggests, provide services or assistance to other departments. These contribute to production process in an indirect manner and do not shape or form the finished product. Typical examples are : personnel, cafeteria and maintenance departments. The following factors must be considered in deciding the kinds of departments required to control costs and to establish accurate departmental overhead rates.

1. Similarity of operations, processes and machinery in each department.
2. Location of operations, processes and machinery in each department.
3. Responsibilities of production and costs.
4. Relationship of operations to flow of production
5. Number of departments or cost centres.

4.8 Allocation of Overheads :

According to the Chartered Institute of Management Accountant, London, allocation is defined as “the allotment of whole items of cost to cost centres or cost units”. Expenses which originate directly and completely in a department are identified with the foreman responsible for the supervision of that department. Direct departmental overhead in production and service department can be categorised as under.

1. Supervision, indirect labour and overtime.
2. Labour fringe benefits.

3. Indirect material and factory supplies.
4. Repairs and maintenance.
5. Equipment depreciation.

4.9 Apportionment of overheads :

Expenses such as power, light, rent, depreciation of factory buildings are expenses shared by the all departments and cannot be charged directly to a department, be it producing or service. These expenses do not originate with any specific department. They are incurred for all to use and must, therefore, be apportioned to all departments using such items. According to bold cim, London, Technology, apportionment is defined as “the allotment of proportions of items of cost to cost centres or cost units.”

Distinction between Allocation and Apportionment :

Allocation and apportionment represent two successive stages in the process of distributing factory indirect expenses. The purpose obviously is to determine unit product cost. Thus, the distinction between these two terms is largely conceptual rather than substantive. The points of distinction are enumerated below :

i) Direct vs. Indirect identification : If an item of factory overheads can be identified directly with a specific cost centre, it is allocated thereto. If such an identification with a particular cost centre is not possible, the item will have to be apportioned on some fair and equitable bases. That is the allocation ends with cost centre, the process of apportionment is carried further down.

ii) Whole vs. part : In allocation, the whole amount of factory overheads is charged to a cost centre whereas in apportionment only a part of the factory overheads is charged to the departments or division within a cost centre. For example, if the factory itself is treated as one cost centre, the depreciation and maintenance of factory building will be allocated to it. If the factory consists of two or more departments the depreciation and maintenance cost will have to be apportioned on some reasonable basis. Similarly the salary of the supervisor will be allocated to a cost centre if he looks after the factory treated as a single cost centre. If it is a multidepartment factory, his salary will be apportioned amongst all divisions and departments. In brief, allocation is a direct process but apportionment is an indirect method for which equitable bases are to be selected.

The allocation and apportionment of overheads is explained with the following illustration :

Illustration :

Kumaresh Ltd has three production departments A,B,C and two service departments D. and E. The following figures are extracted from the records of the company :

Rent and rates	5,000
Indirect wages	1,500
Depreciation of machinery	10,000

General lighting	600
Power	1,500
Sundries	10,500

Following further details are available

	Total	A	B	C	D	E
Floor space (Sq.meters)	10,000	2,000	2,500	3,000	2,000	500
Light points	60	10	15	20	70	5
Direct wages (Rs)	10,000	3,000	2,000	3,000	1,500	500
H.P. of machines	150	60	30	50	40	---
Value of Machinery (Rs.)	2,50,000	60,000	80,000	1,00,000	5,000	5,000

Apportion the cost to various departments on the most equitable basis by preparing a primary Departmental Distribution summary.

Solution :

Primary Departmental Distribution Summary

Item	Basis of Apportionment	Total Rs.	Producing depts.			Service depts	
			A Rs.	B Rs.	C Rs.	D Rs.	E Rs.
Direct wages	Actual	2,000	--	---	---	1,500	500
Rent and rates	Floor space	5,000	1,000	1,250	1,500	1,000	250
General lighting	Light points	600	100	150	200	100	50
Indirect wages	Direct wages	1,500	450	300	450	225	75
Power	H.P. of machines	1,500	600	300	500	100	---
Depreciation.of machinery	Value of machines	10,000	2,400	3,200	4,000	200	200
Sundries	Direct wages	10,000	3,000	2,000	3,000	1,500	500
Total departmental overheads		30,600	7,550	7,200	9,650	4,625	1,575

It should be noted that direct wages for service departments only have been charged because for service departments all costs are indirect.

4.10 Advantages of Departmentalisation of Overhead Expenses :

Departmentalisation of overhead expenses has the following advantages :

1. Allocation and apportionment of overhead expenses to the respective departments facilitates control of overhead costs by means of budgets predetermined.
2. Apportionment of service department cost to production and other service departments facilitates control of the uses made of the services rendered to respective departments.
3. Absorption of overheads costs in the products produced by departmental overhead rates facilitates ascertainment of cost as the overhead costs of the respective departments are taken into consideration in determining the overhead rates.
4. The basis used in the predetermination of the departmental overhead rates may be used for control of actual basis in comparison to the quantity predetermined.
5. Analysis of under or over absorption of overhead discloses the reasons of variances which indicate the remedial measures to be taken.
6. For working out correctly the cost of work-in-progress. If the overhead is not departmentalised the cost of work-in-progress will be loaded with a proportion of overhead of all the departments including those in which the product is yet to be processed.

4.11 Secondary Distribution of Overheads with Criteria :

Since service departments expenses cannot be traced directly to finished units or cost centres, they are treated as indirect costs or manufacturing overheads which need to be apportioned to use departments on some rational and consistent basis. They are taken as overhead costs which are to be accumulated in separately designated service departments and then apportioned to benefiting production departments. This kind of apportionment is generally called secondary for two purposes:

1. to value inventory for external financial reporting,
2. to encourage departmental manager to monitor each other's costs

Criteria of apportionment of overheads costs of Service Departments : Different methods of criteria have been applied for the apportionment of overhead costs. There are no definite rules or statute laws that make the choice. The final decision must be left to the judgement of the individual cost accountant. The following are some important principles or standards :

i) Service or use or benefit received : Under this criterion, overhead cost of the services department are shared by the production departments according to the services or benefits received from the service departments. For example, cost of maintenance department may be apportioned to the production departments on the basis of machine hours or the capital value of the machines.

ii) The ability to bear : Under this principle a department producing expensive goods may absorb a large share of the service departments costs by deliberate decision, although the legitimate share of the department might be less than the apportioned. Thus, a higher share is apportioned to departments or jobs which earn more profit. However, this is inequitable method and is not advisable.

iii) Survey Criterion : This is applicable in those cases where it may not be possible to measure exactly the extent of benefit or service received by the different departments. Under such circumstances, a survey is made in respect of the benefits derived by the different departments. For example on the basis of survey of assessment, it was found that the Works Manager devotes 60% of his time to Department A and 40% to Department B. The salary of the Works Manager would thus be apportioned on 3:2 basis.

iv) Efficiency or Incentive principle : Under this principle, the production targets are fixed for each department and overheads are apportioned on the basis of budgeted or targeted volume. If the target is exceeded, the unit cost reduces indicating the efficiency of the department, on the other hand, if targets are not achieved, cost per unit goes up indicating inefficiency of the department.

4.12 Bases of Apportionment :

The following table gives the bases of apportionment of service department cost to other production departments :

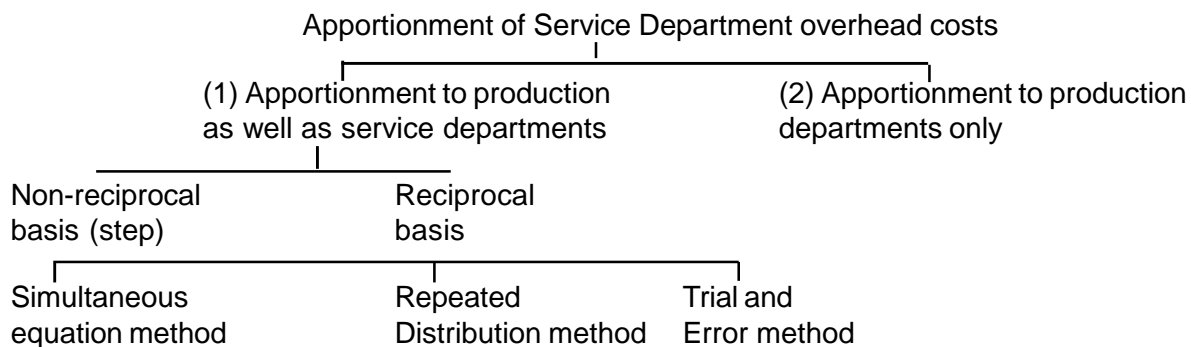
Bases of Apportionment

Service department cost	Bases of apportionment
1. Maintenance department	Hours worked for each department
2. Payroll or time - keeping department	Direct labour hours, machine hours, or No. of employees in each department.
3. Personnel department	Labour turnover, total wages or No. of employes
4. Store-keeping department	No,of requisitions handled or value of materials of each department or on the basis of cost per rupee of material received and issued.
5. Purchasing department	No. of purchase orders placed, value of materials purchased.
6. Recreation	No. of employees, total wages.
7. Welfare, canteen, hospital service, insurance, accident, employer's liability	No. of employees in each departments, total wages.
8 Internal transport service, overhead crane service	weight, value of the products or weight and distance covered.
9. Inspection	Value of items inspected.
10. Drawing office	No. of drawings made, chargeable man hours
11. Design, pattern making	Chargeable man-hours, No. of patterns made
12. Caretaking, watching and patrolling	Area of floor space.

13. Planning and control	Machine operating hours, direct labour hours.
14. Supervision	No. of employees, total wages or requirements of a centre.
15. Training	No. of trainees or cost incurred for specific groups of departments.

4.13 Methods of Re Apportionment : (Secondary Distribution)

The methods of distributing service department overhead costs to production departments may be better understood with the help of the following diagram :



Apportionment to production as well as service departments : Under this method, an item of manufacturing expenses relating to both production and service departments, such as indirect labour cost, should be distributed overall the departments, i.e., production and service departments. This can either be on non-reciprocal basis or on reciprocal basis.

Non-Reciprocal Basis : Apportionment on non-reciprocal basis is done by arranging the service cost centres in the descending order of their service ability on the overhead analysis sheet. The cost of the most serviceable department, i.e., the department which renders services to all production and service departments, is first apportioned to production departments and other service departments. The next services department, in the ascending order, is taken and its cost is apportioned to production and service departments and this process goes on till the cost of the last service department on an ascending order, they may be arranged on highest cost basis, i.e., the service cost centre having highest cost comes first and so on. The process of apportionment of cost is the same as followed in the ascending order method.

Reciprocal Basis : This method recognises the fact that if a service department receives services from other service department, the department receiving services should be charged. Thus, the costs of inter departmental services are taken into account on reciprocal basis. There are three methods which may be used for reciprocal distribution.

1. Simultaneous Equation Method
2. Repeated Distribution Method.
3. Trail and Error method

1. Simultaneous Equation method : In this method, the true total overhead costs of each service department is ascertained with the help of simultaneous equations. These are then redistributed to production departments on the basis of given percentages.

2. Repeated distribution method : Under this method, the total of overhead costs of the service departments are distributed to other services and production departments according to the given percentage till the expense of all service departments are exhausted or remain insignificant.

3. Trail and error method : Under this method the cost of service centre is apportioned to another service centre. The cost of another service centre plus apportioned cost from the first centre is apportioned back to the first service centre. This process is repeated till the amount to be apportioned becomes negligible.

4.14 Methods of Redistribution (Another way)

There are three recognised methods of redistribution of service department costs. They are

I Direct Redistribution

II Step Method

III Reciprocal Services Method.

I. Direct Redistribution : Under this method, service department costs are apportioned directly to production departments only ignoring the services rendered by one service department to the other.

Illustration :

'Akai Company Ltd' has three production departments and four service departments. The expenses for these departments as per Primary Distribution Summary were :

Production Departments	Rs.	Rs.
A	15,000	
B	13,000	
C	12,000	40,000
Service Departments :		
Stores	2,000	
Time keeping & Accounts	1,500	
Power	800	
Canteen	500	
		4,800
	Total	Rs 44,800

The following information are also available in respect of the production departments :

	Dept. A	Dept. B	Dept. C
Horse power of machines	300	300	200
Number of workers	20	15	15
Value of stores requisitioned (Rs)	2,500	1,500	1,000

Apportion the costs of the various service departments to the production departments.

Cost	Basis of Apportionment	Total Rs.	Production Departments		
			A Rs.	B Rs.	C Rs.
As per primary Distribution summary	-----	40,000	15,000	13,000	12,000
Stores	Value of stores requisition (5:3:2)	2,000	1,000	600	400
Time-keeping & Accounts	Number of workers (4:3:3)	1,500	600	450	450
Canteen	---do---	500	200	150	150
Power	H.P. of machine (3:3:2)	800	300	300	200
	Total	44,800	17,100	14,500	13,200

II Step Method : This method partly recognises the services rendered by service departments to other service departments. Therefore, a Sequence of apportionments must be chosen. The sequence begins with the department that renders service to the maximum number of other service departments (or, that receives least interdepartmental) services from other service departments) it continues in step-by-step fashion and ends with the apportionment of costs of that service department which renders service to the least number of other departments (or which receives maximum interdepartmental services from other service departments) Thus, department like time-keeping would be taken up earlier than, say, production control.

Illustration :

Maruti company has two production departments X and Y and three Service Departments-Time keeping, Stores and Maintenance. The Departmental Distribution Summary showed the following expenses for July, 2003.

Production Departments	Rs.	Rs.
X	12,000	
Y	8,000	
		20,000
Service Departments :		
Stores	2,500	
Time-Keeping	2,000	
Maintenance	1,500	
Total		6,000
		26,000

Other information relating to these departments were :

	Production Departments		Service Departments :		
	X	Y	Stores	Time Keeping	Maintenance
Number of Employees	20	15	10	8	5
Number of Stores requisitions	12	10	---	---	3
Machine hours	1,200	800	---	---	----

Apportion the costs of the Service Departments to Production Departments X and Y

Dept.	As per Primary Distribution Summary					
	Rs.	Rs.		Rs.		
Time - Keeping	2,000	(-) 2,000				
Stores	2,500	400	(-) 2,900		Rs.	
Maintenance	1,500	200	348	(-) 2,048		Rs.
X	12,000	800	1,392	1,229		15,421
Y	8,000	600	1,160	819		10,579
	26,000					26,000

Notes : Basis of apportionment :

(a) Time - Keeping - Number of employees (i.e., 10:5 : 20 : 15)

(b) Stores - Number of Stores requisitions (i.e., 3:12:10)

(c) Maintenance - Machine Hours (i.e., 12:8)

In this method, the fact that many service departments may render reciprocal services is ignored. As a result, the total cost of a service departments cannot be accurately ascertained although it will not distort the final charges to the production departments.

Repeated distribution method :

Under this method the overhead expenses as per Primary Distribution summary are put below the respective departments in a line and then the service department costs are redistributed to production and other service departments on the basis of agreed percentage and, as the name suggests, this process of distribution is continued or repeated taking up service department total one after another until these figures are exhausted or become too small to matter. This method is also known as 'cycles method'.

Illustration :

Onida Company has three Production Departments and two Service Departments. In July, 2003, the departmental expenses were as follows :

Production Departments	Rs.	Rs.
A	8,000	
B	6,500	
C	7,000	
		21,500

Service Departments	Rs.	Rs.
E	2,340	
F	3,000	
		5,340
Total		26,840

The Service Department Expenses are charged out on a percentage basis Viz-

Service Departments	Production Departments			Service Departments	
	A	B	C	E	F
E	20	25	35	---	20
F	25	25	40	10	---

Prepare statement showing the apportionment of the expenses of the two Service Departments to the Production Departments.

Secondary Distribution Summary

Particular	Production Departments			Service Departments	
	A	B	C	E	F
	Rs.	Rs.	Rs.	Rs.	Rs.
As per summary	8,000	6,500	7,000	2,340	3,000
Service Dept. E	468	585	819	(-) 2,340	468
Service Dept. F	867	867	1,387	347	(-) 3,468
Service Dept. E	69	87	121	(-) 347	70
Service Dept. F	18	17	28	7	(-) 70
Service Dept. E	1	2	3	(-) 7	1
	9,423	8,058	9,358		

Note : (-) Signs indicate credits, necessary to exhaust the Service Department totals.

Alternative approach to repeated distribution method :

In order to reduce the labour involved in the process of redistribution of the costs of the service departments, an alternative short cut approach may be followed. In this case, the process of repeated distribution will have to be carried out only in respect of service departments. Production departments are ignored strictly for the purpose of redistribution when the expenses of the service departments are exhausted or when they become too small to matter, all 'allotments' in relation to corresponding service departments will have to be added to find out total expenses of the service departments on the basis of reciprocal services. Lastly, a statement should be prepared to show redistribution of the total service department expenses on the basis of given percentages.

Illustration :

Same data for Repeated Distribution method :

(i) Statement ascertaining the expenses of the service departments on the basis of reciprocal services.

	E Rs.	F Rs.
As per summary	2,340	3,000
Service Department E (20% to F)	(-) 2,340	468
Service Department F (10% to E)	347	(-) 3,468
Service Department E	(-) 347	70
Service Department F	7	(-) 70
Service Department E	(-) 7	1
Gross Expenses	2,694	3,539

(adding all allotments i.e., ignoring figures with (-) signs)

(ii) Statement showing redistribution of service department expenses to production departments

Particulars	A Rs.	B Rs.	C Rs.	E Rs.	F Rs.
As per summary distribution	8,000	6,500	7,000	2,340	3,000
Service Department .E	539	674	942	(-) 2,694	539
Service Department. F	885	884	1,416	354	(-) 3,539
Total	9,424	8,058	9,358	Nil	Nil

(b) Simultaneous equations method : Under this method, the true costs of service departments are ascertained first with the help of simultaneous equations, these are then redistributed to production departments on the basis of given percentages. The principle is illustrated below with the help of the same data used in the previous illustration.

Illustration :

Let X = Total overhead of Service Department E

and Y = Total overhead of Service Department F

Then,

$$X = 2,340 + 10\% \text{ of } Y$$

$$Y = 3,000 + 20\% \text{ of } x$$

or,

$$X = 2,340 + 0.1 Y \dots\dots\dots (1)$$

$$Y = 3,000 + 0.2 x \dots\dots\dots (2)$$

Rearranging and eliminating decimals

$$10x - y = 23,400 \dots\dots\dots (3)$$

$$-2x + 10y = 30,000 \dots\dots\dots (4)$$

Multiplying equation (4) by 5 :

$$10x - y = 23,400 \text{ -----} (5)$$

$$-10x + 50y = 1,50,000 \text{ -----}(6)$$

Adding equation (6) to (5)

$$49y = 1,73,400$$

$$y = 3,538$$

Substituting this value in equation (1)

$$x = 2,694$$

Thus, if inter departmental services are taken into account the total overhead of service Departments E and F will be Rs. 2,694 and Rs. 3,538 respectively. These are to be redistributed to the production departments through a separate statement.

4.15 Illustrations In Overhead Accounting :

(1) What basis would you follow for distribution of the following overheads expenses to departments

- (a) Store Service Expenses
- (b) Employee's State Insurance (ESI)
- (c) Factory Rent
- (d) Municipal Rent, Rates and Taxes
- (e) Insurance on Building and Machinery
- (f) Welfare department expenses
- (g) Creche expenses
- (h) Steam
- (i) Electric light
- (j) Fire Insurance.

Expenses	Basis of apportionment
a) Store Service Expenses	a) Value of materials consumed.
b) ESI	b) Wages of each department
c) Factory Rent	c) Floor area
d) Municipal Rent, Rates and Taxes	d) Floor area
e) Insurance on Building and Machinery	e) Insurable value
f) Welfare Department Expenses	f) Number of employees
g) Creche Expenses	g) Number of female expenses
h) Steam	h) Potential demand
i) Electric light	i) Calculated units
j) Fire Insurance	(i) For capital items - Value of capital items (ii) For stores-Average value of goods in stock

Illustration :

The Modern Company is divided into four departments A,B, and C are production departments and D is a service department. The actual costs for a period are as follows :

	Rs.		Rs.
Rent	10,000	Supervision	15,000
Repairs to plant	6,000	Fire insurance	5,000
Depreciation of plant	4,500	power	9,000
		Light	1,000
		Employers liability	
		insurance	1,500

The following information are available in respect of the four

Departments :	Dept. A	Dept B	Dept C	Dept D
Area (Sq. fit)	1,500	1,100	900	500
Number of Employees	20	15	10	15
Horse power of machines	800	500	200	---
Total wages (Rs)	60,000	40,000	30,000	20,000
Value of plant (Rs.)	2,40,000	1,80,000	1,20,000	60,000
Value of stock (Rs)	1,50,000	90,000	60,000	-----
Light points (Nos)	40	30	20	10

Apportion the costs of the various departments by the most equitable method.

Departmental Distribution Summary.

Item of Expenditure	Basis of Distribution	Total Amount	Production Departments		Service Departments	
			A	B	C	D
			Rs.	Rs.	Rs.	Rs.
Rent	Areas occupied (15:11:9:5)	10,000	3,750	2,750	2,250	1,250
Repairs to plant	Value of plant (4:3:2:1)	6,000	2,400	1,800	1,200	600

Depreciation of plant	--do--	4,500	1,800	1,350	900	450
Supervision	Wages of employees (6:4:3:2)	15,000	6,000	4,000	3,000	2,000
Fire Insurance	Value of stock (5:3:2)	5,000	2,500	1,500	1,000	----
Power	H.P. of machines (8:5:2)	9,000	4,800	3,000	1,200	----
Light	No.of Points (4:3:2:1)	1,000	400	300	200	100
Employer's Liability insurance	No. of Employees (4:3:2:3)	1,500	500	375	250	375
	Total	52,000	22,150	15,075	10,000	4,775

Illustration :

The following information is supplied from the costing records of Hemalatha Textiles Ltd.

	Rs.				
Rent	4,000				
Maintenance	2,400				
Depreciation	1,800				
Lighting	400				
Insurance	2,000				
Employer's contribution to Provident fund	600				
Energy	3,600				
Supervision	6,000				
		Departments			
Particulars		Spinning	Weaving	Stores	Time Keeping
Floor space (Sq.ft)		300	220	180	100
Number of workers		48	32	24	16
Total direct wages (Rs)		16,000	12,000	8,000	4,000
Cost of machinery (Rs.)		48,000	36,000	24,000	12,000
Stock of goods		30,000	18,000	12,000	----

Prepare a statement showing apportionment of costs to various departments.

Solution :

Department Overheads Distribution Summary

Expenses	Basis of Apportionment	Total Rs.	Spinning Rs.	Weaving Rs.	Departments	
					Stores Rs.	Time keeping Rs.
Rent	Floor space (300:220:180:100)	4,000	1,500	1,100	900	500
Maintenance	Cost of machine (48:36:24:12)	2,400	960	720	480	240
Depreciation	---do---	1,800	720	540	360	180
Lighting	Floor space (300 : 220 : 180 : 100)	400	150	110	90	50
Insurance	Stock of goods (30 : 18 : 12 : 00)	2,000	1,000	600	400	----
Employer's Contribution	Direct wages (16:12:8:4)	600	240	180	120	60
Energy	Cost of machine (48 : 36 : 24 : 12)	3,600	1,440	1,080	720	360
Supervision	No. of workers (48 : 32: 24 : 16)	6,000	2,400	1,600	1,200	800
Total overheads as per primary distribution		20,800	8,410	5,930	4,270	2,190

(2) The Mushea company is divided into four departments M1 M2, M3 are producing departments and S1 is a service department. The actual cost for a period are as follows :

	Rs.
Rent	1,000/-
Repairs to plant	600/-
Depreciation of plant	450/-
Employer's liability for insurance	150/-
Supervision	1,500/-
Fire insurance in respect of stock	500/-

Power - 900 ; Light - 120/-

The following information is available in respect of the four departments :

	Dept. M1	Dept. M2	Dept.M3	Dept. S1
Area (Sq. Metres)	1,500	1,100	900	500
Number of Employees	20	15	10	5
Total wages (Rs)	6,000	4,000	3,000	2,000
Value of plant (Rs)	24,000	18,000	12,000	6,000
Value of stock (Rs)	15,000	9,000	6,000	----
H.P. of plant	24	18	12	6

Apportion the costs to the various departments on the most equitable basis.

Overheads Distribution Summary (Primary)

Item	Basis of apportionment	Total Amount	Production Departments				Service Department S1
			M1	M2	M3		
(1) Rent	Floor area (25 paise per metre)	1,000	375	275	225		125
(2) Repairs to plant	Plant Value (1 paise per rupee)	600	240	180	120		60
(3) Depreciation	Plant Value (0.75 paise per rupee)	450	180	135	90		45
(4) Light	Floor area (3 paise per sq. metre)	120	45	33	27		15
(5) Power	H.P. of plant (Rs. 15 per kmt)	900	360	270	180		90
(6) Supervision	No of Employess (Rs. 30 per employee)	1,500	600	450	300		150
(7) Fire insurance	Stock value (1/60 of value of stock)	500	250	150	100		---
(8) Employer's Liability for Insurance	No. of Employees (Rs. 3 per employee)	150	60	45	30		15
	Total	5,220	2,110	1,538	1,072		500

(3) In cima light Engineering factory, the following particulars have been collected for the three months period ended on 31-3-04. You are required to reapportion the service departments expenses to production departments.

	Production Departments			Service departments	
	P1	P2	P3	S1	S2
Expenses as per primay	8,850	7,165	6,285	4,515	6,010

Distribution summary

Apportion the expenses of service department S_2 inproportion of 3:3:4 and those of service department S_1 in the ratio of 3:1:1 to departments P_1 , P_2 and P_3 respectively

Production overheads distribution summary (primary)
(for quarter ending 31-3-02)

	Production Departments			Service departments	
	P1	P2	P3	S1	S2
Total expenses as per primary Distribution summary	8,850	7,165	6,285	4,515	6,010
Reapportionment of Department S_2 (3:3:4)	1,803	1,803	2,404	---	(6,010)
Reapportionment of Department S_1 (3 : 1 : 1)	2,709	903	903	(4,515)	----
Total	13,062	9,871	9,592	----	-----

(4) Kasturi manufacturing company has two production departments P1 & P2 and three service departments, Time keeping, stores and maintenance. The departmental summary showed the following expenses for July 2003.

Production Departments		Service Departments (in order of their importance)		
P1	P2	S1 (Time-keeping)	S2 (Stores)	S3 (Maintenance)
Rs.	Rs.	Rs.	Rs.	Rs.
16,000	10,000	4,000	5,000	3,000

The other information relating to departments were :

	Service Departments			Production Departments	
	S1 (Time-keeping)	S2 (Stores)	S3 (Maintenance)	P1	P2
No. of employees	----	20	10	40	30
No. of stores requisitions	----	----	6	24	20
Machine hours	---	---	---	2,400	1,600

Find out the overhead cost of Production Depts :

Secondary Distribution :

Dept.	As per primary Distribution Summary				
	Rs.	Rs.			
S1 (Time - Keeping)	4,000	(-) 4,000			
S2 (Stores)	5,000	800	(-) 5,800		
S3 (Maintenance)	3,000	400	696	(-) 4,096	
P1	16,000	1,600	2,784	2,458	22,842
P2	10,000	1,200	2,320	1,638	15,158
	38,000				38,000

Note : Basis of Apportionment :

- (a) Time - keeping - No. of employees (i.e., 2:1:4:3)
- (b) Stores - Number of stores requisition (i.e. 3 : 12: 10)
- (c) Maintenance - Machine hours (i.e., 3:2)

(5) Sindhuri company has three production departments and two service departments, and for a period the departmental distribution summary has the following totals :

Production departments :	Rs.
P1-Rs.800, P2-Rs 700 and P3 - Rs. 500	2,000
Service departments :	
S1-Rs. 234 and S2 - Rs. 300	534
	2,534

The expenses of the service departments are charged out on a percentage basis as follows :

	P1	P2	P3	S1	S2
Service Department S1	20%	40%	30%	---	10%
Service Department S2	40%	20%	20%	20%	----

Prepare a statement showing the apportionment of two service departments expenses to Production Departments by simultaneous equation method.

Sol :

Let X = Total overheads of departments S1

Y = Total overheads of department S2

Then,

$$X = 234 + 0.2y$$

$$Y = 300 + 0.1x$$

Rearranging and multiplying to eliminate decimals :

$$10x - 2y = 2,340 \text{ ----- (1)}$$

$$-x + 10y = 3,000 \text{ ----- (2)}$$

Multiplying equation (1) by 5, and add result to (2) we get

$$49x = 14,700$$

$$\therefore X = 300$$

Substituting this value in equation (1) we get

$$Y = 330$$

All that now remains to be done is to take these value $x = 300$ and $Y = 330$ and apportion them on the basis of agreed percentage to the three production departments, thus :

	Total	P1	P2	P3
	Rs.	Rs.	Rs.	Rs.
Per distribution summary	2,000	800	700	500
Service department S1 (90% of Rs. 300)	270	60	120	90
Service Department S2 (80% of Rs. 330)	264	132	66	66
	2,534	992	886	656

(6) In a Rubber factory, there are three production departments P1,P2 P3 and one service department S1. The following figures are available for one month of 25 working days of 8 hours each a day. All departments work all these days with full attendance :

Expenses	Total	Service Dept S1 Rs.	Prod Dept P1 Rs.	Prod Dept P2 Rs.	Prod Dept P3 Rs.
Power & Lighting	1,100	240	200	300	360
Supervisor's salary	2,000	---	---	---	---
Rent	500	---	---	---	---
Welfare	600	---	---	---	---
Other	1,200	200	200	400	400
	5,400				
Supervisor's salary		20%	30%	30%	20%
Number of workers		10	30	40	20
Floor area in Sq.metres		500	600	800	600
Service rendered by service Dept. to production depts.		---	50%	30%	20%

Calculate labour hour rate for each of the Depts. P1, P2 and P3

Solution :

Overhead Distribution Summary

Items	Basis	Total Rs	Service dept S1 Rs.	Production Depts.		
				P1 Rs.	P2 Rs.	P3 Rs.
Power and lighting	Direct (as given)	1,100	240	200	300	360
Supervisor's Salary	Ratio given	2,000	400	600	600	400
Rent	Floor area	500	100	120	160	120
Welfare	No. of workers	600	60	180	240	120
Others	As given direct	1,200	200	200	400	400
Total		5,400	1,000	1,300	1,700	1,400
Allocation of Service Dept	Ratio given 5:3:2		-1,000	500	300	200
Total overheads(1) ----->		5,400	---	1,800	2,000	1,600
Total labour hours (2)						
8x25 = 200 hours x No.of workers ----->				6,000	8,000	4,000
Labour hour rate (1) ÷ (2)				30 P	25 P	40 P

Problem :

Calculate the overheads allocable to Production Departments A and B. There are also two Service Departments E and F. E renders service worth Rs. 15,000 to F and the balance to A and B as 3:2. F renders service to A and B as 9:1

	A	B	E	F
Floor space (sq.ft)	5,000	4,000	1,000	2,000
Assets (Rs. in lakh)	10	5	3	1
H.P. of machines	1,000	500	400	100
Nos. of workers	100	50	50	25
Light and Fan points	50	30	20	20
Expenses and charges are :	Rs.			
Depreciation	1,90,000			
Rent, Rates and Taxes	36,000			
Insurance	15,200			
Power	20,000			
Canteen expenses	10,800			
Electricity	4,800			

Solution :

Statement of Apportionment of Overheads

Particulars	Basis of Apportionment	Total Rs.	Service Depts		Production Depts	
			E Rs.	F Rs.	A Rs.	B Rs.
Depreciation	Value of assets	1,90,000	30,000	10,000	1,00,000	50,000
Rent, Rates and taxes	Floor space	36,000	3,000	6,000	15,000	12,000
Insurance	Value of assets	15,200	2,400	800	8,000	4,000
Power	H.P. of machines	20,000	4,000	1,000	10,000	5,000
Canteen expenses	No. of workers	10,800	2,400	1,200	4,800	2,400
Electricity	Light and Fan Points	4,800	800	800	2,000	1,200
Service Dept		2,76,800	42,600	19,800	1,39,000	74,600
A			(-) 42,600	12,000	18,360	12,240
B				(-) 31,800	28,620	3,180
Total					1,86,780	90,020

Illustration :

Himalayan Soaps Limited supplied you the following information for the month ending January 2003. You are required to apportion the overheads to production departments.

Item	Production Departments			Service Departments	
	A	B	C	X	Y
Direct wages (Rs.)	14,000	12,000	10,000	2,000	2,000
Direct material (Rs.)	6,000	5,000	4,000	3,000	2,000
Employee - Numbers	400	300	300	100	100
Electricity - KWH	16,000	12,000	12,000	4,000	6,000
Light points - No :	20	30	30	10	10
Asset value (Rs.)	1,00,000	60,000	40,000	20,000	20,000
Area Occupied (Sq. yards)	1,600	1,200	1,200	400	400

The Expenses for the month were :

	Rs.		Rs.
Stores overhead	800	Repairs & Maitenance	2,400
Motive power	3,000	General overheads	20,000
Lighting	400	Rent & Taxes	1,200
Labour Welfare	6,000		
Depreciation	12,000		

Apportion the expenses of Dept X in the ratio of 4:3:3 and that of the Dept Y in proportion to direct wages to Dept A,B & C respectively.

Solution :**Department Overheads Distribution Summary.**

Expenses	Basis	Total	Production depts			Service Depts.	
			A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
Direct wages	Allocation	4,000	----	----	---	2,000	2,000
Direct Material	Allocation	5,000	----	----	----	3,000	2,000
Stores overhead	Material	800	240	200	160	120	80
Power	KWH	3,000	960	720	720	240	360
Lighting	Light points	400	80	120	120	40	40
Labour welfare	Employees	6,000	2,000	1,500	1,500	500	500
Depreciation	Assest value	12,000	5,000	3,000	2,000	1,000	1,000
Repairs & Maintenance	,,,,	2,400	100	600	400	200	200
General overhead	D. wages	20,000	7,000	6,000	5,000	1,000	1,000
Rent & Taxes	Area	1,200	400	300	300	100	100
Total as per primary distribution		54,800	16,680	12,440	10,200	8,200	7,280
Service Dept x 4:3:3			3,280	2,460	2,460	(-8,200)	----
Sevice Dept Y D. wages			2,831	2,427	2,022	----	(-7,280)
Total as per secondary distribution			22,791	17,327	14,682	----	-----

Illustration :

From the following information of an engineering company in Hyderabad, prepare the departmental overhead distribution summary.

Item	Production Departments			Service Departments	
	A	B	C	X	Y
Direct wages (Rs.)	60,000	90,000	1,20,000	30,000	60,000
Direct Material (Rs.)	30,000	60,000	60,000	44,000	45,000
Staff number	3,000	4,500	4,500	1,600	1,400
Electricity KWH	12,000	9,000	6,000	3,000	3,000
Asset Value (Rs.)	1,20,000	80,000	60,000	20,000	20,000
Light points	20	32	8	12	8
Area (Sq. Yards)	300	500	100	100	100

The expenses for the period were :

	Rs.		Rs.
Power	2,200	Depreciation	60,000
Lighting	400	Repairs	12,000
Stores	1,600	General Overheads	24,000
Welfare to staff	6,000	Rent & Taxes	1,100

Apportion the expenses of service department Y according to direct wages and those of service department X in the ratio of 5:3:2 to the production departments.

Departmental Overheads Distribution Summary.

Expenses	Basis	Total Rs.	Production Depts			Service Depts.	
			A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
Power	KWH	2,200	800	600	400	200	200
Lighting	Light points	400	100	160	40	60	40
Stores overheads	Direct Material	1,600	200	402	402	295	301
Welfare to the staff	Staff number	6,000	1,200	1,800	1,800	640	560
Depreciation	Asset Value	60,000	24,000	16,000	12,000	4,000	4,000
Repairs	Asset Value	12,000	4,800	3,200	2,400	800	800
General overhead	Direct wages	24,000	4,000	6,000	8,000	2,000	4,000
Rent & Taxes	Area	1,100	300	500	100	100	100
Wages	Allocated	90,000	---	---	---	30,000	60,000
Material	,,,	89,000	---	---	---	44,000	45,000
Total as per Primary distribution		2,86,300	35,400	28,662	25,142	82,095	1,15,001
Department Y as per Wages			25,556	38,334	51,111	----	(1,15,001)
Department x 5:3:2			41,048	24,628	16,419	(82,025)	----
Total as per secondary distribution			1,01,990	81,626	92,684	---	---

Problem :

The overhead expenses recorded in the books of Tata company for the year ended 30th June, 2003 are given below :

	Production Departments			Service Departments	
	Total	Machine	Packing	General Maintenance	
				Rs.	Rs.
	Rs.	Shop Rs.	Rs.		
Indirect Labour	29,300	8,000	6,000	4,000	11,300
Maintenance Materials	10,040	3,600	1,400	2,040	3,000
Miscellaneous supplies	3,500	800	2,000	300	400
Supervisor's salary	8,000	----	-----	8,000	---
Cost&payroll salaries	20,000	---	---	20,000	---
Power	16,000				
Rent	24,000				
Heat & fuel	12,000				
Insurance	2,000				
Taxes	4,000				
Depreciation	2,00,000				
	3,28,840	12,400	9,400	34,340	14,700

The following data are also available :

	Floor space (Sq. ft)	Radiator section	No. of employees	Value of asset (Rs)	H.P. X hours
Machine shop	1,000	90	40	64,000	3,500
Packing	400	180	20	20,000	500
General plant	200	60	6	1,000	----

Maintenance & store	800	120	10	15,000	1,000
	2,400	450	76	1,00,000	5,000

Expenses charged to the maintenance and stores are to be distributed to other departments by the following percentages. Machine shop 50%, packing 20%, General plant 30% General plant overhead is to be distributed on the basis of number of employees.

Show the distribution of overhead to production and service departments and determine the amount of production departments overhead after redistribution carry through 2 cycles.

Solution :

Particulars	Basis of allocation	Production Depts		Service Depts		Total Rs.
		Machine shop Rs.	Packing Rs.	General Plant Rs.	Maintenance stores Rs.	
Indirect labour	Direct	8,000	6,000	4,000	11,300	29,300
Maintenance	„	3,600	1,400	2,040	3,000	10,040
Materials						
Misc. Supplies	„	800	2,000	300	400	3,500
Supervisor's		----	----	8,000	---	8,000
Salaries						
Cost payroll						
salaries		---	---	20,000	---	20,000
		12,400	9,400	34,340	14,700	70,840
	Horse power X					
Power	Hours Floor space	11,200	1,600	---	3,200	16,000
Rent	(Sq. ft)	10,000	4,000	2,000	8,000	24,000
Heat & Fuel	Radiator section	2,400	4,800	1,600	3,200	12,000
Insurance	Value of asset	1,280	400	20	300	2,000
Taxes	„	2,560	800	40	600	4,000
Depreciation	„	1,28,000	40,000	2,000	30,000	2,00,000

Total		1,67,840	61,000	40,000	60,000	3,28,840
Maintenance & Stores	Percentages	30,000	12,000	18,000	(-)80,000	
General plant	No. of employees	33,143	16,571	(-) 58,000	8,268	
Maintenance etc	Percentages	4,143	1,657	2,486	(-) 8,286	
General plant	No. of employees	1,657	829	(-) 12,486	----	
Total		2,36,783	92,057			

Problem :

Wipro company has two production departments and three service departments overhead allocated for a period to these departments is as follows :

Production Dept.	Rs.
1	5,000
2	8,000
Service Dept	
A	1,000
B	4,000
C	2,000
Total	20,000

A technical assessment for the apportionment of the cost of the service departments shows :

Department	1	2	A	B	C
A	30%	50%	----	10%	10%
B	40%	30%	20%	---	10%
C	30%	30%	30%	10%	---

You are required to show the total overhead chargeable to the two production departments by using :

- (a) Repeated Distribution Method, and
 (b) Simultaneous Equation method.

Solution : Statement ascertaining the expenses of the service departments on reciprocal services basis :

	A	B	C
	Rs.	Rs.	Rs.
As per allocation :	1,000	4,000	2,000
Service dept. A (10% to B&D each)	-1,000	100	100
Service dept. B (20% A, 10% to)	820	-4,100	410
Service dept C (30% A, 10% B)	753	251	-2510
A	-1,573	157	158
B	82	-408	41
C	59	20	-199
A	-141	14	14
B	7	-34	3
C	5	2	-17
A	-12	1	1
B	1	-3	---
Total	2,727	4,545	2,727

ii) Statement showing redistribution of service department expenses to production departments:

	Production Department			Service departments		
	1	2	A	B	C	
	Rs.	Rs.	Rs.	Rs.	Rs.	
As per original allocation						
Service Dept. A	818	1,363	(-) 2,727	273	272	
Service Dept. B	1,818	1,364	909	(-) 4,545	454	
Service Dept. C	818	819	818	272	(-)2,727	
Total	8,454	11,546	Nil	Nil	Nil	

b) Let X = Total overhead of dept A

Y = Total overhead of dept. B

and Z = Total overhead of dept. C

Then :

$$X = 1,000 + 0.2Y + 0.32Z$$

$$Y = 4,000 + 0.1x + 0.13$$

$$Z = 2,000 + 0.1x + 0.1y$$

Rearranging and eliminating decimals :

$$10x - 2y - 3z = 10,000 \text{ ----- (1)}$$

$$-x + 10y - z = 40,000 \text{ ----- (2)}$$

$$-X - Y + 10z = 20,000 \text{ ----- (3)}$$

Deducting equation (3) from (2)

$$11y - 11z = 20,000 \text{ ----- (4)}$$

Multiplying (3) by 10 and adding the result to equation (1)

$$-12y + 97z = 2,10,000 \text{ ----- (5)}$$

Multiplying equation (4) by 12 and (5) by 11 :

$$132y - 132z = 2,40,000$$

$$-132y - 1067z = 23,10,000$$

$$935z = 25,50,000 ; z = 2,727$$

Substituting this value in equation (4)

$$11y = 50,000 \quad Y = 4,545$$

Substituting the values of y and z in equation (3)

$$-x = 20,000 + 4,545 - 27,270$$

or X = 2,725

Thus, after expenses of the service departments have been determined on the basis of reciprocal services, a redistribution statement will have to be prepared. This would be similar to statement (ii)

4.16 Absorption of overheads (or) recovery of overheads :

Meaning of absorption : After learning the methods to be followed for allocation and apportionment of overhead costs to producing cost centres, now we are required to learn the next step in the accounting of manufacturing overhead i.e., how to recover this cost from the production. The method of apportionment of overhead absorption (also referred to as levy, recovery, or application of overhead). It is necessary to charge each unit of produce with its share of overhead expenses to ascertain the total cost of each unit. The charge made to each job to recover indirect cost is known as absorption of overhead. Absorption actually means the distribution of the overhead expenses allotted to a particular department over the units produced in that department. Overhead absorption is accomplished by overhead rates.

Overhead absorption Rates : Overhead rates related to suitable bases or factors must be determined in order to absorb the overhead in cost of jobs, processes or products. The basic procedure for the calculation of overhead rate is to divide the amount of overhead expenses by the total number of units of the base selected as units of products, direct labour hours, machine hours etc. In order to arrive at the cost of each unit of production the rate so calculated is multiplied to the unit of the base contained in each individual product, job, process etc. In simple terms, the rate and overhead to be absorbed in a product can be calculated as below :

$$\text{Overhead Rate} = \frac{\text{Overhead expenses}}{\text{Total quantum of basis (quantity or value)}}$$

Overhead absorbed in a product = overhead rate X units of the base contained in the product.

Overhead rates are fixed in order to absorb the overhead to cost units on logical and equitable bases, to smooth out monthly fluctuations in the overhead cost per unit, to promptly compile the cost of the completion of production, to estimate the overhead cost in advance of production and to compute promptly the cost of work-in-progress.

Clerical cost and degree of accuracy are two important factors which determine the rate to be calculated in a particular concern. The following are the main overhead rates usually referred in cost accounting literature.

(1) Actual Overhead Rate : This rate is obtained by dividing the overhead expenses incurred during the accounting period by the actual quantum (quantity or value) of the base selected. Monthly rates can be calculated on the basis of the following formula :

$$\text{Overhead rate (actual)} = \frac{\text{Actual expenditure during the month}}{\text{Actual quantity or value of the base related to the total production in the month.}}$$

Recovery should be made on actual bases in order to charge the expenses directly to production, jobs, operations, processes etc. It is, however, not desirable to adopt actual rate in practice for the purpose of recovery of overhead expenses as it suffers from the following limitations :

i) Actual rate cannot be determined unless the accounting year or period is over and the relevant data is available for the purpose of calculation of such rate. This delays the determination of the cost of products :

ii) Some of the costs like leave wages, repairs and maintenance are not uniformly spread over all the accounting period. Certain other payments like insurance premium, rent etc. are made only periodically. The actual volume of activity is also affected by the seasonal or cyclical fluctuations because of number of days to be worked in a calendar month are not uniform and actual overhead cost will vary from month to month. Because of these reasons the actual rate is liable to wide fluctuations and this makes the cost comparison from period to period difficult.

iii) Actual cost is generally used for comparison with the predetermined figures for the purpose of control. Thus, it is useful only when compared with the established norms or standards.

2. Predetermined overhead Rate : Predetermined rate is determined in advance of the actual production and is computed by dividing the budgeted overhead expenses for the accounting period by the budgeted base for the period i.e.,

$$\text{Overhead Rate (Pre-determined)} = \frac{\text{Budgeted overhead expense for the period}}{\text{Budgeted base of the period}}$$

The computation of a predetermined overhead rate is more practical and useful as the rate related to a particular accounting period is available for costing purposes well in advance and helps in cost control. This helps in quick preparation of cost estimates and fixing rate prices especially in case of cost plus contracts. In those concerns where the budgetary control system is in operation, all the data for the purpose of calculation of predetermined overhead rate is available without any extra clerical cost. Overhead rate can also be calculated in those concerns by estimation the overhead cost and basis where the system of budgetary control is not used. The only limitation of such rate is that it may give rise to over and under - absorption of overhead.

Blanket overhead Rate : When a single overhead rate is computed for the factory as whole it is known as single or blanket or plant wide rate. It is calculated as under :

$$\text{Blanket Rate} = \frac{\text{Overhead cost for the entire factory}}{\text{The total quantum of the base selected}}$$

Blanket rate is calculated in small concerns where only one product is manufactured or where all the products pass through all the operations or departments and the incidence of overhead is uniform on all departments. These rates are easy to compute and require less clerical cost but have a very limited use. The limitations of such rates are as under.

i) Such rate may be erroneous and misleading results where several products are manufactured and are required to be passed through various production departments. Such departments may have different overhead expenses, and the product base and the productive time for different products may also differ.

ii) As the performance of the individual department cannot be assessed properly with this rate, so no satisfactory managerial control is possible.

iii) Such rate may render the valuation of work - in - progress erroneous

4. Multiple overhead rate : When different rates are computed for each producing department, service department, cost centre, each production factor and for fixed overhead, and variable overhead then they are known as multiple rates. It is calculated as under :

$$\text{Overhead Rate} = \frac{\text{Overhead cost allocated and apportioned to each cost centre}}{\text{Corresponding base}}$$

Multiple rates can be calculated on the following lines :

i) Separate rate for each production department having similarity of machinery and labour operations is calculated. It does not pose any problem.

ii) Separate rate for each service department is calculated when secondary distribution is not done, costs of service department are directly applied to work-in-progress through overhead rate relating to service departments. These rates are not widely used in practice.

iii) Separate rate of each cost centre is calculated in order to have comparative study of cost behaviour of different cost centres.

iv) Separate rate for fixed and variable overhead is calculated as it helps the concern in various ways.

v) Separate overhead rate of each product line is calculated when there are differences among products with regard to time spent in different parts of the factory and different types work is performed in different parts of the factory. It helps in determining comparative profitability of different products. It also provides a scientific basis for determining comparative profitability of different products. It also provides a scientific basis for determination analysis and control of costs.

vi) Separate rate for each element of cost is calculated when there are substantial differences in material content, labour content and factory utilisation and different elements of overhead. It ultimately leads to better utilisation of material, labour and facilities.

5) Normal Overhead Rate : Under this method overhead rate is a predetermined rate calculated with reference to normal capacity. It is determined by the following formula.

$$\text{Normal Overhead Rate} = \frac{\text{Normal overhead}}{\text{Base at normal capacity}}$$

6) Supplementary overhead Rates : These rates are used to carry out adjustment between overhead absorbed and overhead incurred. These are used in addition to some other rates and is calculated as under :

Supplementary Overhead Rate = Actual overhead incurred

$$\frac{\text{Actual overhead} - \text{absorbed overhead}}{\text{Base (hours or units etc.)}}$$

Principles of Apportionment of Overhead costs : The determination of a suitable basis is of primary importance and the following principles are useful guides to cost accountant :

i) Service or use or benefit derived. If the service rendered by a particularities of expense to different departments can be measured, overhead can be conveniently apportioned on this basis. Thus the cost of maintenance may be apportioned to different departments on the basis of machine hours or capital value of the machines, rent charges to be distributed according to the floor space occupied by each department.

ii) Ability to pay method : Under this method, overhead should be distributed in proportion to the sales ability, income or profitability of the departments, territories, basis of products etc. Thus jobs or products making higher profits take a higher share of the overhead expenses. This method is in suitable and is not generally advisable to relieve inefficient units at the cost of efficient units.

iii) Efficiency method : under this method, the apportionment of expenses is made on the basis of production targets. If the target is not achieved, the unit cost goes up, disclosing thereby the inefficiency of the department.

iv) Survey method : In certain cases it may not be possible to measure exactly the extent of benefit which the various departments receive as this may vary from period to period. A survey is made of the various factors involved and the share of overhead costs to be borne by each cost centre is determined. Thus, the salaries of foreman serving two departments can be apportioned after a proper survey which may reveal that 30% of such salary should be apportioned to one department and 70% to the other department. The cost of lighting, when not metered may similarly be apportioned on a survey of the number wattage of light points and the hours of use in each cost centre.

4.17 Methods of Absorption :

Absorption refers to the charging of overhead to cost units by means of rates. The various methods used for the purpose may be conveniently grouped under three heads :

1. Production unit Methods
2. Percentage Methods, e.g.

- i. Percentage on Direct wages
 - ii. Percentage on Direct Material cost
 - iii. Percentage on Prime Cost
3. Hourly Rate Methods, e.g.
- i. Direct Labour Hour Rate
 - ii. Machine Hour Rate

These methods of absorption are now discussed in detail.

Production unit method : This is an actual or pre - determined rate of overhead absorption which is calculated by dividing the cost to be absorbed by the number of cost units produced or expected to be produced. This is also known as cost unit rate method.

The production unit method is the simplest and most direct one. However, its usefulness is limited to those situations where only one product is produced or if there are two or more products all the products can be expressed in some common measuring unit.

Percentage on Direct wages Method :

This is defined in the Terminoloty as follows :

$$\text{Overhead Absorption rate} = \frac{\text{Estimated overhead cost}}{\text{Expected direct wages}} \times 100$$

Illustration :

The production overhead and direct wages for a period are Rs. 15,000 and Rs. 10,000 respectively. Find out the cost of production of a job which will cost Rs. 500 for materials and Rs. 1,000 for direct wages.

$$\text{overhead recovery rate} = \frac{\text{Rs. 15,000}}{\text{Rs. 10,000}} \times 100$$

Cost Sheet :

Dept.....		Job.....
Direct Material	500	
Direct wages	1,000	
Prime cost	1,500	

Production overhead 1,500

Cost of production 3,000

This method is suitable where production is uniform, all the workers employed earn more or less the same hourly rate, and labour is predominant. The advantages of this method are :

a) It is simple to understand and operate.

b) It gives due consideration to the time factor. In other words, it recognises the fact that a large proportion of overhead expenses vary with time and hence the longer the time that (or longer the amount) spent on a job, the more would be the charge of that job in respect of overhead.

c) Labour rates fluctuate less frequently than the rate of materials so that the method of production remaining unchanged, the overhead chargeable will not vary appreciably from period to period.

The application of the percentage on direct wages method will not give correct results in the following cases :

(a) Where major portions of the work is done by machines and workers act just as attendants, or where in some departments machines are extensively used while in the other there are predominance of hand - labours.

(b) Where same operation is performed on different jobs by workers with different rates of pay and also the highly paid workers can not increase their productivity = In such a case ; if overhead is recovered on the basis of direct wages, it will not only cost more in labour but also involve larger share of overhead expenses as compared to those performed by lowly paid workers. But in fact, highly paid workers take less time and, therefore, make use of less power supplies etc., so that share of overhead should be rather less.

Percentage on Direct Material cost Method : This method is similar to the previous one except that here materials cost is taken as base for ascertaining the recovery rate. This method is very seldom used because of a number of limitations :

a) Material prices are subject to constant fluctuations and this lead to high or low charges in respect of overhead even though overhead figure remains unchanged. This vitiates comparison of cost of production from period to period.

b) Most of the overhead expenses vary with time. Thus a job requiring cheap materials but longer period of processing should bear more for overhead as compared to a job which necessitates expensive materials but shorter period of processing. But in direct material cost is taken as the base, this time factor is totally ignored.

Percentage on Prime cost Method :

This method is also very simple and can be used where a standard product requiring a constant quantity of materials and a number of labour hours is produced. The main disadvantages of the method are :

a) If the cost of materials is the predominating item of prime cost, inadequate allowance is made for the time factor.

b) In some departments expensive machines may be used by some workers while in others hand tools may be used. Thus, the additional expenses occasioned by the use of expensive machinery are ignored.

Direct Labour hour Rate : For greater degree of accuracy the hourly rates of absorption (e.g. Labour Hour Rate, Machine Hour Rate) should be adopted. The Labour Hour rate is ascertained as follows :

$$\text{Rate} = \frac{\text{Overhead to be absorbed}}{\text{Labour Hours For Production}}$$

The terminology defines direct labour hour rate as :

“A rate calculated by dividing the budgeted or estimated overhead cost attributable to a cost centre by the appropriate number of direct labour hours.

Hours may be either the number of hours expected to be worked, or the number of hours which would relate to working at normal capacity.”

The rate may be computed for each gang of workers or each department engaged upon similar tasks. Thus, when the hourly rate methods are adopted, the time spent on each job by the hand worker or machine will have to be ascertained from the worker's job card and the charge for production overhead computed therefrom.

The labour hour rate can be adopted under the following circumstances :

- a) Where production is not uniform and where a percentage method not give accurate results.
- b) Where labour represents the predominating factor of production.

Sometimes, percentage on direct wages and labour hour rate may be used interchangeably. But when there are varying grades of direct labour, direct labour hour rate will be more appropriate than the former as many items of overhead are more related to time than to direct wages.

Actual Rate :

This is computed as follows :

$$\text{Actual rate} = \frac{\text{Actual overhead cost}}{\text{Actual base}}$$

The rate may be computed annually or for shorter periods like quarter, month etc. When historical cost ascertainment is the sole objective, actual overhead rate will lead to desired results.

When monthly rates are used, there will be variation in unit cost from month to month. This is due to two reasons. First while certain items of overhead expenses will tend to remain constant per month over the accounting period, certain other items will fluctuate as the number of days in each calendar month is not uniform (also holidays may be more in some months than those in others). Second, due to seasonal and cyclical factors, production will also fluctuate from month to month. Besides, the incidence of repairs, maintenance and overheads of plant and machinery may be more during slack production periods than that in peak production periods. Consequently, actual monthly overhead rates will fluctuate and when these rates are applied to production, actual unit cost will vary from month to month. In other words, in slack season cost per unit will be high whereas in busy season it will be low. This vitiates comparison of costs from month to month.

To obviate the above annually, overhead rate is to be computed for a full cycle covering seasonal fluctuations. This is usually done annually. But actual annual rate is not desirable because in that case one has to wait till the end of the accounting year for knowing actual overheads and actual base, thereby, frustrating the very objective of costing i.e., costs data will not be available either for control or for decision making.

Pre-determined overhead rate :

This is computed as follows :

$$\text{Rate} = \frac{\text{Budgeted overhead cost the the year}}{\text{Budgeted base for the year}}$$

Illustration :

Budgeted annual overheads	Rs. 48,000
Budgeted direct labour hours (annual)	24,000
Actual direct labour hours for a month	1,800
Actual overhead for the month	4,000

Compare pre - determined overhead rate (using direct labour hours for the budgeted period and show the amount of overhead expenses to be charged to production for month.

Pre-determined overhead rate = Rs. 48,000 / 24,000 = Rs. 2 per hour.

Therefore, since 1,800 hours are worked in the month, overhead to be charged to production is Rs. 3,600.

(i.e 1,800 @ Rs. 2) although actual overheads for the month amount to Rs. 4,000

It has been already stated that actual overhead rates suffer from certain serious limitations. The remedy lies in adopting normal predetermined overhead rates may be traced to the following reasons:

1) In jobbing type industry for making quotation one has to know in advance the anticipated overhead rate which will remain operative for a year. The use of actual rates, in such cases, will result in delay as these rates can be finalised only at the end of a period and consequently the order may not at all be obtained for delay in submitting quotation. Thus, the use of pre-determined overhead rates will help prompt preparation of cost estimates, quotations, fixation of selling prices, provisional billing to the customer before completion of the job or contract and so on.

2) If the industry is of seasonal nature, use of predetermined overhead rates will prevent fluctuation in costs. This makes inter - period and inter - firm cost comparisons more meaningful. The use of actual annual rate also prevents fluctuation in unit cost as has already been stated earlier. But, in that case, one has to wait till the end of the accounting period for knowing the rate.

3) The use of pre - determined rate will provide cost data available for control as well as for decision making. While control presupposes setting a rate in advance and comparing actual overheads with overheads absorbed and taking necessary preventive and corrective actions, tactical decisions are to be based preferably on anticipated costs rather than on historical costs. Pre-determined overhead rates would be of immense help in this respect as well.

Machine Hour Method : This method is similar to labour hour method. But, instead of taking labour hours as the base, machine hours form the basis of calculating overhead rate. The absorption rate is calculated by dividing the factory overheads apportioned to a machine by the number of hours the machine has been worked. Thus, we will get the rate per machine hour. This is called machine hour rate. In other words, it is the cost of running a machine for one hour. A separate rate is calculated for each machine or a group of similar machines.

Here, the overheads will be apportioned to the machines instead of the departments. Each machine is considered to be a cost centre. The total overheads of the machine will be divided by the number of hours worked by it. Thus, we get the absorption rate per machine hour. This rate will be multiplied with the number of machine hours spent for a particular job to get the cost to be absorbed by that job.

If production overheads of Machine 1 Rs. 5,000

No. of machine hours 500

Machine hour rate will be = $\frac{\text{Production overheads}}{\text{No. of machine hours}}$

$$= \frac{5000}{500} = \text{Rs. } 10$$

If machine 1 has been used for 5 hours for a job, overheads to be absorbed by that job will be Rs. 50 (Rs. 10x50)

This method is suitable where work is carried on mostly by the machine because in such case the overheads are more related to the machines.

Let us take an example (illustration) involving calculation of overhead absorption rates under various methods of absorption and see how it affects the total cost of a job or a product.

Illustration :

The production department of a factory furnishes the following information for the month of October, 1990.

	Rs.	Hours
Materials used	54,000	
Direct wages	45,000	
Overheads	36,000	
Labour hours worked		36,000
Machine hours worked		30,000

For an order executed by the department during October, the relevant data is as follows :

	Rs.	Hours
Materials used	6,000	
Direct wages	3,200	
Labour hours worked		3,200
Machine hours worked		2,400

Calculate the overheads chargeable to the job by a) Direct Materials Cost Method, ii) Direct Labour Cost Method iii) Labour Hour Rate and iv) Machine Hour Rate.

Solution :

Overhead Absorption Rates :

$$\begin{aligned} \text{i) Direct Material Cost Method} &= \frac{36,000}{54,000} \times 100 \\ &= 66 \frac{2}{3} \% \end{aligned}$$

$$\begin{aligned} \text{ii) Direct Labour cost Method} &= \frac{36,000}{45,000} \times 100 \\ &= 80\% \end{aligned}$$

$$\begin{aligned} \text{iii) Labour Hour Rate} &= \frac{36,000}{36,000} \\ &= \text{Rs. 1.00} \end{aligned}$$

$$\begin{aligned} \text{iv) Machine hour rate} &= \frac{36,000}{30,000} \\ &= \text{Rs. 1.20} \end{aligned}$$

Statement showing cost of the job under different methods of Absorption :

	Direct Materials Cost method Rs.	Direct Labour Cost Method Rs.	LHR Rs.	MHR Rs.
Direct Materials	6,000	6,000	6,000	6,500
Direct Wages	3,200	3,200	3,200	3,200
Overheads (applied)	4,000	2,560	3,200	2,880
Cost of production	13,200	11,760	12,400	12,580

Working Note :

Overheads chargeable to the job have been worked out under different methods of absorption as follows :

- i) Direct Material cost method = 66 2/3% of Rs. 6,000
= Rs. 4,000
- ii) Direct Labour cost method = 80% of Rs. 3,200
= Rs. 2,560
- iii) Labour Hour Rate = 3,200 x Rs 1.00

$$= 3,200$$

$$\text{iv) Machine Hour Rate} = 2,400 \times \text{Rs. } 1.20$$

$$= \text{Rs. } 2,880$$

Requisites of A Good Method of Absorption :

A good method of absorption should possess the following characteristics :

1. It should be simple to understand and easy to operate.
2. It should take into consideration the time factor.
3. It should distinguish between work done by manual labour and the work done by machine.
4. It should be distinguish between the work done by skilled and unskilled workers.
5. The method should provide an equitable basis for overhead absorption. It should not cause under of over absorption of overheads to any cost centre.
6. The method should not involve much clerical work and should be economical in application.

Computation of Machine Hour Rate :

As explained earlier, Machine hour rate is the overhead rate for one hour of machine worked. The first step in the computation of machine hour rate is the departmentalisation of overheads. Next these overheads of the department are allocated and apportioned to different machines in that department treating each machine or a group of machines as separate cost centre. Then, the total overheads pertaining to the machine are divided by the effective working hours of the machine to know the machine hour rate. The time required for setting of the machine and its idle time are deducted from the total working hours of the machine so as to get the effective working hours of the machine.

The overhead concerning a machine are divided into fixed and variable / running overheads. The total fixed overheads (also called standing charges) are taken and divided by the machine hours for the period concerned to get the fixed overhead hourly rate. For each variable overhead, per hour rate is directly computed. The total of fixed and variable hourly rate gives the machine hour rate. It should be noted that while calculation the machine hour rate (MHR) one would take all expenses for a particular period (a year or a month) and the machine hour should also relate to the same period.

The proforma for computation of machine hour rate is given in Fig :

Fig : computation of machine hour rate

Standing charges	Amount	Per hour
	Rs.	Rs.
Rent	xxx	
Lighting	xxx	
Salary	xxx	
Insurance	xxx	
Cotton waste	xxx	
Total	xxx	

$$\text{Hourly rate} = \frac{\text{Total}}{\text{No. of machine hours}}$$

Variable Expenses	xxx
Depreciation	xxx
Repairs	xxx
Power	xxx
Machine hour rate	xxx

Illustration :

From the following details compute a comprehensive machine hour rate.

1. The machine costs Rs. 50,000 and is deemed to have a scrap value of Rs. 5,000 at the end of its effective life (15 years) Ordinarily, the machine is expected to run for 1,020 hours per annum, but it is estimated that 20 hours will be lost for normal repairs and maintenance and 10 hours for abnormal idle hours.

2. Other details in respect of the machine shop are :

(a) Wages, workmen's compensation insurance etc. of each of two operators (each operator is incharge of two machines) Rs. 4,000 p.a.

b) Rent and rates of the shop p.a - Rs. 2,400

c) General lighting of the shop per month - Rs. 250

d) Insurance premium for the machine - Rs. 200 per quarter

- e) Cost of repairs and maintenance per machine per month - Rs. 200
- f) Shop supervisor's salary per month - Rs. 500
- g) Power consumption of the machine per hour - 20 units ; rate of power per 100 units - Rs. 10
- h) Other factory overhead attributable to the shop-Rs. 4,000 p.a. There are four identical machines in the shop. The supervisor is expected to devote one - fifth of his time for supervising the machine.

Machine Hour Rate

Dept./ Shop	Machine No.....	
	Effective life : 15 years	
	Anticipated	
	Working hours : 1,020 - 20	
	= 1,000 p.a	
1. Variable expenses	per annum	per hour
	Rs.	Rs.
Wages etc. (Rs. 4,000 ÷ 2)	2,000	2.00
Power $\left(20 \times \frac{10}{100}\right)$		2.00
Repairs and maintenance (Rs. 200 x 12)	2,400	2.40
		<hr style="width: 50%; margin-left: auto; margin-right: 0;"/>
		6.40
2. Fixed expenses		<hr style="width: 50%; margin-left: auto; margin-right: 0;"/>
Depreciation $\left(\frac{\text{Rs. } 50,000 - 5,000}{15}\right)$	3,000	
Rent & rates (Rs. 2,400 ÷ 4)	600	
General Lighting (250 x 12) ÷ 4	750	
Insurance (200 x 4)	800	
Supervisor's salary (500 x 12) ÷ 5	1,200	
Other overhead (Rs. 4000 ÷ 4)	1,000	
	7,350 ÷ 1,000	7.35
	Total	<hr style="width: 50%; margin-left: auto; margin-right: 0;"/>
		13.75

Note : For 10 abnormal idle hours idle time account should be appropriately charged, i.e. by Rs. 73.5 (10hrs @ Rs. 7.35) It should be emphasised that Rs. 6.40 (variable) will be incurred only when the machine will operate.

Problem :

Calculate Machine Hour Rate for recovery of overheads for a group of 4 machines from the following data : Original cost of the 4 machines Rs. 76,800 Depreciation at 10% per annum, straight line method. Maintenance cost average Rs. 8/- per day of 8 hours for the group of machines.

Power 25 paise per running hour (per machine) supervision for the machine group Rs. 640 per month. Allocation of building depreciation for the 4 machines on a floor area basis Rs. 80 per month.

Share of manufacturing overheads, Rs. 240 per month for the group.

Normal working days in the year, 300

Normal idle time, 20%

Normal running, 1 shift of 8 hours

Solution :

Machine Hour Rate

$$\text{Effective running hours p.a} = 300 \times 8 \times \frac{80}{100} = 1,920$$

1. Running & Maintenance expenses :

	Per hour Rs.
Power	0.25
Maintenance $\left(\frac{\text{Rs.8}}{4 \times (8 - 20\%)} \right)$	0.31
	Rs. 0.56

2. Fixed Expenses Per annum Rs.

Depreciation $\left(\frac{76,800 \times 10}{4 \times 100} \right)$	1,920
---	-------

$$\text{Supervision } \left(\frac{640}{4} \times 12 \right) \quad 1,920$$

$$\text{Building depreciation } \left(\frac{80}{4} \times 12 \right) \quad 240$$

$$\text{Manufacturing Overhead } \left(\frac{240}{4} \times 12 \right) \quad 720$$

$$\text{Rs. } 4,800 \div 1,920$$

$$2.50$$

$$\text{Rs. } 3.06$$

Illustration :

Compute the machine hour rate from the following data :

	Rs.
Cost of Machine	1,00,000
Installation Charges	10,000
Scrap value after 15 years	5,000
Rent of the shop per month	200
General lighting for the shop per month	300
Insurance for the machine p.a	960
Repairs p.a	1,000
Power 10 units per hour	20
Rate of power per 100 units	
Shop supervisor salary p.m	600
Estimated working hours p.a are	1,000

The machine occupies one - fourth of total area of the shop. Supervisor devotes one - third of his time for this machine

Computation of Machine Hour Rate

	P.a.	Per hour
	Rs.	Rs.
Standing charges :		
Rent 200 p.m x 12 months = Rs. 2,400		
Machine occupies 1/4 th area		
only (2,400 x 1/4)	600	
Lighting 300 p.m x 12 months = Rs. 3,600		
Machine occupies 1/4 th area		
(3,600 x 1/4)	900	
Insurance	960	
Supervisor's salary		
600 x 12 months = Rs. 7,200		
He devotes 1/3 rd of his time		
(7,200 x 1/3)	2,400	
Total standing charges p.a	4,860	
Hourly rate 4,860 ÷ 1,000 hours		4.86
Variable charges :		7.00
Depreciation		1.00
Repairs Rs. 1000 ÷ 1000 hours p.a		
Power for 100 units = Rs. 20		
for 10 units = $\frac{10 \times 20}{100}$		2.00
Machine Hour Rate		14.80

	Rs.
Depreciation cost of the machines	1,00,000
Add : Installation	+ 10,000
	1,10,000
Less : Scrap value	- 5,000
	1,05,000

$$= \frac{1,05,000}{15 \text{ yrs.}} = \text{Rs. } 7,000 \text{ p.a.}$$

Working hours p.a 1,000

$$\text{Depreciation per hour} = 7,000 \div 1,000 = \text{Rs. } 7$$

For more than One Machine

Illustration :

A machine shop contains four newly purchased machines each occupying equal amount of space and costing X Rs. 40,000, Y Rs. 50,000, Z Rs. 60,000 and W Rs. 80,000

Expenses per annum of the Machine shop are :

	Rs		Rs.
Rent	20,000	Power A	10,200
Rates	8,500	B	10,000
Light	6,300	C	24,000
Administration	19,000	D	29,000
Running expenses	40,000		

Prepare a machine hour rate for each machine assuming (1) 45 hours in a week and 50 weeks a year, (ii) 80% utilisation and life of machine being 10 years without any scrap value.

Solution :

Working hours : 45 hours in a week and 50 weeks a year with 80% utilisation

$$45 \text{ hours} \times 50 \text{ weeks} \times \frac{80}{100} = 1,800 \text{ hours}$$

$$\text{Depreciation} = \frac{\text{Cost}}{\text{Life}}$$

$$A = \frac{40,000}{10} = \text{Rs. } 4,000 \text{ p.a}$$

$$B = 50,000 \div 10 = \text{Rs. } 5,000 \text{ p.a}$$

$$C = 60,000 \div 10 = \text{Rs. } 6,000 \text{ p.a}$$

$$D = 80,000 \div 10 = \text{Rs. } 8,000 \text{ p.a}$$

Computation of Machine Hour Rate.

	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Standing Charges				
Rent apportioned equally (space)	5,000	5,000	5,000	5,000
Rates - do-	2,125	2,125	2,125	2,125
Light - do-	1,575	1,575	1,575	1,575
Administration - do -	4,750	4,750	4,750	4,750
Total Expenses p.a	13,450	13,450	13,450	13,450
Running Charges :				
Depreciation	4,000	5,000	6,000	8,000
Power	10,200	10,000	24,000	2,000
Other running expenses (equally)	10,000	10,000	10,000	10,000
	37,650	38,450	53,450	60,450
Machine hour rate				
(Total expenses ÷ 1,800 hrs)	20.92	21.36	29.69	33.58

Hourly Rate with setting up time

Illustration :

Calculate machine hour rate from the following data :

Total Machine hours worked p.a. 4,400

Selling up time 400 hours

Expenses for the machine p.a

Rent Rs. 12,000 ; Lighting Rs. 1,200, Repairs Rs. 2,400 ;

Supervision Rs. 4,800

Two attendants looking after 4 Machines were paid Rs. 120

Per month each.

Power consumed by the machine 10 units per hour @ Rs. 40 per 100 units.

Cost of the machine Rs. 17,200

Scrap value Rs. 1,200

Life period 16,000 hours.

Sundry supplies for the machine shop are Rs. 480 p.m. There are four identical machines in the machine shop. Supervisor is expected to devote his time equally for all the machines.

Computation of Machine hour rate

Standing Charges	P.a. Rs.	Per hour Rs.
Rent	12,000	
Light	1,200	
Supervision 4 identical Machines equal time		
1/4 th x 4800	1,200	
Attendants salary		
2 Attendants 120 p.m. x 12 months		

= 2,880 for four machines

For 1 machine $2,880 \div 4$ 720

Sundry supplies for the shop

480 p.m. x 12 months = 5,760

for four machines

For one machine $5760 \div 4$ 1,440

Total 16,560

Hourly rate $16,560 \div 4000$ 4.14

Running charges

Depreciation $\frac{17,200 - 1,200}{16,000 \text{ hours (life time)}}$ 1.00

Repairs $2,400 \div 4,000$ 0.60

Power for 100 units - Rs. 40

For 10 units per hour = $\frac{10 \times 40}{100}$ 4.00

Machine hour rate 9.74

Effective working hours p.a = 4,400 hours p.a - 400 hours set up time

= 4,000 hours.

When Annual working hours are not given.

Illustration :

Complete a machine hour rate for the month of January

Cost of machine Rs. 64,000

Scrap value Rs. 4,000

Effective working hours 10,000

Repairs and maintenance over the life period of machine Rs. 5,000. Standing charges allocated to this machine Rs. 1,000 for January. Power consumed by the machine at Rs. 0.60 per unit Rs. 1,200 p.m. The machine consumes 10 units of power per hour.

Solution :

Calculation of annual working hours by taking power as the basis

For Rs. 0.60 = 1 unit

For Rs. 1,200 ?

$$\frac{1,200}{0.60} = 2,000 \text{ units}$$

For 10 units of power time is 1 hour

$$\text{for 2000 units of power ? } \frac{2,000}{10} = 200 \text{ hours p.m}$$

Computation of machine hour rate

	P.m.	Per hour
	Rs.	Rs.
Standing charges	1,000	
Hourly rate $1000 \div 200$ hours		5.00
Variable charges :		
Depreciation $\frac{64,000 - 4,000}{10,000}$		6.00
Repairs $5,000 \div 10,000$ life hours		0.50
Power 10 units @ 0.60		6.00
		17.50
Machine hour rate		17.50

4.18 Under or over absorbed overhead :

What it is : When predetermined rate is used for absorption overhead there is likely to be some difference between the amount of overhead absorb and the amount of overhead incurred. This is because the predetermined rate is worked out before actual production starts and is applied to the products manufactured during the period for which the rate has been established. If the amount

absorbed or recovered is less than the amount incurred, there is under absorption and into the reverse case there is over absorption.

Illustration :

	Production Overhead Rs.	Adminstration Overhead Rs.	Selling & Dis tribution OH Rs.
Incurred	25,000	30,000	18,000
Recovered	20,000	32,000	18,000
Over/under recovery	-5,000	2,000	Nil

Cause : There are two basic reasons for over or under - recovery of over heads :

1. When overhead incurred differs from the estimated amount e.g. in case of under-recovery, actual overhead exceeds budgeted overhead and vice versa : Snf/or

2. When the actual hours or out put differs from the budgeted figure e.g. in case of under recovery, actual hours or output are less than budgeted output or hours and vice versa.

But if actual hours or production change in the same proportion with actual overhead, there will not be any under-or over-recovery of overhead.

The various causes of under-or over - absorption may be enumerated as follows :

1. Fluctuation in volume. It may be increase in activity due to increased demand for the product or reduction in the volume due to recession.

2. Mistakes in estimating the overheads for determination of absorption rates.

3. Unforeseen changes in the production methods affecting overheads.

4. Seasonal fluctuations.

Treatment of under or over absorbed overhead : The under or over absorbed overhead may be disposed of in any one of the three ways.

1. Carry forward to the next period's accounts

2. Write off to costing profit and loss account.

3. Use of supplementary rate.

According to the first method, the under or over absorbed overhead is transferred to an overhead reserve or suspense account for being carried forward to the next periods accounts for absorption on the assumption that it may be counter balanced next time. This method is not very popular and should be applied only when the normal business cycle extends for more than one year.

Under this method, the balance is transferred to production overhead under or over absorbed Account for eventual transfer to costing profit and loss account. This is generally done when the amount of under or over asorbed overhead is not appreciable enough to warrant a separate treatment.

According to the third method, under or over absorbed over head is adjusted to (a) work-in-progress (b) finished goods (in store) and (c) Factory cost of sales by way of supplementary rate. Thus amount of under absorbed overhead is to be added back while the amount absorbed overhead is to be deducted by applying supplementary rates. The supplementary rate may be calculated on the basis of (a) monetary value in each account, (b) direct material cost or labour cost in each account or (c) labour hours or machine hours in each account.

This method has the ultimate effect of charging actual overhead and should not be used unless there is serious error in estimating overhead or major change in the method of production or level of activity (in all such circumstances the amount of under or over absorbed overhead will be abnormally high such as to vitiate the cost of production).

Illustration :

Overheads incurred (Dr.)	2,25,000
Overheads applied (Cr.)	2,00,000
Closing work-in-progress	8,00,000
Closing Finished Stock	12,00,000
Cost of sales (work completed and sold during the period)	30,00,000
Total value of work in progress, Finished stock and cost of sales	50,00,000
Rate per rupee = Rs. 25,000 / 85,00,000	= Rs. 0.005

Thus on the basis of this rate the respective account will be debited with following amount :

Work in progress A/c :	8,00,000 x 0.005	=	Rs. 4,000
Finished stock A/c	12,00,000 x 0.005	=	Rs. 6,000
Cost of sales A/c	30,00,000 x 0.005	=	Rs. 15,000
		Total	Rs. 25,000

Profit for the period will be affected (reduced) by Rs. 15,000 i.e., by the amount cost of sales is increased and the current assets will increase by Rs. 10,000 (i.e. s, 4,000 + 6,000). The latter will affect the profit of the subsequent period.

Illustration :

Estimated annual overheads in department X were Rs. 3,500 fixed, Rs. 6,500 variable. Estimated machine hours were 10,000. Actual machine hours worked were 9,500 and actual overheads incurred were

Fixed Rs. 4,000

Variable Rs. 5,000

Find under or over absorption based on pre-determined rates :

Solution :

$$\text{Pre - determined cost} = \frac{\text{Estimated Overheads}}{\text{Estimated working hours}}$$

$$\text{Fixed overheads} = \frac{3,500}{10,000} = \text{Rs. } 0.35 \text{ per hour}$$

$$\text{Variable overheads} = \frac{6,500}{10,000} = \text{Rs. } 0.65 \text{ per hours}$$

	Actual Overheads	Overhead absorbed at pre-determined rate	Over absorbed	Under absorbed
	Rs.	Rs.	Rs.	Rs.
Fixed	4,000	3,325	675	----
Variable	5,000	6,175	---	1,175
Total	9,000	9,500	675	1,175

Fixed pre-determined rate x Actual hours worked

$$\text{Fixed } 0.35 \times 9,500 = \text{Rs. } 3,325$$

$$\text{Variable } 0.65 \times 9,500 = \text{Rs. } 6,175$$

Illustration :

Pre - determined overheads	Rs. 10,000
Pre-determined Machine hours	
Actual overheads	Rs. 9,000
Actual Machine hours	

Calculate under or over absorption of overheads using pre-determined rates and correct the situation using supplementary rates :

Solution :

$$\begin{aligned} \text{Pre-determined rate} &= \frac{\text{Estimated Overheads}}{\text{Estimated hours}} \\ &= \frac{10,000}{5,000 \text{ hours}} \text{ Rs. 5 per machine hour} \end{aligned}$$

Overhead absorbed on

$$\begin{aligned} \text{Pre-determined rate} &= \text{Pre-determined rate} \times \text{Actual hours} \\ &= 5 \times 1,500 = \text{Rs. 7,500} \end{aligned}$$

$$\text{Actual overheads} = \text{Rs. 9,000}$$

$$\begin{aligned} \text{Under - absorbed overheads} &= \text{Actual - Absorbed overhead} \\ &= 9000 - 7,500 = \text{Rs. 1,500} \end{aligned}$$

$$\text{Supplementary rate} = \frac{\text{Difference}}{\text{Actual hours}} = \frac{1,500}{1,500} = \text{Rs. 1 per hour}$$

4.19 Administration Overheads And Methods of Handling :

It has been pointed out earlier that when overhead expenses are classified according to main functions of an under taking, the items of expenses which relate to administrative offices are known as administration overhead. These expenses are incurred for the business as a whole. The terminology uses the term administration cost and defines it, as follows :

“Cost of management, and of secretarial, accounting and administrative services, which cannot be directly related to the production marketing, research or development functions of the enterprise”.

Functionally, they may consist of expenses of the following activities :

- | | |
|-----------------------|--------------------------|
| 1. Board to Directors | 5. Legal |
| 2. Secretarial | 6. Audit |
| 3. Financing | 7. Personnel |
| 4. Accounting | 8. Trade representatives |

The expenses of the above functions may again be classified under the following heads :

- | | |
|---|----------------------------------|
| 1. Salaries and allowances | 6. Postage telephone, telegrams, |
| 2. Rent, rates and taxes | 7. Audit fees |
| 3. Repair an maintenance of office
building, furniture and equipment | 8. Legal charges |
| 4. Travelling expenses | 9. Subscriptions and donations |
| 5. Transport | 10. Interest |
| | 11. General office expenses. |

In section, it was mentioned that these types of overhead are collected under cost account numbers. In this section, there fore, it is necessary to consider the treatment of administration overhead in the books of account.

Treatment in Accounts :

There may be three possible methods of accounting of administration overheads :

1. Transfer to costing profit and loss account
2. Apportion to production and selling and distribution functions of the concern.
3. Treat administration as a separate entity and include the costs relating to administration in costs as such.

Transfer to profit and loss account :

This method recognises the fact that the items of administration expenses are of fixed nature and also that their relationship with the production and sales activities of a concern cannot be determined. They would, therefore, be treated as period or fixed costs, being written off to costing profit and loss account in the period in which they are incurred.

Apportionment to production and sales functions :

Under this method, administration costs are distributed to production and selling and distribution functions on some equitable basis. This method is based upon the principle that there are only two basic functions of a manufacturing concern, Viz, production and selling and distribution and therefore,

to ascertain production and selling and distribution costs accurately, administration overhead should be assigned to each. Therefore, administration overhead incurred is debited to the Administration overhead account and at the end of a period the amount of administration overhead pertaining to the production function is transferred to the production overhead account and that pertaining to the selling and distribution Overhead Account.

The main problem in this method is to select equitable bases for the apportionment of administration overhead to the other two functions. The bases selected are more or less similar to those adopted for apportionment of production overhead.

Treating Administration Overhead as a separate addition to cost of production sales :

This method recognises administration as a separate function like production and sales and as such, costs relating to formulating the policy directing the organisation and controlling the operations are taken as a separate charge to the cost of the job or a product sold along with the cost of other functions. For this purpose, the bases which are generally used for apportionment are :

- i) Works cost
- ii) Sales value or quantity
- iii) Gross profit on sales
- iv) Quantity produced
- v) Conversion cost, etc

Each one has its relative merits and demerits, but the works cost is generally the best basis, as this incorporates all functions of administration.

4.20 Selling And Distribution Overhead :

The Terminology uses the term marketing cost which is further analysed into a) selling cost, b) distribution cost.

4.21 Analysis of Selling and Distribution Overhead :

The following methods are available for analysis of selling and distribution overhead :

A) By nature of Expenses, e.g.

- | | |
|---------------------------|-------------------------------|
| 1. Remuneration | 6. Freight |
| 2. Direct material | 7. Duty |
| 3. Miscellaneous expenses | 8. Packing materials |
| 4. Services | 9. Sales promotion |
| 5. Fixed charges | 10. Discounts and allowances. |

B) By Functions, e.g.,

- | | |
|------------------------------------|---------------------------|
| 1. Direct selling expenses | 5. Credit and collection |
| 2. Advertising and sales promotion | 6. Financial |
| 3. Transportation | 7. General administration |
| 4. Warehousing and storage | 8. Miscellaneous. |

C) By Areas**D) By products****E) By slemen****F) By type of customers, e.g.,**

- | | |
|------------------------|--------------------------------|
| 1. State Government | 3. Country - retailers |
| 2. National Government | 4. Country - wholesalers, etc. |

G) By Channels of Distribution, e.g.,

- | | |
|-------------------|-----------------|
| 1. Consumers | 3. Wholesalers. |
| 2. Retailers, and | |

From the point of view of cost control each method has its own advantages. But since too many elaborate analyses will be expensive, the particular analysis which will be most suitable for each type of product and the method of marketing should be adopted.

Treatment :

In whatever way the selling and distribution expenses are analysed, they are to be included in cost of sales. This is done through two steps : a) The direct expenses are allocated to functions, areas, salesmen or products as far as possible b) the general selling and distribution expenses which cannot be directly allocated are apportioned on some equitable basis. Some of the bases used for particular functions are :

Functions	Possible Bases
Direct selling	Gross sales value or number of sales men's calls on customer.
Advertisement and sales promotion	Sales turnover or no of units sold.
Transportation	Weight or packages, no of packages or distance.

Warehousing and storage	Sales volume, area occupied, size, weight or number of products handled or shipped.
Credit and collection	Number of invoices, number of customer's orders or number of transactions.
General Accounting	Number of customers orders, number of transactions or number of invoices.

Selling and distribution overhead is debited to selling and Distribution overhead Account. The application of selling and distribution overhead is done by the following entry :

Cost of sales Account Dr.

To selling and Distribution overhead Account.

Illustration :

Show the distribution of expenses and the cost per unit of A,B, and C from the following particulars.

	Rs.
Sales salaries	20,000
Sales Commission	12,000
Sales office expenses	4,000
Advertising - general	5,000
Advertising - specific	11,000
Packing expenses	1,500
Delivery van expenses	2,400
Ware house expenses	1,800
Credit collection expenses	3,000
	60,700

Additional Information :

	Total	Size A	Size B	Size C
1. Number of salesman (all paid same salary)	10	4	5	1
2. Units sold	2,000	1,000	500	500
3. Number of orders	1,000	400	200	400
4. Percentage of specific advertising	100%	40%	30%	30%
5. Sales turnover	Rs. 2,00,000	1,20,000	40,000	40,000
6. Volume in cubic ft. per unit of finished product	-----	15	10	5

Solution : Statement showing apportionment of selling and Distribution overheads.

Item	Basis of Apportionment	Total Amount	A Rs.	B Rs.	C Rs.
Sales salaries	Number of salesman (4:5:1)	20,000	8,000	10,000	2,000
Sales commission	Sales turnover (3:1:1)	12,000	7,200	2,400	2,400
Sales office Expenses	No.of orders (4:2:4)	4,000	1,600	800	1,600
Advertisement General	Sales turnover (3:1:1)	5,000	3,000	1,000	1,000
Advertisement specific	Direct allocation (40%, 30%, 30%)	11,000	4,400	3,300	3,300
Packing expenses	Volume in cubic ft. of products sold (3:2:1)	1,500	750	500	250
Delivery expenses	--- do ---	2,400	1,200	800	400

Ware house expenses	-- do --	1,800	900	600	400
Credit collection expenses	No. of orders (2:1:2)	3,000	1,200	600	1,200
	Total	60,700	28,250	20,000	12,450
	Units sold		1,000	500	500
Cost per unit (Total divided by units sold)			28.25	40	24.90

4.22 Key words :

Overheads : Overheads refer to all indirect costs including indirect materials, indirect labour and indirect expenses.

Allocation : Allotment of whole amount of overhead cost to a particular cost centre.

Apportionment : Distribution of common costs to various cost centres on some equitable bases.

Common costs : Overheads incurred jointly for various cost centres.

Departmentalisation (Primary Distribution) : Allocation and apportionment of overheads to production and service departments.

Overheads Distribution Summary : A statement showing allocation and apportionment of various items of overheads.

Re-apportionment (Secondary Distribution) : Apportionment of service department's cost to production department.

Absorption : The process of charging the overheads of cost centres to cost units.

Comprehensive Machine Hour rate : Overhead and direct wages absorbed by the cost units in one single rate.

Labour Hour Rate : The overhead rate for one labour hour worked.

Machine Hour Rate : The overhead rate for one hour of machine worked.

Over-Absorption : Excess of absorbed amount of overheads over the actual amount of overheads incurred.

Setting up time : Time spent by labour on making necessary adjustments in machine before work is commenced on the next job.

Under - Absorption : Excess of actual amount of overheads incurred over the absorbed amount of overheads.

Apportionment of profit : Utilisation or distribution of profit.

Defective work : Defective finished goods production in the factory which requires correction or have to be sold at a loss.

Development cost : Cost incurred in implementing the decision to produce new / improved product.

Idle Capacity : Unused production potential of the plant.

Research cost : Cost incurred for experimentation on new / improved product, idea or method.

Royalties : Rent / fees paid for the use of a patent or copyright.

Spoilage : Rejected units of output having little or no value.

4.23 Self - Assessment Questions :

Exercises :

1. Describe steps required in accounting overheads.
2. What do you understand by the terms : (a) Production department
(b) Service department ? using your own figure, illustrate how the expenses of service department are reapportioned over the production departments. Consider at least 3 service departments and 4 production departments, and name them specifically.
3. Define cost allocation and cost apportionment. Explain fully the distinction between cost allocation and cost apportionment.
4. Explain the various bases of apportionment of overheads to departments with illustrations as to the items of expenses.
5. Explain the different methods of apportionment of service department costs over production departments ?
6. What do you understand by absorption of overheads ? Describe the various methods of absorption of factory overheads. Which of these methods do you consider most scientific and why ?
7. What do you mean by a Machine Hour Rate ? How is it calculated ? Give the circumstances under which it may suitably be used in cost accounting.
8. (a) Explain the concept of under - absorption and over-absorption of factory overheads.
(b) Describe 'Direct Material Cost' and 'Direct Labour Cost' methods of absorption of factory overheads. Which one of these do you consider better and why ?

Problems :

1. Kumar Ltd, has three production departments x1, x2, x3 and two service departments Y 1, Y2. The following figures are extracted from the records of the company :

	Rs.
Rent and Rates	5,000
Indirect wages	1,500
Depreciation of Machinery	10,000
General Lighting	600
Power	1,500
Sundries	10,500

Following further details are available :

	Total	x1	x2	x3	y1	y2
Floor space	10,000	2,000	2,500	3,000	2,000	500
Light points	60	10	15	20	10	5
Direct Wages (Rs.)	10,000	3,000	2,000	3,000	1,500	500
H.P. of machines	150	60	30	50	10	----
Value of machinery	2,50,000	60,000	80,000	1,00,000	5,000	5,000

Apportion the costs to various departments on the most equitable basis by preparing a primary departmental distribution summary.

2. The following particulars relate to a manufacturing company which has three production departments a1,a2,a3 and two service departments b1,b2.

	Departments				
Total departmental overheads	a1	a2	a3	b1	b2
Per primary distribution Rs.	6,300	7,400	2,800	4,500	2,000

The company decided to charge the service department cost on the basis of following percentages.

Service departments	Production depts.			Service depts	
	a1	a2	a3	b1	b2
b1	40%	30%	20%	---	10%
b2	30%	30%	20%	20%	--

3. In a factory there are two service departments b1 and b2 and three production departments a1, a2, a3. In April 2002, the departmental expenses were :

Departments	a1	a2	a3	b1	b2
Rs.	6,50,000	6,00,000	5,00,000	1,20,000	1,00,000

The service department expenses are allocated on a percentage basis as follows :

Service Depts	Production depts.			Service depts.	
	a1	a2	a3	b1	b2
b1	30	40	15	---	15
b2	40	30	25	5	---

Prepare a statement showing the distribution of the two service departments expenses to the three departments by (a) Simultaneous Equation method, (b) Repeated Distribution Method.

4. Godreg Ltd. has three production departments a1,a2,a3, and two service departments b1,b2.

The following particulars are available for the month of March, 2002 concerning the organization; Rent 15,000 ; Municipal Taxes 5,000 Electricity 2,400, In direct wages 6,000 ; Power 6,000 ; Depreciation on Machinery 40,000 ; Canteen Expenses 30,000 other labour related costs 10,000

Following further details are also available :

F	Total	a1	a2	a3	b1	b2
Floor space	5,000	1,000	1,250	1,500	1,000	250
Light point	240	40	60	80	40	20
Direct wages	40,000	12,000	8,000	12,000	6,000	2,000
House power of machines (no)	150	60	30	50	10	---
Cost of Machines	2,00,000	48,000	64,000	80,000	4,000	4,000
Working hours		2,335	1,510	1,525	---	---

The expenses of service departments are to be allocated in the following manner.

	a1	a2	a3	b1	b2
b1	20%	30%	40%	---	10%
b2	40%	20%	30%	10%	---

You are requested to calculate the overhead absorption rate per hour in respect of the three production departments.

5. Calculate Machine Hour Rate from the following :

- i) Cost of Machine Rs. 19,200.
- ii) Estimated scrap value Rs. 1,200.
- iii) Average Repair and maintenance charges per month Rs. 150.
- iv) Standing charges allocated to machine per month Rs. 50.
- v) Effective working life of machine 10,000 hours.
- vi) Running time per month 166 hours.
- vii) Power used by machine : 5 units per hour @ 19 paise per unit.

6. Calculated Machine Hour Rate of A Machine :

Consumable stores	600	For A Machine
Consumable stores	1,000	For B Machine
Repairs	800	For A Machine
Repairs	1,200	For B Machine
Heat and light	360	
Rent	1,200	
Insurance Building	4,800	
Room service	60	
General Charges	90	
Insurance of Machines	800	
Depreciation of Machines	700	

7. Compute the Machine Hour Rate from the following data :

Cost of Machine	1,00,000	
Installation charges	10,000	
Estimated scrap value after expiry of its life (15 yrs)	5,000	
Rent and Rates for the shop	200	(per month)
General lighting for the shop	300	(Per month)
Insurance premium for the machine	960	(per annum)
Repairs and maintenance expenses	1,000	(per annum)
Power consumption - 10 units per hour - Rate of power per 100 units	20	
Estimated working hours per annum -	2,200	
This include setting up time of 200 hours		
Shops supervisor's salary per month	600	

The machine occupies 1/4th of the total area of the shop. The supervisor is expected to devote 1/5 th of his time for supervising the machine.

8. Work out, in the appropriate form, the comprehensive machine - hour rate of a Saw Mill with reference to the following items as information extracted from the account books of wood working shop :

- i) purchase price of the Saw Mill 40,000
- ii) Railways frieght, other incidental charges and installation charges incurred for the equipment 10,000
- iii) Life of the Saw Mill is 10 yrs @ 2,000 working hours per year.
- iv) Repair charges - 40 percent of depreciation.
- v) Consumption of electric power - 20 units per hour @ 10 per unit.
- vi) Lubricating oil @ Rs. 2 per day of 8 hours.

vii) Consumable stores @ Rs. 10 per day of 8 hours.

viii) Wages of machine operator @ Rs. 4 per day of 8 hours.

Note : The residual scrap value of the Saw Mill is nil.

9. In a manufacturing unit, overhead was recovered at a pre-determined rate of Rs. 25 per man-day. The total factory overhead expenses incurred and the man - days actually worked were Rs. 41.50 lacks man-days respectively, out of the 40,000 units produced during a period, 30,000 were sold.

On analysing the reasons, it was found that 60% of the unabsorbed overheads were due to defective planning and the rest were attributable to increase in overheads costs.

How would unabsorbed overheads be treated in Cost Accounts ?

10. A company is having three production departments a, b and c and two service departments boiler - house and pump - room. The boiler - house has to depend upon the pump - room for supply of water and pump - room in its turn is dependent on the boiler - house for supply of steam power for driving the pump. The expenses incurred by the production departments are : X-Rs. 6,00,000; Y-Rs. 5,25,000 ; Z - Rs. 3,75,000. The expenses of the boiler - house and pump - room are apportioned to the production departments on following basis :

	Departments			Boilerhouse	Pumproom
	a	b	c		
Expenses of boiler - hourse	20%	40%	30%	---	10%
Expenses of pump-room	40%	20%	20%	20%	---

Show clearly as to how the expenses of boiler - house and pumproom Would be apportioned to a, b and c departments by following :

i) Simultaneous Equation Method and ii) Repeated Distribution Method.

11. A company has 3 production departments a1,a2,a3 and two service departments b1 and b2. The following data are extracted from the records of the company for a particular given period :

A) i) Rent and rates	25,000
ii) General lighting	3,000
iii) Indirect wages	7,500
iv) Power	7,500
v) Depreciation on machinery	50,000
vi) Sundries	50,000

B) Additional data department - wise :

	Total			Departments		
		a1	a2	a3	b1	b2
Direct Wages (Rs.)	50,000	15,000	10,000	15,000	7,500	2,500
Horsepower of machine used	150	60	30	50	10	---
Cost of machinery	12,50,000	3,00,000	4,00,000	5,00,000	25,000	25,000
Production hours worked	----	6,226	4028	4066	---	---
Floorspace used (Sq.ft)	10,000	2,000	2,500	3,000	2,000	500
Lighting points (nos)	60	10	15	20	10	5

C) Service department's expenses allocation :

	a1	a2	a3	b1	b2
b1	20%	30%	40%	--	10%
b2	40%	20%	30%	10%	---

You are require to :

a) compute the overhead rate of production departments using the repeated distribution method;

b) hence, determine the total cost of product whose direct material cost and direct labour cost are respectively Rs. 250 and Rs. 150 and which would consume 4 hours, 5 hours and 3 hours in departments a1, a2, a3 respectively.

12. Following figures have been extracted from the accounts of a Omega Manufacturing concern for the month of December 2003

Indirect Materials :

		Rs.
Production Departments	X	1,000
	Y	1,800
	Z	500
Maintenance Dept.	P	3,000
Stores Dept.	Q	800

Indirect wages :

Production Dept.	X	1,400
	Y	1,900
	Z	400
Maintenance Dept	P	2,000
Stores Dept	Q	1,300
Power and Light		12,000
Rent		5,600
Insurance on assets		2,000
Meal Charges		6,000

Depreciation @ 6% on capital value of assets. From the following additional information calculate, the share of overheads of each department.

Item	Production			Service	
	X	Y	Z	P	Q
Area (sq.ft.)	4,000	4,000	3,000	2,000	1,000
Capital value of asset (Rs.)	2,00,000	2,40,000	1,60,000	1,20,000	80,000
K.W. hours	4,000	4,400	1,600	1,500	500
No. of employees	180	240	60	80	40

Ans : X : Rs. 11,300 ; Y : Rs. 13,900 ; Z : Rs. 5,500 ; P : Rs. 9,000 ; Q : Rs. 4,000

13. Motorola Co. Ltd, has three production departments A,B, and c and two service Departments D and E. The following figures are extracted from the records of the company :

	Rs.
Rent and rates	10,000
Indirect wages	3,000
Depreciation	20,000

Lighting	1,200
Power	3,000
Sundries	20,000

The following further details are available

	Total	A	B	C	D	E
Floor Space (Sq.ft)	20,000	4,000	5,000	6,000	4,000	1,000
Light points	120	20	30	40	20	10
Direct wages (Rs.)	20,000	6,000	4,000	6,000	3,000	1,000
H.P. of machines	300	120	60	100	20	---
Value of machines (Rs.)	5,00,000	1,20,000	1,60,000	2,00,000	10,000	10,000

Apportion the costs to various departments on the most equitable basis :

(Ans : A : Rs. 15,000 ; B : Rs. 14,400 ; C: Rs. 19,300 ; D : Rs. 9,250 ; E : Rs. 3,150)

14. A factory has two production departments A and B and two service departments. Purchasing Department C and time keeping department D.

	A	B	C	D
Wages (Rs.)	16,000	12,000	6,000	6,000
Area sq.meter	1,500	1,100	900	500
Number of employees	80	60	40	20
Value of plant and Machinery (Rs.)	32,000	24,000	16,000	8,000
Value of direct materials purchased (Rs.)	10,000	20,000	----	----
Lighting units	5,000	3,000	1,500	500

The following costs have been incurred :

	Rs.		Rs.
Supervision	6,000	Rent	1,600
Repairs to plant and machinery	2,400	Depreciation to plant and Machinery	4,000
Light	2,000	Power	2,000
Employers contribution to ESI	400	Canteen expenses	200

From the above information apportion the service departments costs to production departments, ignoring inter - service department transfer.

(Ans : A : Rs. 15,220 ; B : Rs. 15,280)

15. Calculate the overheads applicable to production departments A&B. There are also two Service Departments X & Y. X renders service worth Rs. 24,000 to Y and the balance to A&B as 3:2. Y renders service to A and B as 9:1

	A	B	X	Y
Floor space (sq.ft)	10,000	8,000	2,000	4,000
Assets (Rs. in lakhs)	20	10	6	2
H.P. of machines	2,000	1,000	800	200
Number of workers	200	100	100	50
Light points	100	60	40	40

Expenses are :

	Rs.
Depreciation	3,80,000
Rent, Rates etc.	72,000
Insurance	30,400
Power	40,000
Canteen expenses	20,000
Electricity	9,600

(Ans : A : Rs. 3,73,560, B : R. 1,79,940)

16. The Royal Engineering Industries produced products P and Q during January 2003. Direct Department Expenses of the 3 service sections and 2 production sections through which the products pass and other relevant information are furnished.

Section / Departments	Expenses Rs.	Number of Workers	Labour Hour	Labour Cost Rs.	Installed Capacity
Service Section X (Personal and amenities)	30,000	12	---	---	---
Service section Y (Electrical)	40,000	10	---	---	---
Service section Z (Mill weight)	10,000	10	600	---	---
Production Section A	70,000	50	6,000	26,000	40 H.P.
Production Section B	80,000	50	12,000	36,000	60 H.P.

Expenses under Service Section Y represent Departmental Expenses directly apportioned on electrical power used on installed capacity of electric motors in Departments A and B.

Of the 600 effective hours of Mill weight section Z, 240 hours relate to section A and 360 to section B. Show the apportionment of Service Sections to production sections.

(Ans : A : Rs. 1,04,500 ; B : Rs. 1,25,500)

17. The following is the budget of German Engineering Works for the year 2003.

Factory Overheads	:	Rs. 62,000
Direct Labour cost	:	Rs. 1,24,000
Direct Labour hours	:	1,55,000
Machine Hours	:	10,000

From these figures ascertain the overhead application rates, using the following methods (a) Direct Labour Hour, (b) Direct Labour Cost and (c) Machine Hour Rate.

Prepare a comparative statement of cost showing the result of applications of each of the above rate of job order Number 555 from the undermentioned data :

Direct Materials Rs. 90; Direct wages Rs. 25; Direct Labour 20 hours; Machine hours = 30.

(Ans : Direct Labour hour rate = Rs. 0.40)

Direct Labour Cost method = 50%

Machine hour rate = Rs. 6.20

Cost of Job No. 555 under LHR = Rs. 123

Under labour cost method = Rs. 127.50; and under MHR = Rs. 301)

18. Calculate the machine hour rate to recover the overhead expenses given below :

	Per hour	Per annum
Electric Power	75 ps	
Steam	10 ps	
Water	2 ps	
Repairs		Rs. 530
Rent		Rs. 270
Running hours		Rs. 2,000
Original cost	Rs. 12,500	
Book value	Rs. 2,870	
Replacement value	Rs. 11,500	
Depreciation	7 1/2% p.a.	

(Ans : Rs. 1.74)

4.24. Futher Readings :

1. Prasad, N.K. Principles and Practice of Cost Accounting
2. Mittal and Mittal, Cost Accounting.

Lesson - 5**PRODUCT COSTING METHODS - JOB ORDER COSTING**

Objectives : of this unit are to explain and familiarise with you :

- K Meaning, features and objectives of Job order costing
- K Various prerequisites for adopting, a job order costing system.
- K The procedure of Job order costing
- K The meaning and features of Batch costing

Structure :

- 5.1 Introduction**
- 5.2 Features of job order costing**
- 5.3 Objectives of job order costing**
- 5.4 Prerequisites for job order costing**
- 5.5 Advantages and limitations of job order costing**
- 5.6 Procedure of job order costing**
- 5.7 Batch costing**
- 5.8 Summary**
- 5.9 Key words**
- 5.10 Self-Assessment Questions / Exercises**
- 5.11 Further Readings.**

5.1 Introduction

A method of costing refers to fundamental procedural steps to be followed for measurement and estimation of cost based on nature of production. Basically there are two methods of product costing: i) Specific order costing and ii) Operation costing

According to Chartered Institute of Management Accountants, London, "Specific order costing is the basic costing method applicable where the work consists of separate contracts, Jobs or batches." Thus, Specific order costing includes job costing, batch costing and contract costing methods.

On the other hand, Operation Costing is the basic costing method which is applicable where standardised goods or services result from a sequence of repetitive and more or less continuous operations or processes to which costs are charged before being averaged over units produced during the period. This category includes process costing, unit or output costing and single costing

5.2 Features of Job order costing :

Under Job Costing or Job Order Costing, costs are collected and accumulated for each job, work order or project separately. Each job can be identified separately and hence it becomes essential to analyse the costs according to each job. It differs from contract costing in that each job is of comparatively of shorter duration and involves lesser cost. In other words, job is a small contract and contract is a big job. This method is applicable to printing, engineering works, foundries, machine tool manufacturers, made to order, garments etc.

The following are the main features of job order costing :

1. The firm undertakes production generally against customer's order and not for stock.
2. Each job is separately identifiable and has its own characteristics and hence it needs special treatment.
3. The time duration required for completing jobs and costs involved differ from job to job.
4. Flow of production from process to process and department to department is not uniform. It differs from job to job.
5. Each job is treated as a cost unit.
6. Each job is assigned a specific job order number and distinctiveness of each job is maintained throughout the production stage.
7. Cost ascertainment for each job is done after its completion.
8. It required, estimated job cost sheet can be prepared for submitting tenders for the jobs.
9. The work-in-progress differs from time to time depending on the size and number of jobs in hand.

5.3 Objectives of Job Order Costing :

The main objectives of Job Order Costing are as follows :

- i) It helps in ascertaining cost of production of each job and profit or loss made in its execution, so that it helps the management to judge the profitability of each job.
- ii) It facilitates the estimation of cost of similar jobs to be undertaken in future on the basis of past records.
- iii) It helps the management to control the operational efficiency of jobs by comparing actual costs with estimated costs.
- iv) It helps the management in the valuation of work-in-progress on different jobs.

5.4 Pre-Requisites for Job Order Costing

Before adopting a system of Job Order Costing two factors should be considered.

- (a) Each job should be continuously identifiable from the stage of raw materials to completion stage.
- (b) As it is very expensive and requires a lot of clerical work in designing and scheduling of production and cost estimation, this system should be adopted only when it is absolutely necessary.

Moreover, the following factors are necessary for making it an effective and workable system.

- i) A sound system of production control should exist.
- ii) Accounting system should provide cost details for each job separately.
- iii) All required documents giving cost details for each should be maintained, such as, work order, bill of materials, material requisitions, tool requisitions etc.
- iv) An efficient system of time booking and piece work recording should be maintained.
- v) There should exist a suitable system of material issues and material pricing.
- vi) Appropriate overhead absorption rates for different types of jobs should be followed.
- vii) Cost centres should be clearly defined.

5.5 Advantages and Limitations of Job Order Costing :

Job Order Costing System has the following advantages :

1. It provides a detailed analysis of cost of materials, labour cost and overheads for different jobs and departments.
2. It helps in determining the operational efficiency of different factors of production and production centres.
3. It helps in the ascertainment of each job.
4. It facilitates cost control by comparing cost estimates and actual costs.
5. It helps in ascertaining causes of cost variations by comparing similar jobs completed at different times
6. It helps in the ascertainment of absolute and comparative profitability of different jobs,
7. It provides all the information required for preparing an estimated job cost sheet for the purpose of submitting tenders.

8. As predetermined overhead rates are to be applied for job costing, it necessitates an effective budgetary control of overheads with all its advantages.
9. Since spoilage and defectives for each job are separately ascertained, it enables the management to take necessary steps to control them.
10. It helps in ascertaining cost trends on the basis of job cost details of previous periods.
11. It is also useful in quoting cost plus contract.

Disadvantages / Limitations : In spite of its advantages, Job Order Costing has its own limitations. They are as follows.

1. It is an expensive system as it involves a lot of clerical work.
2. Since it involves a lot of clerical work, chances of errors are also high.
3. This system may not be effective, if a well developed production control system is not existing
4. It may not be possible to make an accurate asertainment of cost of jobs in the absence of an effective system of budgetary control of overheads.
5. Cost comparison among different jobs may not be effective, if drastic changes take place.
6. Job costing is basically a historical costing method where costs are ascertained only after their incurrence. Hence, it suffers from all the defects of historical costing.

5.6 Procedure of Job Order Costing System

A costing system should be designed in such a way that it would be able to provide the necessary information for achieving control of cost and performance of each job or special order. A job cost sheet is prepared for each job which provides the information regarding various cost components, Viz., materials, labour and overheads. Thus, a Job cost sheet shows the total cost incurred in respect of a particular job.

The procedure for a Job Order System and various steps and documents involved in the system are summarised as follows.

1. Receiving an Enquiry. The producer receives an enquiry from the customer regarding the price, quality to be maintained, the time of delivery of the job along with other details and specifications.
2. Estimation of the Price and Delivery of the Job : After receiving the enquiry, the cost accountant makes an estimate of the cost of the job keeping in mind the specifications of the customer. While preparing the estimate, the cost incurred in case of similar jobs in the past and the possible changes expected totake place in the future are taken into consideration. The estimate of the job is informed to the prospective customer.
3. Receiving the order. In case the customer is satisfied with the quotation price, delivery schedule and other terms of execution, he may place the order for the job.

4. Job Order Number : Once the order is accepted, a job number is assigned for distinguishing each job order from others. This number serves as a reference number for tracing the jobs as well as for their costing.
5. Production order : Production Control Department prepares a production order authorising all concerned departments to commence work on the job. It contains all the information regarding the job. A sufficient number of copies of production order are prepared and sent to the following
 - i) Production supervisors or Foremen of all concerned departments
 - ii) Store keeper for issuance of materials,
 - iii) Tool room as an advance intimation of tools required, and
 - iv) Cost control department for keeping a track of jobs to be costed and controlled.

The details to be furnished in production order, the number of copies to be prepared and the follow up procedure may differ from firm to firm and also from job to job depending on the job characteristics. A specimen of production order is given below.

ABC Ltd Production Order				
Sl. No.....		Quantity ordered.....		
Job Description		Date		
Job Order No.		Date of Commencement.....		
Customer's Name and Address		Date of Completion		
Operation No.	Bill of Materials No.	Clock Time	Machinery Required	Drawings and Patterns

Recording of costs. The costs are collected and recorded for each job executed under separate production order number. A separate job cost sheet or job cost card is prepared for each job. It gives full details about all the costs incurred on the job, i.e., direct materials, direct wages, and overheads applicable to the job. Selling price is arrived after adding profit margin as per the policy of the firm.

Ascertainment of various cost incurred on the job is as follows :

- (a) **Materials** : Cost of materials is obtained from material Requisitions, Bill of materials and Materials issue analysis sheet.
- (b) **Labour** : wages chargeable to the job is ascertained from operation schedule, job card and wage analysis sheet.
- (c) **Overheads** : Predetermined overhead absorption rates are used for charging overheads to the jobs. Standing Order Numbers or Cost Account Numbers are used for this purpose.

A specimen of job cost sheet is given below :

ABC Ltd.												
Job cost sheet												
Job No						Customer's Name..... and Address						
Job Description No.						Date of Commencement						
Quantity						Date of Completion						
Materials				Labour				Overheads				
Date	Department	Material Requisition No.	Amount Rs.	Date	Department	Time Ticket No.	Amount Rs.	Date	Department	Rate Rs.	Amount Rs.	
Total			Rs.	Rs				Rs,				
Summary												
				Estimated cost Rs.	Actual cost Rs.	Difference Rs.						
Materials												
Labour												
Overheads												
Total												

7. **Completion of Job** : After the job is completed, a completion report is sent to costing department. The total job cost is ascertained by adding the cost under each element. The actual cost is compared with the estimated cost so as to show the efficiency or inefficiency in operation.
8. **Profit or loss on job** : By deducting the actual total cost from the price, the profit or loss on the job is determined.

Illustration 5.1

The following information has been extracted from the cost records of a factory in respect of job no. 101 :

Direct Material Rs. 4,010

Wages :

Department	A	:	60 hours @ Rs.3 per hour
„	B	:	40 hours @ Rs. 2 per hour
„	C	:	20 hours Rs. 5 per hour

Variable overheads :

Department	A	:	Rs. 5,000 for 5,000 hours
„	B	:	Rs. 3,000 for 2,000 hours
„	C	:	Rs. 2,000 for 500 hours

Fixed expenses are estimated at Rs. 20,000 for 10,000 working hours. Prepare job cost sheet for job no. 101 and determine the price for the job to give a profit of 25% on the selling price.

Solution :

Cost Sheet for Job No. 101

	Rs.	Rs.
Direct Materials		4,010
Wages :		
Department A : 60 X Rs. 3 =	180	
„ B : 40 X Rs. 2 =	80	
„ C : 20 X Rs. 5 =	100	360
Prime Cost :		4,370
Overheads :		
Variable :		
Department A : 60 X Rs. 1 =	60	
(W.Note) „ B : 40 X Rs. 2 =	80	
„ C : 20 X Rs. 4 =	80	220
Fixed : 120 hours @ Rs.2 perhour		240
(W. Note : 2)		4,830
Profit (at 25% on selling price or $33\frac{1}{3}\%$ on cost)		1,610
Selling Price		6,440

Working Note - 1 :

Variable overhead Rates :

Department A :	Rs, 5,000 ÷ 5,000 hours =	Rs. 1 per hour
„ B :	Rs. 3,000 ÷ 1500 hours =	Rs. 2 per hour
„ C :	Rs. 2,000 ÷ 500 hours =	Rs. 4 per hour

Working Note 2 :

Fixed Overhead Rate : Rs. 20,000 ÷ 10,000 hours = Rs. 2 per hour

Work - in - progress : It represents costs of jobs not yet completed. A work-in-progress account is debited with all direct and indirect costs incurred in execution of jobs. Periodically, say monthly, the cost of completed jobs is credited to this account. The balance in this account represents cost of incomplete jobs. for this purpose two accounts may be prepared consolidated completed jobs account and consolidated work-in- progress account.

The consolidated completed jobs account is prepared by debiting the account with the total amount spent on materials, labour and overheads in respect of all completed jobs and crediting the same with the amount received from customers on account of completed jobs. The difference is the profit or loss on completed jobs.

Illustration 5.2

The following information for the year ended December 31, 2003 has been extracted from the books and records of a factory.

	Completed Jobs Rs.	Work-in-Progress Rs.
Raw Materials Supplied from stores	1,00,000	34,000
Wages	1,00,000	40,000
Materials transferred to work-in-progress	2,000	2,000
Materials returned to stores	1,000	-----

Factory overheads are 80 percent of wages and administration overheads are 25 percent of factory cost. The value of the executed jobs during 2003 was Rs. 4,10,000

Prepare (a) Consolidated Completed Jobs Account showing the profit made or loss incurred on the jobs, and (b) consolidated work-in-progress account.

Solution :

consolidated completed jobs account

	Rs.		Rs.
To Raw Materials consumed :			
Supplied from stores : 1,00,000		By customer's A/c	4,10,000
Less Transferred to VIP $\frac{2,000}{98,000}$			
Less Returned to stores 1,000	97,000		
To Wages	1,00,000		
To Factory overheads (80% of Wages)	80,000		
	2,77,000		
To Administration overheads (25% of Rs. 2,77,000)	69,250		
To Net Profit transferred to P&L	63,750		
	4,10,000		4,10,000

Consolidated Work-in-Progress A/c

To Raw Materials Consumed :		Balance C/d	1,35,000
Supplies from stores :	34,000		
Add Transferred From Completed jobs	<u>2,000</u>	36,000	
To Wages		40,000	
To Factory overheads (80% of wages)		32,000	
		<u>1,08,000</u>	
To Administration overheads (25% of Factory cost)		27,000	
		<u>1,35,000</u>	<u>1,35,000</u>

Illustration 5.3

You are required to submit a quotation for a job which requires direct material cost of Rs. 20,000, Direct labour Rs. 25,000 and Direct factory expenses Rs. 5,000

The job passes through three machines : Machine x for 10 hours, Machine y for 20 hours and machine Z for 5 hours. The machine hour rate for the three machines is Rs 50, Rs. 60 and Rs. 100 respectively. Office overheads are 20% of prime cost, selling overheads are 10% of cost of production. The producer intends to earn a profit of 20% on the quotation price. Prepare Job cost Sheet.

Job Cost Sheet

		Amount Rs.
Direct Materials		20,000
Direct labour		25,000
Direct Factory Expenses		5,000
	Prime Cost	<u>50,000</u>
Factory overheads :		
Machine X :	10 Hrs X Rs 50 = 500	
Machine Y :	20 Hrs X Rs 60 = 1,200	

Machine Z :	5 Hrs X Rs. 100 = 500	2,200
Works Cost :		52,200
Office Overheads :		
@ 20% of prime cost :	$50,000 \times \frac{20}{100} =$	10,000
Cost of Production :		62,200
Selling Overheads :		
@ 10% of cost of Production :	$62,200 \times \frac{10}{100} =$	6,220
Cost of Sales :		68,420
Profit (at 20% on quotation : Price or 25% on cost of sales)	$68,420 \times \frac{25}{100}$	17,105
Quotation Price		85,525

5.7 Batch Costing

Batch Costing is one of the methods of specific order costing. While job costing refers to costing of jobs that are executed against specific orders from customers, in batch costing production is carried on generally for stock.

According to CIMA Terminology, London, "Batch costing is that form of specific order costing which applies where similar articles are manufactured in batches either for sale or use within the undertaking".

Batch Costing is similar to job costing in that each batch is treated as a cost unit and is costed separately, while each job is treated as a separate cost unit under job costing. However, each batch consists of a number of identical units of a product so that the total batch cost divided by total number of units in a batch gives cost per unit. Batch costing method is generally followed in case of pharmaceutical production, components of automobiles, shoes, garments, engineering products etc.

To find out the cost per unit under batch costing, a batch cost sheet is prepared in the same lines a job cost sheet is prepared. Each batch is a separate cost unit and a batch number is given to each batch. All material cost, labour, and other expenses which can be identified with the batch are entered in the batch cost sheet.

5.7.1. Features of Batch Costing :

The Main features of batch costing are given below :

1. Each batch is separately treated as a cost unit and is costed separately.
2. All the units produced in a batch are identical
3. Each batch involves a setting up cost which remains the same irrespective of the size of the batch.
4. The setting up cost per unit becomes lower, with every increase in the size of the batch.
5. Batch production is generally made for stock.
6. This method is used where small component parts are produced significantly in large number.
7. Larger the size of a batch, longer is the time interval between batches.
8. Cost per unit is derived by dividing the total batch cost with the total number of units in the batch.

5.7.2 Economic Batch quantity : Determination of the optimum size of a batch is an important problem in batch costing. The size of a batch of goods to be produced should not be too large or too small. It should be optimum. Every time a batch of production is undertaken, it involves two types of costs : 1) setting up costs and 2) Inventory carrying cost. The optimum size of a batch or Economic Batch Quantity (EBQ) is that quantity of a product to be produced in a single production run where the total cost (total production cost and setting up costs plus carrying costs) is the lowest. In other words at EBQ, total setting up costs, are equal to inventory carrying cost.

1. Setting up costs. These are the costs required to prepare for starting a new production run. These include setting the machines and tools ready for production, cleaning the machinery, wastage of materials due to a change in machine feeding, cost of lost time in changing from one batch to another etc. Setting up costs remain constant irrespective of the size of a batch. Hence, setting up cost per unit will become less and less with every increase in the size of the batch.

2. Carrying cost : Cost of capital blocked in inventories and storage costs such as rent for godown space, insurance, pilferage, obsolescence etc. Larger the batch size, larger will be the average inventory held and therefore larger will be the total carrying cost for the year, and vice versa.

Computation of EBQ :

The EBQ can be computed with the help of the following formula :

$$EBQ = \sqrt{\frac{2DS}{I}}$$

Where,

D = Annual Demand or requirement of product in units

S = Setting up costs per batch.

I = Inventory carrying cost per unit per annum.

Illustration 5.4

M/s. Andhra Bearings Ltd. is committed to supply 24,000 bearings per annum on a steady daily basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set up cost per run of bearing manufacturing is Rs. 324

Determine i) the optimum batch quantity for manufacturing bearings, ii) the number of batches required per annum and iii) the time interval between two consecutive production runs.

Solution :

$$i) \text{ Economic Batch Quantity} = \sqrt{\frac{2DS}{I}}$$

Where, D = Annual demand for bearings

S = Setting up cost per run of production

I = Inventory carrying cost per unit.

$$\begin{aligned} \text{EBQ} &= \sqrt{\frac{2 \times 24,000 \times \text{Rs. } 324}{.10 \times 12}} \\ &= \sqrt{\frac{15552000}{1.2}} = 3,600 \text{ Units} \end{aligned}$$

$$ii) \text{ Total no. of batches required per annum} = \frac{\text{Annual Demand for bearings}}{\text{EBQ}}$$

$$= \frac{24,000}{3,600}$$

$$= 6.67 \text{ or } 7 \text{ batches.}$$

$$\begin{aligned} iii) \text{ The time interval between two consecutive production runs} &= \frac{365 \text{ Lays}}{7} \\ &= 52.14 \text{ i.e. } 52 \text{ days} \end{aligned}$$

Illustration 5.5

Compute the economic batch quantity for a company using batch costing with the following information :

Annual demand for the component = 12,000 units

set-up cost per batch = Rs 240

Carrying cost per unit of production = 36 paise

Solution :

$$\text{Economic Batch Quantity} = \sqrt{\frac{2DS}{I}}$$

Where, D = Annual demand for the component

S = Setting-up cost per batch

I = Inventory carrying cost per unit of production per annum.

$$\begin{aligned} \therefore \text{EBQ} &= \sqrt{\frac{2 \times 12,000 \times 240}{.36}} \\ &= 4,000 \text{ units} \end{aligned}$$

5.8 Summary

A method of costing of costing refers to the fundamental procedural steps followed for measurement and estimation of cost based on nature of production, There are basically two methods of costing, Specific order costing and operation costing. Job order costing, batch costing and contract costing are the methods covered by specific order costing.

Under job costing, costs are collected and accumulated for each job, work order or project separately. Each job is assigned a specific job order number and is treated as a cost unit. This method helps in ascertaining cost of production of each job and profit or loss made in its execution, so that it helps the management to judge the profitability of each job. Job order costing method has several advantages. However, it has its own limitations. As it involves a lot of clerical work, it is very expensive and chances of errors are also high.

A job cost sheet is prepared for each job shows various cost elements relating to a Job. It shows the total cost incurred in respect of a particular job.

Batch costing is one of the methods of specific order costing which applies where similar articles are manufactured in batches either for sale or use within the firm. Batch costing is similar to job costing in that each batch is treated as a cost unit and is costed separately. A batch cost sheet is prepared for this purpose. One important problem in batch costing is determination of economic batch quantity i.e., optimum size of a batch. The EBQ is that quantity where the total setting up costs are equal to inventory carrying cost.

5.9 Key words :

Specific order costing : The basic costing method applicable where the work consists of separate contracts, jobs or batches.

Job order costing : A method of costing where costs are ascertained for each job or work order or project.

Production order : An order prepared by production control department authorising all concerned departments to commence work on the job

Job Cost Sheet or Job Cost Card : It is a statement of cost prepared for each job showing various costs incurred on the job.

Economic Batch Quantity : It refers to the optimum size of a batch where the total cost of setting up and inventory carrying is the lowest.

Setting up cost : It refers to the costs required to be incurred for preparing the plant & machinery for a new production run.

Inventory carrying cost : The cost incurred to maintain the inventory after the goods are produced.

5.10 Self-Examining Questions / Illustrations

1. What is Job order costing ? Explain its main features and objectives
2. What are the advantages and limitations of job order costing ?
3. What is job costing ? Explain the procedure of job order cost system
4. What is job costing ? Give a proforma of Job cost sheet
5. What is meant by batch costing ? Explain its main features.
6. What is meant of Economic Batch quantity ? How is it calculated ?
7. Following is the information extracted from the job ledger, in respect of job No. 505, Materials Rs. 3,400 Wages :

Dept A : 80 Hours at Rs. 2.50 per hour

B : 60 Hours at Rs. 4 per hour

Variable Overheads :

Dept A : Rs. 5,000 for 4,000 direct labour hours

B : Rs. 6,000 for 3,000 direct labour hours

Fixed Overhead :

Rs. 7,500 for 10,000 hours of normal working time of the factory. Calculate the cost job no. 505 and determine the percentage of profit if the price quoted is Rs. 4,750

Ans : (cost Rs. 4,165 percentage of profit on the sale price 12:32)

8. A factory uses job costing : The following cost data is obtained from its books for the year ended 31st December, 2001 Direct Materials Rs. 90,000 ; Direct wages Rs. 75,000 Profit Rs. 60,900 Administrative overheads Rs. 42,000 ; Selling and Distribution overheads Rs. 52,500 and factory overheads Rs. 45,000

(a) Prepare a Job cost sheet indicating prime cost, works cost, production cost, cost of sales and sales value for the year ended 31st december 2001

(b) In 2002, the factory receives an for a few jobs. It is estimated that direct materials required will be Rs. 1,20,000 and direct labour will cost Rs. 75,000. What should be the price these jobs, if the factory intends to earn the same rate of profit on sales. The factory recovers factory overheads as a percentage of direct wages and administrative and selling and distribution overheads as a percentage of works cost, based on cost rates prevailing in the previous years.

Ans [(a) Prime cost Rs. 1,65,000 ; Works cost Rs. ,2,10,000 Production cost Rs. 2,52,000 ; Cost of sales Rs. 3,04,500 ; and Sales value Rs. 3,65,400 ; (b) Price Rs. 4,17,600)

9. A firm is producing a component of a passenger car in batches. Annual demand of the component is 72,000 units. The cost of setting of machinery, tools etc., for each new batch is rs. 450. The cost of each part is Rs 30. The producer has to borrow at 10% per annum for financing stocks. Other carrying costs are Rs. 2 per part per annum. Calculate Economic Batch Quantity and the time interval between batches assuming 300 working days in a year.

Ans (EBQ : 3600 units ; Time interval : 15 days)

5.11 Future Readings

1. C.T. Horngren - Cost Accounting a managerial Emplosis
2. S.P. Jain & K.L. Naraing - Cost and Management Accounting
3. Khanna,Pandey - Problems on costing

Lesson - 6**CONTRACT COSTING****Objectives :**

The objectives of this unit are :

- K to explain the features of contract costing
- K to familiarise you with the procedures of contract costing

Structure :

- 6.1 Introduction**
- 6.2 Significant features**
- 6.3 Job costing vs Contract costing**
- 6.4 Various Accounts**
- 6.5 Costs Debited**
- 6.6 Costs Credited**
- 6.7 Work Certified and uncertified and extract of Balance sheet**
- 6.8 Profit on incomplete contracts**
- 6.9 Retention Money**
- 6.10 Completion of contracts**
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6.1 Introduction

Contract costing is a form of Job Costing. Contract costs represent costs of various operations which include the process of erecting or otherwise providing structures such as buildings, dams, roadways, etc. Contract costing is also known as terminal costing. The chief features of contract costing are :

1. Work is generally carried out at a site other than the contractor's own premises.
2. Many contracts require several years for completion. In other words, they cover in many cases, more than one accounting period.
3. Most of the items of costs are directly chargeable to individual contracts. It, therefore obviates the possibility of under or over absorption of many items of cost. Of course, general overhead expenses are to be apportioned to or absorbed by individual contracts on a suitable basis. But as these general overhead expenses form only a small part of total cost of contracts, the incidence of under or over absorption of general overhead expenses is very negligible.
4. More often than not, each contract is dissimilar to the other. That is, output from one job is quite different from the output from one another job.

6.2 Significant features

The work to be executed depends upon customer's specification and is generally done at site. Each contract is treated as cost unit and is generally of long duration for completion. Most of the expenses are direct in nature and payment is received depending on the stage of completion of work. The following are the main features of contract accounts :

1. **Higher proportion of direct costs** : As most of the items of expenses can be directly identified with a contract, though indirect, are treated as direct expenses. Expenses on telephone installed at site, site power usage, site vehicles, transportation are treated as direct expenses.
2. **Low indirect cost** : The only item of indirect cost may be head office expenses. Such cost represents only a small proportion of the contract cost and is absorbed usually on some overall basis such as percentage of total contract cost.
3. **Difficulties of cost control** : The large scale of contracts and the size of the site may create some major problems of cost control consuming material usage and loss of plant and tools etc.
4. **Surplus materials** : Surplus material, if any, will be either credited to the contract account with the cost of material at the end of the contract or will be debited to the new contract account, if directly transferred to another contract. If the material is not required immediately, it will be stored and the cost debited to a stock account.

6.3 Job costing vs contract costing :

There is certain similarities in job and contract costing. Both the methods belong to the category of specific order costing in which work is executed according to the specifications of customers. Under both the methods customers come on their own and there is no need of creating demand.

Generally quotation price is asked before giving order and production starts only on receipt of order from customer. As every job and contract is dissimilar in nature and is identified by a separate number and is known by that number until it is completed. Profit is also determined in respect of each job and contract separately.

In spite of the above similarities there are certain differences between job and contract costing. These are given as under :

- 1) A job is small in size but the contract is big in size.
- 2) Work under job costing is performed in the workshop of the proprietor but the contract is executed mostly at site.
- 3) A job usually takes less time for completion of work where as a contract takes more time to complete the work.
- 4) The selling price of a job is paid in full after completing the job but in case of a contract, the price is paid in various instalments depending upon the progress of the work.
- 5) There is heavy investment on assets initially in case of job costing as compared to contract costing.
- 6) In job costing, expenses may be direct and indirect but in case of contract costing, most of the expenses are direct in nature.
- 7) Profit earned on a job is entirely taken to profit and loss account but in case of incomplete contract, only proportionate profit is transferred to profit and loss account depending on the completion stage of the contract.

6.4 Various Accounts :

In the contract Account, four accounts are generally prepared :

1. Contract Account
2. Contractee's Account
3. Work-in-progress Account
4. Balance Sheet.

dr	Specimen of Contract Account	cr
Direct Materials		Materials returned
Direct Labour		Material Transferred
Direct Expenses		Materials at the end
Indirect expenses (overheads)		Price of plant

Plant and Tools	Less Depreciation
Sub contract cost	Return of plant and machine
Extra work done	Loss due to damage of
Provision for contingencies	materials or plants
Opening work in progress	Loss by the sale of materials
	work certified
	work done but not yet certified
	Contract price

6.5 Costs debited

1. Direct materials : Materials may be obtained for the contract from four sources :

- i) From the store : Materials received from the store are debited to the contract account directly
- ii) From the market : When the materials are purchased from outside for the use of a contract, the total cost is directly debited to the related contract.
- iii) From other contracts (by transfer) : Where materials obtained from other contracts through the Material Transfer note, the total cost is debited to the contract.
- iv) From the contractee (from own stock) : Sometimes, the customer (contractee) himself supplies certain materials for the contract. Such materials are not debited to the contract account but shown in the separate memorandum record outside the accounts.

2. Direct Labour : The contract is carried out at the site of the construction, i.e., away from the contractors premises. The wages to the labourers working at the site of the contract are treated as direct wages and charged to the contract account directly. Where a number of contracts are undertaken a pay-roll should be prepared for each contract. Where supervisors are engaged on two or more contracts, their wages must be apportioned on equitable basis. Wages accrued will also be debited to the contract account.

- ii) Direct Expenses : The co expenses incurred for a particular contract only are the direct expenses and are chargeable to that contract for which they are incurred.
- iii) Overheads : The Indirect expenses in common for two or more contracts are the overheads. These overheads are allocated or apportioned to the contracts on an appropriate basis. The examples of overheads are :
 - a) Salaries of Managers, architects, supervisors, engineers etc ;
 - b) Stores expenses including the salary of storekeeper ;
 - c) Administration expenses, such as, salaries of the office staff, stationary, telephone, postage, rent of office building, electricity charges, advertisements, insurance etc.

3. Plant : The plant used on a contract can be dealt with in the contract accounts in the following ways

- i) **Full value basis :** Contract is debited with the full value of the plant. When a new plant or old plant is issued to be a contract, the cost of the plant or book value of the old plant is debited to the contract. The plant is revalued at the end of the year and the credited to the contract with revalued (depreciated) value.
- ii) **Depreciation basis :** Where the services of the particular plant upon a contract are needed only for a short period, the contract account should be debited with the amount of usual depreciation of the plant.
- iii) **Plant returned to store :** When a portion of the contract is returned to the store, the contract is to be credited with the depreciated value of that part.
- iv) **Plant used on several contracts :** If a plant is used for several contracts, the hourly rate of depreciation is found out. Thus the charge for plant to respective contracts is made on the basis of the time for which the plant is put to use in different contracts.

4. Subcontract cost : Sometimes, the contractor give a portion of work to a sub-contractor. In the construction of a building for example, the contractor may give sub-contracts to various persons of digging foundation, electrical fittings flooring etc. The cost of the sub-contract is directly charged to the main contract.

5. Extra work : Some times, the contractor may be asked to do some extra work which is not shown in the original contract agreement. In such cases the work is additional and will be subjected to a seperate charge. The cost of extra work done is added to the original contract price.

6. Accrued charges : All accrued expenses should be debited to the contract concerned at the end of the accounting period and carried forward to the next period.

6.6 Cost Credited

1. Materials returned and transferred : When the materials are returned to the store the contract account is credited with the amount of such materials as are returned by the contract to the store. In such case of materials transferred to another contract by the contract, account is credited with the amount of material transferred by contract by debiting the transferee contract account.

Materials at the end : The materials left on the site at the end of the contract is returned to the store at its cost price Y. The cost price is the price at which it was issued to the contract. If the materials are sold at the contract site the contract account is credited with the sale value of the materials. If the materials on the contract are lost or destroyed by fire etc, the contract account credited and a profit and loss account is debited with the cost of such loss.

2. Plant and loose tools at the end :

- i) In case of completion of contract : The plant and loose tools account is debited and contract accounts is credited with the revalued price. The plant is returned to the store.

- ii) If the contract is incomplete : If the contract is incomplete and it is desired to calculate profit on the contract, then at that time plant at site account is debited and contract account is credited with the revalued price at the end of the period. In the beginning of the next period, the entry is reversed to close the plant at site account.
- iii) In case the plant is sold at site : The profit or loss on the sale of the plant transferred to the profit and loss account

3) plant lost, stolen or destroyed :

The cost of plant lost, stolen or destroyed should be debited to the profit and loss account and credited to the contract account. If the plant is insured, the amount received from the insurance company should be credited to the profit and loss account and not to the contract account. The same accounting treatment should be given to materials lost, stolen or destroyed.

6.7 Work certified and uncertified and Extract of Balance sheet

With work in progress in respect of a contract included the valued of the work certified and work uncertified. 'Work certified' is the work approved by the contractee's architect or engineer or surveyor. Usually, on the basis of the certificate given the contractee advances may 80 or 90 percent of the work certified. The balance amount is retained by the contractee, so that contractor may continue to work and not leave the contract if the contract is not proving be profitable one. The amount so retained is known as 'Retention money'. Work completed but not yet to be approved by the contractee (because it has not reached a stipulated stage) is known as work uncertified. It is valued at cost. The amount of work in progress is credited to the contract account at the end of the year and shown in the balance sheet on the assets side till the contract is completed.

Extract of Balance Sheet as on (assets side) 31-12-2003

	Rs.	Rs.
Work in progress	xxxxxx	
Value of work certified	xxxxxx	
cost of work uncertified	_____	
Less : Reserve for unrealised profit	xxxxxx	
Less : amount paid by contractee	xxxxxx	_____
		xxxxxx

6.8 Profit on incomplete contracts :

In case of unfinished contracts, the profit shown by the contract account should not entirely be transferred to profit and loss account because it reflects unrealised profit. Excluding such profits from the account books will not also be a desirable practice. It may lead to heavy fluctuations in the profit from year to year. Therefore only a part of such unrealised profit as calculated in the manner explained below may be transferred to profit and loss account.

1. Where less than one fourth of the contract is finished, no profit should be taken.
2. Where the work certified is 1/4 th or more but less than 1/2 of the contract price 1/3 of the notional profit (as disclosed by the contract account) as reduced to the percentage of cash paid by the contractee may be transferred to the profit and loss account and the balance of the profit and loss account is the 'reserve for unrealised profit'.

$$\text{Formula} = \text{notional profit } 1/3 \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \text{Profit to be certified}$$

3. Where more than half the contract is nearing completion, then two thirds of the notional profit may be credited on the basis of the cash received to the profit and loss account.

$$\text{Formula} = \text{notional profit } 2/3 \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \text{profit to be certified}$$

The reserve for unrealised profit is deducted from the amount of work in progress in the balance sheet.

4. Where there is loss on the contract, the whole amount of such loss is debited to profit and loss account.

6.9 Retention money :

As the contract is generally of long duration, at the end of each accounting period an architect or surveyor is appointed by the contractee to certify the value of the work completed up to a specified date. A provision is made in the contract that a certain percentage of the amount certified will be with held till the entire job or contract is certified and completed. The amount so retained is called 'retained or retention money'. The "retention money" is generally retained for a short period even after the completion of the contract.

6.10 Completion of the contract.

The object of keeping this money is to safeguarding the interest of the contractee in the event of non-compliance of contractor with the terms of contract eg., work being not up to specification, failure to complete the work within the stipulated time, etc. It is needless to mention, payment for uncompleted work is based on the basis of certificate of the architect balance or surveyor. That is, after deducting the Retention money from the value of work certified balance is paid to contractor. The accounting entries for this are : (1) Debit the contractee's or bank account and credit contract account with the value of work certified ; (2) Debit cash or bank account and credit contractee's account, with the amount received. The balance in the contractee's account at the end of each year will be carried forward until the completion of the work when payment will be received.

6.11 Loss on uncompleted contracts :

It is now clear that if the cost of work certified exceeds the value of such certificate, a loss is incurred and the whole amount of such loss is to be charged to profit and loss account. Again, if it is expected that further loss may arise before the completion of work, a provision should be made in the profit and loss account for such anticipated future losses. However when losses can be foreseen the contractor should make every effort to reduce the costs estimated to complete the contract, eg., on direct labour, overhead, etc., and thus bring the contract round.

6.12 Escalation clause :

According to this clause, a contractor is entitled to make up ward adjustments in the amount or contract price, if prices of elements of cost rise beyond percentage over the prices prevailing at the time of tendering quotation. In contract costing, escalator clause is one of the conditions of the contract where by the contractee agrees to compensate contractor for rise in prices of materials and labour.

6.13 Cost plus contracts :

In case of cost plus contracts, the contractee agrees to pay the cost of work done plus a percentage of its towards overhead expenses and profit. Where it is not possible to arrive at the contract price in a precise way in advance cost plus contracts are devised. These are useful to both the contractor and contractee. The contractor is assured of reasonable profit and the contractee of a reasonable price. In case of production of specialised items like urgent repairs of ships, vehicles, power house and construction work during war time etc. Cost plus contracts are highly useful

6.14 Illustrations :

The contract price in respect of a project was Rs. 5,00,000 On 31st March, 2001. 90% of the work had been completed and certified by the architects. The costs incurred upto 31st March 2001 on this project amounted to Rs. 4,00,000. It was estimated that another Rs. 20,000 would have to be spent further to complete the project. The contractee paid 80% of the value of work certified.

complete the profit to be taken to profit and loss account for the year ending 31 March, 2001

Solution :

		Rs.
Contract Price		5,00,000
Less : Total Estimated cost :		
costs to Date	4,00,000	
Cost to be incurred	20,000	4,20,000
Total Estimated Profit		80,000

Profit to be taken to Profit & Loss Accounts

$$\begin{aligned}
 &= \text{Total estimated profit} \times \frac{\text{Work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{work certified}} \\
 &= 80,000 \times \frac{4,50,000}{5,00,000} \times \frac{3,60,000}{4,50,000} \\
 &= \text{Rs. } 57,600.
 \end{aligned}$$

Working Note :

$$\text{Cash received being 80\% of the work certified is} = \frac{80}{100} \times 4,50,000$$

$$= \text{Rs. } 3,60,000$$

Illustration : On 3rd Jan, 2000 ABC construction Ltd. started work on the construction of an office block at a contracted price of Rs. 7,50,000. The construction company's financial year ended on 31st October 2000 and on that date the accounts pertaining to the contract contained the following balances

	Rs.
Materials issued to site	1,61,000
Materials returned from site	14,000
Wages paid	68,000
Own plant in use on site (at cost)	96,000
Hire of plant and scaffolding	72,000
Supervisory staff Direct	11,000
Indirect	12,000
Head office charges allocated to the contract	63,000
Value of work certified to 31.10.2000	4,00,000
Cost of work completed but not yet certified	40,000
cost Received on work certified	3,30,000

Depreciation on own plant is to be provided at the rate of 12 1/2% per annum on cost : Rs. 2,000 is owing for wages, estimated value of materials on site Rs. 24,000.

You are required to prepare the contract account for the period ended 31st October, 2000 showing the amount to be included in the company's P&L a/c.

Solution :

ABC construction Ltd. contract Account for the year ending 31-10-2000

Dr	Rs.		Rs.	Cr
To Materials issued	1,61,000	By Materials returned	14,000	
To wages paid	68,000	By Plant on hand (Depreciation value)	86,000	
To plant at cost	96,000	By materials on site	24,000	
To plant hire	72,000	By cost of work in progress c/d.	3,61,000	
To Supervision : Direct	11,000			
Indirect	12,000			
To Head office charges	63,000			
To wages	2,000			
	4,85,000			
To cost of work in progress b/d	3,61,000	By value of work certified	4,00,000	
To Notional Profit				
P&L A/c 43,450				
Reserve 35,550	79,000	By cost of work uncertified c/d	40,000	
	4,40,000		4,40,000	

Working Notes :

1) Depreciated Value of plant on hand	Rs.
Plant at cost	96,000
Less : Dept. at $12\frac{1}{2}\%$ for 10 months	10,000
Depreciated value	86,000

2) Profit to be credited to P&L A/c

$$= \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= 79,000 \times \frac{2}{3} \times \frac{33,000}{4,00,000} = \text{Rs. } 43,450$$

Illustration : A firm of building contractors started its business on 1-4-2000. Following was the expenditure on the contract for Rs. 3,00,000.

	Rs.
Materials issued to contract	51,000
Plant issued for contract	15,000
Wages incurred	81,000
Other Expenses incurred	5,000

Cash received on account up to 31-3-2001 amounted to Rs. 1,28,000 being 80% of the work certified. Of the plant and materials charged to the contract, plant which cost Rs. 3,000 and material so which cost Rs. 2,500 were lost. On 31-3-2001 plant which cost Rs. 2,000 was returned to stores. The cost of work done but uncertified was Rs. 1,000 and materials costing Rs. 2,300 were in hand on site.

Charge 15% depreciation on plant and take to the P&L A/c 2/3rd of the profit received. Prepare the necessary contract Account from the above particulars.

Solution : Contract Account for the year ending 31-3-2001

Dr.	Rs.	Cr.	Rs.
To Materials issued	51,000	By Profit & Loss A/c	
To wages	81,000	Plant Lost 3,000	
To plant issued	15,000	Materials lost 2,500	5,500
To other Expenses	5,000		
		By Plant returned to Store (2,000-300)	1,700
		By Materials on hand	2,300

		By Plant on site (10,000-1500)	8,500
		By Cost of work in progress C/d	1,34,000
	1,52,000		1,52,000
To cost of work in progress b/d	1,34,000	By value of work /certified	1,60,000
To notional Profit		By work uncertified	1,000
P&L A/c 14,400			
Reserve 12,600	27,000		
	1,61,000		1,61,000

Working Notes :

1) Value of work certified : Cash received is Rs. 1,28,000 representing 80% of the work certified, hence the value of the work certified would be

$$(1,28,000 \times \frac{100}{80}) = \text{Rs.}1,60,000$$

2) Profit to be taken to P&L A/c It has been worked out as follows :

$$= \frac{2}{3} \text{ Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$= \frac{2}{3} \times 27,000 \times \frac{1,28,000}{1,60,000}$$

$$= \text{Rs.} 14,400$$

Illustration : The following is a summary of entries in a contract ledger as on 31st Dec, 2001 in respect of contract No. 27

	Rs.
Direct Materials	30,000
Materials / from stores	6,500
Wages	17,210

Direct Expenses	6,710
Establishment Charges	8,000
Plant	34,200
Sale of Scrap	1,820
Sub-contract cost	7,210

The following further information is made available to you :

a) Accrued as on 31st Dec, 2001 were :

Wages Rs. 8,000 and Direct Expenses Rs. 1,120

b) Depreciation of plant upto 31st Dec, 2001 was Rs. 8,550

c) Included in the above summary of entries were : Wages Rs. 1,000 ; other expenses Rs. 1,500 and Materials Rs. 2,080. These expenses were incurred after certification

d) Materials on site on 31st Dec, 2001 cost Rs. 10,000.

e) Rs. 62,500 worth of work had been certified upto 31st Dec, 2001 when three eighth of the contract remained uncompleted.

f) The total contract Price was Rs. 1,00,000

You are required to show what profit or loss would be taken into account for the year ended 31st, Dec, 2001 in respect of this contract.

Solution :

Contract Account for 2001

Dr.			Cr	
		Rs,		Rs.
To Materials Direct	30,000		By sale of scrap	1,820
from stores	6,500	36,500	By Materials on hand	10,000
To Wages	17,210		By Plant on hand (34,200-8,550)	25,650
Add. Out standing	800	18,010	By cost of work uncertified	4,580
To Establishment charges		8,000	By value of work certified	62,500
To Plant at cost		34,200	By Loss (transferred to P&L A/c)	7,200

To Direct Expenses 6,710			
Add : Outstanding 1,120	7,830		
To sub-contracting cost	7,210		
	1,11,750		1,11,750

Illustration : XYZ construction co. Ltd, commenced its business on 1st jan, 2000. The following data has been extracted from its books in relation to a contract.

	Rs.
Cash Received From contractee	1,20,000
Materials	40,000
Direct Labour	55,000
Expenses at site	2,000
Plant & Equipments (at cost)	30,000
Fuel and power	2,500

The contract price was Rs. 3,00,000 and the work certified Rs. 1,50,000. The work completed, since certification had been estimated at Rs. 1,00,000 (at cost). Machinery costing Rs. 2,000 was returned to stores at the end of the year. Stock of materials at site on 31-12-2000 was worth Rs. 5,000 and wages outstanding were Rs. 200. Depreciation on machinery was to be charged at 10%. You are required to calculate the profit on the contract and show how the work in progress will appear in the Balance sheet as on 31-3-2000 also prepare the contractees Account.

Solution :

XYZ Construction Co. Ltd. Contract Account 2000.

Dr.	Rs.	Cr.	Rs.
To Materials	40,000	By materials at site	5,000
To Direct Labour	55,000	By Machinery	
		at site	25,200
		at stores	1,800
			27,000
To Expenses at site	2,000		
To Fuel & Power	2,500		

To Machinery at site	30,000	By value of work certified	1,50,000
To Notional Profit c/d	53,300	By cost of work un certified	1,000
	1,83,000		1,83,000
To Profit & Loss A/c	28,427	By Notional Profit b/d	53,300
To Balance c/d (Reserve)	24,873		
	53,300		53,300

Workings : Profit taken to P&L A/c

$$\text{Notional Profit} \times \frac{2}{3} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

$$53,300 \times \frac{2}{3} \times \frac{1,20,000}{1,50,000} = \text{Rs. } 28,427$$

Balance Sheet as on 31-12-2000 (Extracts)

Assets

work-in-Progress

Work certified 1,50,000

Work Un Certified 1,000

1,51,000

Less : Reserves 24,873

1,26,127

Less : Cash received from contractee 1,20,000

6,127

Contractee's Account

Dr.

cr.

	Rs.		Rs.
To Balance C/d	1,20,000	By Bank	1,20,000
		By Balance b/d	1,20,000

- (1) Balaji Builders, carrying out large contracts kept in a contract ledger separate accounts for each contract. The following particulars related to a certain contract carried out during the year ended 30th June.

	Rs.
Work Certified by Architects	1,43,000
Cash received from the contractee	1,30,000
Materials sent to site	64,500
Labour engaged on site	54,800
Plant installed at site	11,300
Value of Plant at 30th June (closing)	8,200
Cost of work not yet certified	3,400
Establishment Charges	3,250
Direct Expenditure	2,400
Wages accrued due	1,800
Materials, closing balance	1,400
Materials returned to store	400
Direct expenses accrued due	200
Contract price	2,00,000

You are required to prepare an account, showing the profit on the contract upto 30th June. 2003

Sol :

Dr.	Contract Account for the year ended 30th June 2003		Cr
To Materials	64,500	By work-in-Progress	
To Labour engaged	54,800	work certified 1,43,000	
To wages outstanding	1,800	work uncertified 3,400	1,46,400
To Direct expenditure	2,400	By Material returned	400

To Direct Expenses Outstanding	200	BY Plant on hand	8,200
		By Material on hand	1,400
To Plant installed	11,300		
To Establishment	3,250		
To Notional Profit	18,150		
	1,56,400		1,56,400
To P&L a/c ($\frac{18,150 \times 2 \times 130}{3 \times 143}$)	11,000	By Notional profit	18,150
To Balance c/d	7,150		
	18,150		18,150

- (2) The following balances were extracted from the books of a kamakshi building contractors at 31st March, 2002

	Rs.
Materials Issued to site	62,720
Wages Paid	73,455
Wages outstanding on 31-3-2002	720
Plant issue to site	6,000
Direct charges paid	2,515
Direct charges outstanding on 31-3-02	210
Establishment Charges	5,650
Stock on Materials at site on 31-3-02	1,200
Value of work certified at 31-3-02	1,65,000
Cost of work not yet certified	3,500
Cash received on account of architect's Certificate	1,41,075

The work was commenced on 1st April 2001 and the contract price agreed at Rs. 2,45,000.

Prepare contract account for the year, providing depreciation of plant at 25%. Calculate the profit or loss on the contract to date and make such provisions in the contract account as you consider desirable. Set out also the contractor's balance sheet so far as it relates to the contract.

Sol :

Dr.	Contract account for the year ending 31-3-02		Cr.
	Rs.		Rs.
To Materials issued :	62,720	By Material at site	1,200
To wages Paid 73,455		By Plant at site	4,500
Out standing 70	74,175	By Work-in-progress :	
To Plant issued	6,000	work certified 1,65,000	
To Direct Charges	2,515	work uncertified 3,500	1,68,500
To Direct charges outstanding	210		
To Establishment charges	5,650		
To Profit c/d	22,930		
	1,74,200		1,74,200
* To Profit & loss a/c	13,070.10	By Profit b/d	22,930
To Work-in-progress a/c (Reserve)	9,860		
	22,930		22,930

$$* \text{ Profit to be taken to P\&L a/c} = 22,930 \times \frac{2}{3} \times \frac{1,41,075}{1,65,000} = 13,070.10$$

Balance sheet (Extract)

Liabilities	Amount Rs.	Assests	Amount Rs.
Wages outstanding	720	Material at site	1,220
Direct Charges outstanding	210	plant at site	4,500
		Work in progress :	

	Work certified 1,65,000	
	Work Uncertified 3,500	
	1,68,500	
	Less : Reseve 9,860	
	1,58,640	
	Less : Cash received	
	from contractee 1,41,075	17,565

(3) Sridevi Enterprises carrying out large contracts kept in a contract ledger separate account for each contract. On 30-06-03, the following was shown as being the expenditure in connection with contract No. 216

	Rs.
Bricks and mortor purchased	58,165
Materials from store	9,800
Wooden doors, windows etc.	12,500
Iron, steel etc., Purchased	3,600
Labour	74,600
Sundry Epenses	2,025
Portion of supervision charges	8,700

The contract which had been commenced on 1st Feb. 2003 was 3,00,000/- and the amount certified by the engineer, after deduction of 20% retention money was Rs. 1,20,000 the work being certified to 30-6-03. The material on site on 30-6-03 was Rs. 600.

Prepare on account : showing the profit or loss on the contract to 30th June, 2003.

Sol :

Dr.	Contract No. 216 a/c		Cr.
2003 Feb.1 to June 30	Rs	2003 June 30	Rs.
To Bricks and Mortor Purchased	58,165	By Materials at site c/d	600
		By Work in progress c/d : work certified	

To Materials from stores	9,800	$(1,20,000 \times \frac{100}{80})$	1,50,000
To Wooden doors, windows etc	12,000	By profit & loss a/c (loss on uncomplete contract transferred to P/L a/c) (B.F)	18,290
To Iron, steel etc, purchased	3,600		
To wages	74,600		
To sundry expenses	2,025		
To supervision expenses	8,700		
	<u>1,68,890</u>		<u>1,68,890</u>

(4) On 1-1-2003, Kaveri constructions undertook a contract for Rs. 5,00,000. It incurred the following expenses during the year.

	Rs.
Materials issued from stores	50,000
Materials purchased for the contract	45,000
Plant installed at cost	35,000
wages paid	1,00,000
wages accrued due on 31-12-03	40,000
Direct expenses paid	10,000
Direct Epenses accrued due on 31-12-03	2,500
Establishment	6,500

Of the plant and materials charged to the contract, the plant which cost Rs. 2,000 and the materials costing Rs. 1500 were lost. Some of the materials costing Rs. 2000 were sold for Rs. 2,500. On 31-12-03, the plant which cost Rs. 500 was returned to stores, and a part of plant which cost Rs. 200 was so damaged as to render itself useless.

The work certified was Rs. 2,40,000 and 80% of the same was received in cash. The cost of work done but uncertified was Rs. 1000. Charge 10% p.a. depreciation on plant and prepare the

contract account for the year ended 31-12-03 by transferring to the profit and loss account the portion of the profit, if any, which you think reasonable. Show also the particulars relating to the contract in the balance sheet of the contractor as on 31-12-03.

Sol.

Dr.		Contract account for the year ended 31-12-03		Cr	
2003 Jan/Dec	Rs.	2003 Jan/Dec		Rs.	
To Material issued from store	50,000	By Profit & loss a/c :			
To Material purchased	45,000	Plant lost	2000		
To Wages	1,00,000	Materials lost	1500	3500	
To Direct Expenses	10,000	By Sale of Materials		2,500	
To Plant	35,000				
		Dec. 31			
To Establishment	6,500	By Plant returned, less depreciation		450	
Dec. 31					
To Wages accrued due	40,000	By Profit & Loss a/c :			
To Direct Expenses due	2,500	plant damaged		200	
To P&I a/c sale of materials	500	Plant on hand		29,070	
		Work certified		2,40,000	
		Work uncertified		1,000	
		By P&I a/c :			
		Loss to date		12,780	
	2,89,500			2,89,500	
2004 Jan - 1		2004 Jan - 1			
To Work certified	2,40,000	By wages accrued due		40,000	
To work Uncertified	1,000	By Direct Expenses accrued due		2,500	
To Plant on hand	29,070				

Note :

Calculation of work - in - progress :

	Rs.
Work certified	2,52,780
Work Uncertified	1,000
	<u>2,53,780</u>
Less : Loss to date	12,780
	<u>2,41,000</u>

Balance Sheet (Extract) as on 31-12-03

Liabilities	Amount Rs.	Assets	Amount Rs.
		Plant at cost	35,000
Outstanding Creditors :		Less : <u>Loss 2,000</u>	<u>33,000</u>
Wages	40,000		
Direct expenses	2,500	Less : <u>Returned 500</u>	<u>32,500</u>
		Less : <u>Damaged 200</u>	<u>32,300</u>
		Less : Depreciation <u>3,230</u>	<u>29,070</u>
		Work-in-Progress	2,41,000
		Less : Cash received <u>1,92,000</u>	<u>49,000</u>
		Profit & loss a/c :	
		Loss to date	12,780
		Loss of Plant and	

	Materials	3,500	
	Plant	<u>Damaged 200</u>	
		16,480	
	Less : Profit on Sale of of materials	500	15,980

(5) The following is the trial balance of Amrita Construction company engaged on the execution of contract No. 009 for the year ended 31st December, 2002 :

	Rs. Dr	Rs. Cr.
Contractee's account	-----	5,00,000
Amount received	3,00,000	-----
Buildings	1,60,000	-----
Creditors	-----	72000
Bank balance	35,000	-----
Capital account	-----	5,00,000
Materials	2,00,000	-----
Wages	1,80,000	-----
Expenses	47,000	-----
Plant	2,50,000	-----
	<u>8,72,000</u>	<u>8,72,000</u>

The work on contract no. 009 was commenced on 1-1-20. Materials costing Rs. 1,70,000 were sent to the site of the contract but those of Rs. 6000 were destroyed in an accident. Wages of Rs. 1,80,000 were paid during the year. Plant costing Rs. 50,000 was used on the contract all through the year. Plant with a cost of Rs. 2,00,000 was used from 1-January to 30th September and was then returned to stores. Materials of the cost of Rs. 4000 were at site on 31-12-02.

The contract was for Rs. 6,00,000 and the contractee paid 62.5% of the work certified. Work certified was 80% of the total contract work at the end of 2002. Uncertified work was estimated at Rs. 15,000 on 31st Dec. 2002. Expenses are charged to the contract at 25% of wages. Plant is to be depreciated at 10% for the entire year.

Prepare contract no. 009 a/c for the year 2002 and make out balance sheet as on 31-12-02 in the books of Amrita Construction company.

sol :

Dr. contract No. 009 a/c Cr

	Rs.		Rs.
To Materials	1,70,000	By work certified	4,80,000
To wages	1,80,000	By work uncertified	15,000
To Expenses	45,000	By P/L a/c :	
To Depreciation of Plant		Loss by accident	6,000
(15,000 + 5,000)	20,000	Materials at site	4,000
To balance c/d	90,000		
	5,05,000		5,05,000
To P/L a/c		By balance b/d	90,000
$(90,000 \times \frac{2}{3} \times \frac{3,00,000}{4,80,000})$	37,500		
To Reserve	52,500		
	90,000		90,000

Balance Sheet as on 31-12-'02

Liabilities	Amount Rs.	Assets	Amount Rs.
Capital	5,00,000	Building	1,60,000
P&I a/c	37,500	Plant in stores	1,80,000
Less : Loss	6,000	Materials in stores	30,000
Less : Unabsorbed Expenses	2,000	Work-in-Progress :	
		Certified	4,80,000
Less : Depreciation Plant	5,000	Uncertified	15,000
	24,500		
Creditors	72,000		4,95,000

		Less : Reserve	52,500	
			<u>4,42,500</u>	
		Less : Cash	3,00,000	1,42,500
		Materials at site		4,000
		Plant at site		45,000
		Bank		35,000
	5,96,500			5,96,500

Comments : Profit to be taken to P&I a/c may also be calculated as under

$$90,000 \times \frac{2}{3} \times \frac{3}{4} = 45,000$$

Depreciation is at 10% on plant for whole year. As plant costing Rs. 20,000 was employed only for 9 months, the amount Rs. 15,000 has been charged for the contract and the balance of Rs. 5,000 on Rs. 2,00,000 for 3 months has been charged to the current year's profit in the balance sheet.

(6) Sanjana Building contractors began to trade on 1st January, 2003 During the year, the company was engaged on only one contract. The contract Price was Rs. 5,00,000

Of the plant and materials charged to the contract, the plant which cost Rs. 5,000 and materials which cost Rs. 4,000 were lost in an accident

On 31-12-03, the plant which cost Rs. 5,000 was returned to the stores, the cost of work done but uncertified was Rs. 2,000 and materials costing 4000/- were in hand on site.

Charge 10% depreciation on the plant, carry forward by way of reserve one-third of the profit received and complete the contract account and balance sheet from the following Trial balance on 31-12-03.

	Rs.	Rs.
Share Capital	-----	1,20,000
Creditor	-----	10,000
Cash received on contract (80% of work certified)	-----	2,00,000
Land, buildings etc	43,000	-----
Bank balance	25,000	-----
Charged to contract :		
Materials	90,000	-----

Plant	25,000	-----
Wages	1,40,000	-----
Expenses	7,000	-----
	<u>3,30,000</u>	<u>3,30,000</u>

Sol : Contract a/c

Dr.	Rs.		Rs.	Cr
		By Profit & loss a/c :		
To Materials	90,000	Plant	5000	
To Plant	25,000	Material	4000	9,000
To wages	1,40,000	Plant returned to store	5000	
To Expenses	7,000	Less : Depreciation	500	4,500
To balance c/d	21,000	By Plant at site	15,000	
		Less : Depreciation	1,500	13,500
		By Material at site		4,000
		By Work certified		2,50,000
		By work Uncertified		2,000
	2,83,000			<u>2,83,000</u>
To Profit & loss a/c	11,200	By Balance b/d		21,000
$\left[21,000 \frac{2}{3} \times \frac{2,00,000}{2,50,000} \right]$				
To Reseve (BF)	9,800			
	21,000			<u>21,000</u>
To Abnormal loss (5000 + 4000)	9,000	By Profit		11,200
To Net profit on contract (BF)	2,200			
	11,200			<u>11,200</u>

Liabilities		Balance Sheet on 31-12-03		Assets	
		Rs.			Rs.
Share Capital		1,20,000	Plant	20,000	
Creditors		10,000	Less : Depreciation	2,000	18,000
P&L a/c.	11,200		Materials		4,000
Less : Loss on :			Land and building		25,000
Plant 5,000			Bank		43,000
Material 4000	9,000	2,200	Work-in-Progress :		
			Work Certified	2,50,000	
			Uncertified	2,000	
				2,52,000	
			Less : Cash received	2,00,000	
				52,000	
			Less : Reserve	9,800	42,200
		1,32,200			1,32,200

(7) Shanti company undertook a contract for construction of a large building complex. The construction work commenced on 1st April, 2002 and the following data are available for the year ended 31st March, 2003

Rs in' 000

Contract Price	35,000	Plant hire charges	1,750
Work certified	20,000	Wages related costs	500
Progress payments received	15,000	Site office costs	678
Materials issued to site	7,500	Head office expenses apportioned	375
Planning & Estimating costs	1,000	Direct Expenses incurred	902
Direct wages paid	4,000		
Materials returned from site	250	Work not Certified	149

The contractors own a plant which originally cost Rs. 20 lakhs has been continuously in use in the contract through out the year. The residual value of the plant after 5 years of life is expected to be Rs. 5 lakhs. Straight line method of depreciation is in use.

As on 31-3-03 the direct wages due and payable amounted to Rs. 2,70,000 and the materials at site were estimated at Rs. 2,00,000.

Required :

- (1) Prepare contract a/c for the year ended 31-3-03
- (ii) Show the calculation of Profit to be taken to the profit & loss a/c of the year.
- (iii) Show the relevant balance sheet entries.

Sol :

Dr.	Contract a/c for the year ended 31-3-03		Cr
	Rs.'000		Rs.'000
To Materials	7,500	By Materials returned	250
To Direct Wages 4000		By Materials at site	200
Add : outstanding <u>270</u>	4,270	By Work-in-Progress :	
To wages related costs	500	work cetified 20,000	
To Direct expenses	902	Work uncertified <u>149</u>	20,149
To Plant hire charges	1,750		
To Planning & Estimating costs	1000		
To Site office costs	678		
To H.O. expenses apporioned	375		
To Depreciation on plant			
$\left[\frac{20,00,000 - 5,00,000}{5} \right] = 3,00,000$	300		
To Notional Profit c/d	3,324		
	20,599		20,599
To Profit & loss a/c		By Notional profit b/d	3,324

$\left(\frac{2}{3} \times 3,325 \times \frac{15,000}{20,000}\right)$	1,662		
To work in progress a/c (Reserve)	1,662		
	3,324		3,324

Balance Sheet (Extract) as on 31-3-03

Liabilities	Amount Rs.'000	Assets	Amount Rs.'000
Outstanding wages	270	Plant at site (2000 - 300)	1700
Profit & Loss a/c	1,662	Material at site	200
		Work-in-progress :	
		Work Certified	20,000
		Work Uncertified	<u>149</u> 20,149
		Less : Profit in reserve	<u>1,662</u> 18,487
		Less : Cash received from the contractee	15,000
			3,487

(8) Modern construction company with a paid up share capital of 50,00,000/- Undertook a contract to construct LIG houses. The contract work commenced on 1-1-2000 and contract price was Rs. 50,00,000. Cash received on account of contract on 31-12-2000 was Rs. 18,00,000 (90% of work certified). Work completed but not certified was estimated at Rs. 1,00,000. As on 31-12-00, material at site was estimated at Rs. 30,000 and machinery at site costing Rs. 2,00,000 was returned to stores. Plant and machinery at site is to be depreciated at 5% wages outstanding on 31-12-'00 was Rs. 5,000.

The following were ledger balances (Dr) as per Trial balance as on 31-12-'00 :

Land & Buildings	15,00,000
Plant & Machinery at cost (60% at site)	25,00,000
Lorries and other Vehicles	8,00,000
Furniture	50,000

Office Equipments	10,000
Materials sent to site	14,00,000
Fuel & power	1,25,000
Site expenses	5,000
Postage & telegrams	4,000
Office expenses	8000
Rates & Taxes	15,000
Cash at bank	1,33,000
wages	2,50,000

Prepare the contract account to ascertain the profit from the contract and Balance sheet.

Dr. Contract account for the period ending 31-12-'00 Cr

Rs.		Rs.	
To materials sent to site 14,00,000		By work-in progress :	
Less : Materials at site 30,000	13,70,000	workcertified ($\frac{100}{90} \times 8,00,000$)	20,00,000
To wages 2,50,000		Work not certified	1,00,000
Add : outstanding <u>5,000</u>	2,55,000		
To site expenses	5,000		
To postage & telegrams	4,000		
To power & fuel	1,25,000		
To office Expenses	8,000		
To Rates & taxes	15,000		
To Depreciation			
$\left[\frac{5}{100} \times \frac{60}{100} \times 25,00,000 \right]$	75,000		
To Notional Profit C/d	2,43,000		

	21,00,000		21,00,000
		"Notional profit bld	2,43,000
To Profit & loss a/c			
$\left[\frac{1}{3} \times \frac{90}{100} \times 2,43,000 \right]$	72,900		
To work-in-progress a/c (Reserve)	1,70,100		
	2,43,000		2,43,000

Balance sheet as at 31-12-'00

Liabilities	Amount Rs.	Assets	Amount Rs.
Paid up capital	50,00,000	Land & Buildings	15,00,000
Wages outstanding	5,000	Lorries & vehicles	8,00,000
Profit and loss a/c	72,900	furniture	50,000
		Office equipments	10,000
		Machinery at site	13,00,000
		Less : Depreciation @ 5%	65,000
		in stores (office)	
		(10,00,000 + Machinery returned from site 1,90,000)	11,90,000
		Materials at site	30,000
		Work in Progress :	
		Work certified	20,00,000
		Work Uncertified	1,00,000
			21,00,000
		Less : Reserve	1,70,100

		19,29,900	
		Less : Cash received 18,00,000	1,29,900
		Cash at bank	1,33,000
	50,77,900		50,77,900

Illustration-9 : The following particulars relate to a contract for Rs. 40 lakhs :

	1999 Rs	2000 Rs.	2001 Rs.
Materials	4,50,000	7,00,000	6,00,000
Wages	4,30,000	6,00,000	5,00,000
Expenses	20,000	50,000	16,000
Carriage	20,000	60,000	50,000
Work certified	9,00,000	30,00,000	40,00,000
Work Uncertified	10,000	50,000	-----

Plant costing Rs. 1,00,000 was bought in the beginning of 1999, and depreciation was charged at to per annum. The contractee was to pay 80% of the work certified every year and settle the account in 2001. Draw contract Account for three years and also write contractee's Account and work-in-progress Account in the books of the contractor.

Solution :

Contract Account 1999.

Dr. Particulars	Rs.	Particulars	Cr. Rs.
To Materials	4,50,000	By plant on hand (1,00,000-25,000)	75,000
To wages	4,30,000	By work certified	9,00,000
To Expenses	20,000	By work unctified	10,000
To carriage	20,000	By P&L A/c (Loss Transferred)	35,000
To plant at cost	1,00,000		
	10,20,000		10,20,000

Contract Account for 2000

Dr.	Rs.		Rs.	Cr
To work-in-Progress				
Work certified	9,00,000	By work certified	30,00,000	
Work Uncertified	10,000	By work uncertified	50,000	
	9,10,000			
To plant on site	75,000	By plant on hand (75,000 - 18750)	56,250	
To Materials	7,00,000			
To wages	6,00,000			
To Expenses	50,000			
To carriage	60,000			
To P&L A/c	3,79,333			
To Balance C/d	3,31,917			
	31,06,250		31,06,250	

Contract Account for 2001

Dr.	Rs.		Cr. Rs.
To work-in-Progress			
Work certified	30,00,000	By plant on hand (56,250 - 14,062)	42,188
Work Uncertified	50,000	By contractees A/c (contract price)	40,00,000
	30,50,000		
Less : Reserve	3,31,917		
	27,18,083		
To Plant on site	56,250		
To Materials	6,00,000		
To wages	5,00,000		

To Expenses	16,000		
To Carriage	50,000		
To P&L A/c	1,01,855		
	40,42,188		40,42,188

Contractees Account.

Dr.	Rs.		Rs.	Cr
1999 To Balance c/d	7,20,000	1999 By Bank	7,20,000	
	7,20,000		7,20,000	
2000 To Balance c/d	31,20,000	2000 By Balance b/d	7,20,000	
		By Bank	24,00,000	
	31,20,000		31,20,000	
2001 To contract A/c	40,00,000	2001 By Balance b/d	31,20,000	
		By Bank	8,80,000	
	40,00,000		40,00,000	

Work-in-Progress Account

Dr	Rs.		Rs.	Cr
1999 To contract A/c	9,10,000	1999 By Balance c/d	9,10,000	
	9,10,000		9,10,000	
2000 To Balance b/d	9,10,000	2000 By contract a/c (transfer)	9,10,000	
To contract a/c	30,50,000	By contract A/c (reserve)	3,31,917	
		By Balance c/d	27,18,083	
	39,60,000		39,60,000	
2001 To Balance b/d	27,18,083	2001 By contract A/c (transfer)	27,18,083	
	27,18,083		27,18,083	

(10) Rahul construction ltd. is engaged on two contracts A and B during the year. The following particulars are obtained at the year end (Dec.31)

	Contract A	Contract B
Date of Commencement	April 1	September 1
	Rs.	Rs.
Contract price	6,00,000	5,00,000
Materials issued	1,60,000	60,000
Materials returned	4,000	2,000
Materials at site (Dec. 31)	22,000	8,000
Direct labour	1,50,000	42,000
Direct expenses	66,000	35,000
Establishment expenses	25,000	7,000
Plant installed at site	80,000	70,000
Value of Plant (Dec. 31)	65,000	64,000
Cost of contract not yet certified	23,000	10,000
Value of Contract certified	4,20,000	1,35,000
Cash received from contractees	3,78,000	1,25,000
Architect's fees	2000	1000

During the period materials amounting to 900/- have been transferred from contract A to contract B. You are required to show

(a) Contract a/c (b) Contractee's a/c and Extract of Balance sheet as on December 31, clearly showing the calculation of work-in-progress.

Sol.

Contract a/c					
Dr.	A		B		Cr
Rs.	Rs.	Rs.	Rs.	Rs.	B
To Materials issued	1,60,000	60,000	By Materials returned	4,000	2,000

To Materials from contract A	---	9,000	By Materials at site (Dec.31)	22,000	8,000
To Direct labour	1,50,000	42,000			
To Direct Expenses	66,000	35,000	By Materials transferred to contract B	9000	-----
To Establishment Expenses	25,000	7,000	By Work in progress A B		
To Depreciation on plant	15,000	6,000			
To Architect's fees	2,000	1,000	Work certified 4,20,000 1,35,000		
To Notional Profit c/d	60,000	-----	Work Uncertified 23,000 10,000	4,43,000	1,45,000
			By Profit & Loss a/c	-----	5,000
	4,78,000	1,60,000		4,78,000	1,60,000
To Profit & loss a/c (60,000 x $\frac{2}{3}$ x $\frac{9}{10}$)	36,000	-----	By Notional Profit b/d	60,000	-----
To Work-in-Progress (Reserve)	24,000				
	60,000			60,000	

Contractee's account

Dr.	A		B		Cr
	Rs.	Rs.	Rs.	Rs.	
To Balance c/d	3,78,000	1,25,000	By cash (BF)	3,78,000	1,25,000
	3,78,000	1,25,000		3,78,000	1,25,000

Extract of Balance sheet as on 31st December

Liabilites	Amount Rs.	Assets	Amount Rs.
Profit & Loss a/c :		Plant	1,50,000

		Less : Depreciation	21,000		1,29,000
Profit of A contract	36,000				
Less : Loss of B Contract	5,000				
	31,000	Stock of Materials :			
		Contract A	22,000		
		Contract B	8,000		30,000
		Work-in-progress :			
				A	B
		Work Certified	4,20,000	1,35,000	
		Work not certified	23,000	10,000	
			4,43,000	1,45,000	
		Less : Profit in reserve	24,000	-----	
			4,19,000	1,45,000	
		Less : cash received	3,78,000	1,25,000	
			41,000	20,000	61,000

(11) Shukul a contractor secured a contract to supply and erect machinery for the sum of Rs. 75,00,000. He was to receive payments on account from time to time equal to 90% of the certified value of the work done.

He commenced work on 1-1-03 and incurred the following expenditure during the year - Plant and tools - Rs. 70,000, Machinery & Stores - Rs. 2,00,000; Wages - 1,50,000; Sundry expenses - 30,000; and establishment charges - 40,000/-

A part of Machinery costing to Rs. 20,000 was utilised to the contract and immediately sold at a profit of Rs. 5000

The value of plant & tools on 31-12-2003 was 40,000 and the value of Machinery and stores then in hand Rs. 30,000.

By 31-1-2004 he had received payments on account amounting to Rs. 4,38,750 being 90% of the certified value of work done upto 31-12-2003

In order to calculate the profit made on the contract upto 31-12-03, the contractor estimated the further expenditure that would be incurred in completing the contract and took the credit of profit and

loss a/c for the year that proportion of estimated net profit to be realised on contract which the certified value of work done bore to the contract price. He estimated :

- (a) that the contract would be completed in a further period of six months.
- (b) that plant & tools would have a residual value of Rs. 10,000 upon the completion of the contract.
- (c) that the cost of machinery stores required in addition to those in stock on 31-12-03 would be Rs. 1,00,000 and the further sundry expenses of Rs. 20,000 would be incurred ;
- (d) that the wages on the contract of 6 months to 30th June, 2004 would amount to Rs. 8000
- (e) that the establishment would cost the same sum per month in the previous year.
- (f) that 2 1/2% of the total cost of contract (Excluding the percentage) should be provided for contingencies.

Prepare the contract a/c for the year ended 31-12-03 and show your calculations of the profit & loss a/c for the year.

Sol :

Contract a/c for year ended 31-12-'03

Dr.	Rs.	Cr.	Rs.
To plant & tools	70,000	By sale of plant	25,000
To Machinery & stores	2,00,000	By work-in-progress work certified	4,87,500
To Wages	1,50,000	By Plant & tools in hand	40,000
To Sundry expenses	30,000	By Machinery & stores in hand	30,000
To Establishment Charges	40,000		
To Profit & loss a/c (Profit on sale of plant)	5,000		
To Notional Profit c/d	87,500		
	5,82,500		5,82,500
		By Notional Profit b/d	87,500
To Profit & Loss a/c	34,450		

To work-in-Progress a/c (Reserve)	53,050		
	87,500		87,500

Profit to be credited to P&L a/c has been calculated as under :

	Rs.
Cost to date	4,90,000
Less : cost of plant sold	20,000
	4,70,000

Estimated further Expenditure :

	Rs.
Machinery & stores	1,00,000
Sundry Expenses	20,000
Wages	80,000
Establishment Charges	20,000
	2,20,000
	6,90,000
Less : Residual Value of Plant	10,000
	6,80,000
Provision for contingencies (2 1/2% on 6,80,000)	17,000
Estimated total cost	6,97,000
Profit (Estimated)	53,000
Contract Price	7,50,000

∴ Profit to be credited to p/l a/c :

$$= \text{Estimated Profit} \times \frac{\text{Work certified}}{\text{Total contract price}}$$

$$= 5,300 \times \frac{4,87,500}{7,50,000} = \text{Rs. } 34,450$$

6.15 Key Words

Contractor : The person or the organisation that agrees to undertake the contract.

Contractee : The person or the organisation for whom the Contract is done.

Contract Costing : A special form of job costing applicable to big projects like construction of a building, construction of a bridge, etc. which involve huge cost to complete, and is usually site-based.

Contract Price : The price at which the contractor has agreed to undertake the job.

Escalation Clause : A provision made in the agreement to compensate the contractor for an unwarranted increase in prices and for other contingencies.

Notional (or Attributable) Profit : Value of work certified minus cost of work certified.

Progress Payment : Payment made to the contractor at various stages of the work or at agreed intervals.

Retention Money : Amount of payment withheld as a security against defective work and penalties chargeable for delay in completion of work.

Sub - Contracting : Assigning special work relating to the main contract to a sub-contractor.

Work Certified : Work approved by the contractee's architect or surveyor.

Work Un certified : Work done from the date of certification to the last date of the accounting year and which still remains to be approved.

Surveyors certificate : A certificate which provides confirmation that work to a certain sales value has been completed and that some payment to the contractor is now due.

work-in-Progress : Represents costs of uncompleted contracts. It is shown in the balancesheet after deduction of cash received from contractee.

6.16 Self-assessment Questions / Exercises :

1. Define contract costing and explain the salient features of contract costing. ?
2. Explain in detail the procedures of contract costing ?

3. What is incompleting contract ? How do you account for such contracts ?
4. Explain the procedures of accounting for profits on incompleting contracts.
5. How does contract costing differ from job costing ?
6. Indicate how you would deal with the following items in contract account.
 - (a) Plant and machinery specially purchased for a contract.
 - (b) Loss of materials stolen or destroyed
 - (c) Sub-contracting.
7. State how you would ascertain the actual profit on an incomplete contract. How far such profit is taken into P&L A/C ?
8. How is progress payment due at a specific stage computed ?
 - (b) Explain the use of a production order and give its specimen

PROBLEMS :

9. The following direct costs were incurred on job No. 415 of Philips India Ltd.

Materials Rs. 4,010

Wages

Deptt. A-60 hours @3 per hour

Deptt. B-40 hours @2 per hour

Deptt. C-20 hours @5 per hour

Overheads expenses for these three departments were estimated as follows :

Variable overheads :

Deptt. A Rs. 5,000 labour hours

Deptt.B Rs. 3,000 labour hours

Deptt. C Rs. 2,000 labour hours

Fixed overheads : Estimated at Rs 20,000 for 10,000 normal working hours. You are required to calculate the cost of job No. 415 and calculate the price to earn profit of 25% on selling price. (Ans : Total cost Rs. 4,830; Sales price : Rs. 6,440)

10. A company is engaged in job work. It has completed all jobs in hand except Job no. 44 on Dec, 30, 2000. The cost sheet on Dec. 30, showed direct material and direct labour costs of Rs 40,000 and Rs 30,000 respectively as having been incurred on job No. 44. The costs incurred by the business on 31st Dec. 2000, the last day of the accounting year, were as follows :

Direct Materials (Job 44)	2,000
Direct Labour (Job 44)	8,000
Indirect Labour	2,000
Miscellaneous Factory overheads	3,000

It is the practice of business to charge factory overheads to the jobs on the basis of 120 per cent of direct labour cost. Calculate the cost of work in progress of job No. 44 on 31st Dec, 2000.

(Ans : RS. 1,25,600)

11. ABC co. civil engineers proposes to make tenders for the construction of an auditorium and estimate their direct cost at Rs. 1,12,500 as follows :

Material	45,000
Wages	47,000
Cost of transport of men and materials to site	12,050
Other Direct Expenses	7,500

Existing commitments of the company are involving a total overheads of Rs. 6,37,875 for various projects and direct labour cost of Rs 4,25,250.

Assuming all the overheads as variable, calculate the estimated value of tender keeping in view the following :

- 1) Necessary overheads.
- 2) 5% interest on total capital outlay, and
- 3) 10% margin on total cost.

(Ans : Estimated value of tender : Rs ,11,798)

4) The following figures are available at the end of a financial year relating to a contract.

Total cost of work done to date	1,10,350
Cost of work uncertified	8,300

contract Price	5,80,000
Value of work certified	1,40,280

Determine the amount of profit to be taken to P&L A/c ;

[Ans : Notional profit : Rs 38,230; Profit taken to P&L a/c - Nil (Value of work certified is less than one-fourth of the contract price)]

12. ABC construction co ltd. took a contract in 2000 for road construction. The contract price was Rs. 5,00,000 and its estimated cost of completion would be Rs. 4,60,000. At the end of 2000, the company had received Rs. 1,80,000 representing 90% of work certified. Work not yet certified had cost Rs. 5,000

Expenditure incurred on the contract during 2000 was as follows :

Materials	25,000
Labour	1,50,000
Plant	10,000

Materials costing Rs. 2,500 were damaged and had to be disposed off for Rs. 500. Plant was considered as having depreciated by 25%. Prepare Contact Account for 2000 in the books of the construction company. Also show the amount of profit that can be reasonably credited to P&L A/C in respect of the contract.

(Ans : Notional profit Rs 30,000 Profit taken to P&L a/c ; Rs 9,000. Since the value of work Certified is more than one fourth of the contract price but less than half, the formula used is :

$$1/3 \times \text{Notional profit} \times \frac{\text{Cash Rieved}}{\text{Work certified}}$$

Problems :

13. R.V. construction company Ltd. have obtained a contract for the construction of a bridge. The value of the contract is Rs. 121 lacs and the work commenced on 1st October, 2000. The following details are shown in their books for the year end 30th september, 1998. Plant purchased Rs. 60,000; wages paid Rs. 3,40,000; Materials issued to site Rs. 3,36,000; Direct expenses Rs. 8,000; General overhead apportioned Rs. 32,000; wages accrued as on 30-9-2001 Rs. 2,800 ; Material at site as on 30-9-2001 Rs. 4000; Direct expenses accrued as on 30-9-2001 Rs. 1,200; Work not yet certified at cost Rs. 14,000; cash received being 80% of work certified, Rs. 6,00,000. Life of plant purchased is 5 years and scrap value is nil.
- 1) Prepare the contract account for the year ended 30th sep, 2001 ,
 - 2) Show the amount of profit which you consider might be fairly taken on the contract and how you have calculated it.

14. Uday construction Ltd, took a contract in 2000 for road construction. The contract price was Rs. 10,00,000 and its estimated cost of completion would be Rs. 9,20,000. At the end of 2000, the company received Rs. 3,60,000 representing 90% of work certified. Work not yet certified had cost Rs. 10,000.

Expenditure incurred on the contract during 2000 was as follows : Materials Rs. 50,000; Labour Rs. 3,00,000; plant Rs. 20,000.

Materials costing Rs. 5,000 were damaged and had to be disposed of for Rs. 1,000. Plant is considered as having depreciated by 25%.

Prepare contract Account for 2000 in the books of Uday construction Ltd. Also show all possible figures that can be reasonably credited to profit and loss account in respect of the contract.

15. The following particulars related to a contract undertaken by Ajit Engineers :

Materials sent to site Rs. 85,349; Labour engaged at site Rs. 74,375 ; plant installed at cost Rs. 15,000; direct expenditure Rs. 3,167 ; Establishment charges Rs. 4,126 ; materials returned to stores Rs. 549 ; work certified Rs. 1,95,000; cost of work not certified Rs. 4,500; Materials in hand at the end of year Rs. 1,883; Wages accrued due at the end of year Rs. 2,400 direct expenditure accrued due at the end of the year Rs. 240 value of plant at the end of the years. Rs. 11,000; The contract price has been agreed at Rs. 2,50,000 ; cash received from the contractee was Rs. 1,80,000.

You are required to prepare contract account showing profit, contractee's account and to show suitable entries, in the balance sheet of the contractors.

16. ACB contractors obtained a contract to build houses, the contract price being Rs. 4,00,000. Work commenced on 1st Jan, 2000 and the expenditure incurred during the year was plant and tools - Rs. 20,000 ; Stores and materials Rs. 72,000; wages Rs. 65,000, Sundry Expenses Rs. 5,300; and Establishment charges Rs. 11,700.

Certain materials costing Rs. 12,000 were unsuited to the contract and were sold for Rs. 14,500. A portion of the plant was scrapped and sold for Rs. 2,300.

The value of plant and tools on sites on 31 dec, 2000 was Rs. 6,200 and the value of stores and materials on hand Rs. 3,400. Cash received on account was Rs. 1,40,000 representing 80% of the work certified. The cost of the work done but not certified was Rs. 21,900. and this was certified later for Rs. 25,000.

ABC decided i) to estimate what further expenditure would be incurred in completing the contract. ii) to compute from this estimated and expenditure already incurred, the total profit that would be mad on the contract; and iii) to take the credit of P/L a/c for the year 2000 that proportion of the total profit which correspond to the work certified by 31st dec, 2000 before to the total contract price. The estimate was as follows :

- a) That the contract would be completed by 30th Sept. 2001.

- b) That the wages on the contract in 2001 would amount to Rs. 71,500.
- c) That the cost of stores and materials required in addition to those in stock on 31st Dec, 2000 would be Rs. 6,000.
- d) That a further Rs. 25,000 would have to be laid out on plant and tools and that residual value of the plant and tools on 30th sep. 2001 would be Rs. 3000.
- e) That the establishment charges would cost the same per month as in 2000.
- f) That 2 1/2% of the total cost of the contract would be due to defects, temporary maintenance and contingencies.

Prepare contract account for the year ended 31st dec, 2000 and show your calculation of the amount credited to the profit and loss a/c. for the year.

17. Three contracts commenced on 1st January and 1st October, 2000 respectively were undertaken by a contractor and their accounts on 31st Dec, 2000 showed the following position

	contract 1	contract 2	contract 3
Contract Price :			
Expenditure :	4,00,000	2,70,000	3,00,000
Materials	72,000	58,000	20,000
Wages paid	1,10,000	1,12,400	14,000
General Charges	4,000	2,800	1,000
Plant installed	20,000	16,000	12,000
Materials in hand	4,000	4,000	2,000
Wages accrued	4,000	4,000	1,800
Work certified	2,00,000	1,60,000	36,000
Cash received in respect			
thereof	1,50,000	1,20,000	27,000
Work finished but not certified	6,000	8,000	2,100

The plant was installed on the date of commencement of each contract ; depreciation thereon is to be taken at 10% per annum. Prepare the contract Account in tabular form and show how they would appear in the Balance sheet as on 31st Dec, 2000.

16.17 Futher Readings :

1. Prasad N.K. Principles and Practice of Cost Accounting
2. Nigam, sharmar shegal - Advanced Cost Accounting.

Lesson - 7**PROCESS COSTING****Objectives :**

The objectives of this unit are :

- K to explain you the theoretical background pertaining to the preparation of process accounts
- K to familiarise you with the preparation of process accounts.

Structure :

- 7.1 Introduction**
- 7.2 Characteristics of Process Costing**
- 7.3 Applicability of Process Costing**
- 7.4 Procedure for Process Costing**
- 7.5 Elements of Cost**
- 7.6 Comparison between Job Costing and Process Costing**
- 7.7 Advantages of Process Costing**
- 7.8 Disadvantages of Process Costing**
- 7.9 Problem areas in Process Accounts**
- 7.10 Key words**
- 7.11 Self - assessment Questions / Exercises**
- 7.12 Further Readings**

7.1 Introduction

Process costing is one of the methods of costing. It is applied to industries where material has to pass through two or more processes before being converted into finished product. The divergent processes are sequential in order so that the output of the earlier stage becomes the input of the succeeding stage, and the output of last stage becomes finished product. Hence, process costing refers to costing of processes involved in transforming materials into finished products. Its main objective is to provide an average cost.

According to Kohler Process Costing is “a method of cost accounting where by costs are charged to process or operations and averaged over units produced”.

I.C.M.A., London defines Process Costing as that form of operation costing, where standardized goods are produced.

Types of Processes

Different processes may be classified into the following categories :

(a) Sequential processes : In case of certain manufacturing units sequential product flow takes place. For instance, when there are three processes in a process manufacturing concern the finished product of process I becomes raw material of process II and the finished product of process II becomes the raw material of process III. Here the processes are sequential

(b) Parallel Processes : In a process manufacturing concern each process may be independent of the other such that the finished product of one process does not become the raw material for the next process. In such a case the processes are known as parallel. The parallel processes may supply their finished products as raw material for a third process. In such a case there is sequential relationship between the third process and each of the parallel processes. If A and B are parallel processes supplying their finished products to process C as raw material each of A and B has sequential relationship with process C.

Similarly, the finished product of say, process X may be used as the raw material for process A, B and C. Here, sequential relationship with process X.

The flow of products out of parallel processes is known as parallel products flow.

(C) Joint-processes : When different products come out of a common process the process is called as joint process. Flow of products from joint process may be called as joint products flow.

(D) Selective Processes : Some times the finished product of a process becomes the raw material for a number of processes in the same plant, depending upon the final products to be obtained. Let there are four processes A, B, C and D. A receives raw materials from stores. Finished output of A goes as raw material to D ; finished product of C partly forms financial output and partly goes, as raw material to D. (In other words, each of A, B and C feeds D) C and D give out final outputs. These processes are called as selective processes. The flow may be varying depending upon the final product or products to be obtained. Flow of product in this case is called as selective product flow.

7.2 Characteristics of Process Costing

The main characteristics of Process Costing are as follows :

1. Production is continuous and the final product is the sequence of a number of processes.
2. The products are homogeneous and standardized.
3. The products are not distinguishable in the processing stage.
4. The finished product of one process is the raw material for the next process and this procedure continues until the final product arrives.
5. The sequence of functions for processing the product is predetermined.

7.3 Applicability of Process Costing

Process costing is applied in the following industries :

- 1) Manufacturing, industries, such as, iron and steel, flour milling cement, paper, rubber, automobile plants, ice, paints industries etc.
- 2) Chemical industries, such as, drugs and pharmaceuticals, soap making, perfumery, distilleries, oil refining, etc.
- 3) Mining, such as, mineral oil, coal sulphur, gold, iron, zinc, gas etc.
- 4) Public utility works, such as electricity generation and distribution, water supply, gas supply etc.

7.4 Procedure For Process Costing

The sequence of operations for processing the product should be pre-determined. While dividing the process type production into different processes, ease in supervision, similarity of operations and plant location may be considered

Each process is treated as a cost centre and an account is maintained for each process. All direct and indirect costs are assigned to different processes on appropriate basis.

Output in terms of units such as kilograms, litres, tonnes, or other units of expression is recorded daily, weekly or on suitable periodical basis depending upon the time required for processing.

Cost per unit/Average cost is worked out by dividing the net cost by effective normal output.

Normal process loss should be charged to the process concerned. In other words it should be absorbed in production. However, abnormal loss/gain should be treated separately and it should influence the normal Units produced.

In case of incomplete units in the process at the beginning and at the end of the period equivalence of incomplete units should be determined.

In case there are by - products and joint products, their share in joint costs should be carefully estimated and credited to the main process.

7.5 Elements of Cost

Let us consider how various elements of production cost are accounted for in each process.

Materials : In process costing, no distinction is shown between direct and indirect materials. All materials issued are debited/charged to the process account concerned. Normally raw materials are introduced only at the first process and this process transforms the materials into output and sends it to the next process as input. In certain cases additional direct materials are issued to the subsequent processes depending upon the nature of production.

Labour : Wages of all workers working exclusively in one process or department are charged to process or department directly. Wages of service departments and also of those workers serving more than one process or department are to be suitably apportioned. For the purpose of ascertaining wages to be directly charged to each process for a period payrolls are directly analysed into the processes.

Direct Expenses : Any expense, other than material or labour (wages), which can be directly traced to a product is charged to that process directly. eg. depreciation and repairs on machinery exclusively used for a process.

Overheads : Any one method of recovery of overhead may be applied to different processes for the purpose of ascertaining the amount of overhead chargeable to each process. The overhead amount is charged to the process account. In the absence of an equitable method overhead is generally recorded in ratio of wages.

7.6 Comparison Between Job Costing and Process Costing.

The following are the differences between Job Costing and Process Costing

Job Costing	Process Costing
1. Production is made against specific orders.	1. Production/Manufacturing is carried on as a continuous activity. It is done in anticipation of demand.
2. Each job is distinctly independent and different jobs are distinctly identifiable with their orders.	2. Products are homogenous and have no separate identity from each other
3. Jobs may or may not have opening or closing work-in-progress	3. As production is continuous there is always work-in-progress.
4. Costs are accumulated for each job	4. Costs are accumulated for each process for a period.
5. Costs are completed when a job is completed.	5. Costs are calculated at the end of the cost period.
6. Jobs are allotted distinct numbers and costs are collected under the specific order number	6. Total cost is consolidated and unit cost is worked out by dividing the total costs by the number of units produced in the process. So unit cost is all average.
7. Costs are not transferred from one job to another unless there is a surplus work or excess production.	7. Costs are transferred from one process to another process.

8. As the character of each product is distinctly different from the other and production is not continuous, more supervision and managerial attention is necessary for control.

9. Cost control is comparatively difficult as each product unit is different and production is not continuous.

8. With the standardisation of processing activities better control can be exercised.

9. Cost control is easy due to uniform production

7.7 Advantages of Process costing

The following are some of the advantages of process costing :

1. It is possible to determine the process cost at short periodical interval. As each process is standardized unit cost can be worked out weekly or even daily with the use of pre-determined rates of materials, labour and over heads.
2. Process costing involves less expenditure and effort on accounting owing to its simple nature
3. It is possible to prepare budget for each process, operation, or department and compare actual cost with a view to securing managerial control by evaluating the performance of each process.
4. Overheads may be allocated to departments or process accurately on definite basis of allocation.
5. Price quotation is easy in process costing because there is standard material consumption and standard expenses of operations.
6. As production is continuous fairly stable standards may be set for production activities.

7.8 Disadvantages of Process Costing

The disadvantages of process costing are as follows :

1. Costs are ascertained at the end of the accounting period. Hence, costs are historical not of much use or effective control. This is true for all other historical cost systems but nature of process costing with various stages of operation makes the disadvantage more prominent.
2. In process costing work-in-progress has to be valued at the end of each process / each cost period. The process costs after adjustment for work-in-progress being divided by the number of units produced, give the unit cost. Value of work-in-progress being only an outcome of estimation, renders process costs inaccurate.
3. Some times different products emerge out of one and the same process. In such cases the common costs are prorated to the various products. Due to this cost of individual products cannot be said to be very accurate and reliable.
4. The unit cost under process costing, represents coverage cost over a period. So day-to-day individual efficiency of performance cannot be judged.

7.9 Problem areas in Process Accounts

Problems in process accounting, excluding those on joint products and by products and inter-process profits, may be classified into the following categories.

- A. Problems without process losses, waste or scrap
- B. Problems with normal or unavoidable loss / scrap
- C. Problems with abnormal loss/scrap
- D. Problems with abnormal gain or effectives
- E. Problems with opening and closing stocks of raw materials
- F. Problems with stocks of output at processes
- G. Problems with work-in-progress.

All the above said problem areas are explained through suitable illustrations.

7.9 A. Problems without process Losses, waste or Scrap

In process accounts of this category process output is equal to process input in all processes. Process losses, wastages or scrap values are not present in all the processes. As and when there is no process loss or wastage the issue of scrap value does not arise. The following illustration explains this.

Illustration : 7.1 Samson Ltd. is a spinning and weaving mill producing coarse cloth. The output which is a coarse painted cloth, is measured in kilograms (kgs.). Costs incurred in the three processes, during a month are as follows :

Basic input at spinning process is 10,000 kg. cotton Rs. 80 per kg.

Particulars	Spinning process	Weaving process	Printing process
Material	Rs. 20,000	Rs. 40,000	Rs. 80,000
Labour	30,000	60,000	1,00,000
Direct expenses	10,000	30,000	50,000
Factory overheads	36,000	44,000	52,000

Office and administrative overheads are Rs. 48,000 and selling overheads are Rs. 32,000. Entire output of 10,000 kg. of cloth has been sold @ Rs. 170 per kg.

Prepare process Accounts, finished goods Account and cost of sales Account.

Solution :

Spinning Process Account

Dr.

Cr.

Particulars	Quantity Kg.	Rate Rs.	Amount Rs.	Particulars	Quantity kg.	Rate Rs.	Amount Rs.
To Input (Basic Material)	10,000	80.00	8,00,000	By Process out put			
To Material		2.00	20,000	transferred to			
To Labour		3.00	30,000	Weaving process A/c	10,000	89.60	8,96,000
To Direct expenses		1.00	10,000				
To Factory overheads		3.60	36,000				
	10,000	89.60	8,96,000		10,000	89.60	8,96,000

Weaving Process A/c

Dr.

Cr.

Particulars	Quantity Kg.	Rate Rs.	Amount Rs.	Particulars	Quantity kg.	Rate Rs.	Amount Rs.
To spinning process A/c	10,000	89.60	8,96,000	By Process out put			
To Material		4.00	40,000	transferred to printing			
To Labour		6.00	60,000	proam a/c	10,000	107.00	10,70,000
To Direct Expenses		3.00	30,000				
To Factory Overheads		4.40	44,000				
	10,000	107.00	10,70,000		10,000	107.00	10,70,000

Printing Process Account

Dr.				Cr.			
Particulars	Quantity Kg.	Rate Rs.	Amount Rs.	Particulars	Quantity kg.	Rate Rs.	Amount Rs.
To weaving process A/c	10,000	107.00	10,70,000	By Process out put transferred to Finished Goods A/c	10,000	135.00	13,52,000
To material		8.00	80,000				
To labour		10.00	1,00,000				
To direct Expenses		5.00	50,000				
To Factory overheads		5.20	52,000				
	10,000	135.20	13,52,000		10,000	135.20	13,52,000

Finished Goods Account

Dr.				Cr.			
To printing process A/c	10,000	135.20	13,52,000	By Finished goods output transferred to cost of sales A/c	10,000	140.00	14,00,000
To office & Administration Overheads		4.80	48,000				
	10,000	140.00	14,00,000		10,000	140.00	14,00,000

Cost of sales Account

Dr.				Cr.			
To Finished Good A/c	10,000	140.00	14,00,000	By sales	10,000	170.00	17,00,000
To Selling overheads		3.20	32,000				
To Profit transferred to Costing P&L A/c.	10,000	26.80	2,68,000				
	10,000	170.00	17,00,000		10,000	170.00	17,00,000

7.9 B Problems with Normal or Unavoidable Loss / Scrap

In several manufacturing processes some material loss is unavoidable. As result normally expected output quantity is less than the input. Normal loss takes place under normal conditions and this must be distributed over normal output. The loss may be in different forms such as :

- i) Weight lost in case of which the dquertion of realisable value does not arise.
- ii) Scrap which may be physically available but it may have no realisable value,
- iii) The scrap which may have realisable value. Normal loss get recluded to the extent of its realisable value.

From i) and ii) are identical for purposes of process accounting

Illustration 7.2 : In a wire making factory daily input is 1,000 kg. of wire @ Rs. 24 per kg. other expenses at the factory are Rs. 14,000. Normal loss is 5% of input and it redises nothing. Acutal output is equal to normal output, i.e., 95% of input i.e., 950 kg. of wire nails. Prepare process A/c.

Solution : Cost per unit = $\frac{\text{All normal costs at the process} - \text{Realisable value of normal scrap}}{\text{Pr ocess input in units} - \text{Normal loss in units}}$

$$= \frac{(1000 \times 24 + 14,000) - \text{nil}}{1000 - 5\% \text{ of } 1000} = \frac{38,000}{950} = \text{Rs. } 40 \text{ per kg.}$$

Process Account

Dr.

Cr.

Particulars	units	Rate Rs.	Amount Rs.		Units	Rate Rs.	Amount Rs.
To Input	1,000	24	24,000	By Weight lost	50	-----	-----
To other Expenses			14,000	By Process output	950	40	38,000
	1,000		38,000		1,000	40	38,000

Illustration 7.2 A : Process input = 1000 kg. @ Rs 24 per kg. Other expenses + Rs. 14,200

Normal loss = 5% of input. Realisable value of normal loss = Rs 4 per kg.

Actual output = Normal output = 950 kg. Prepone the process Account and Normal Loss Account.

$$\text{Solution : Cost per Unit} = \frac{[(1000 \times 24) + 14,200] - \text{Rs } 4 \times 50\text{kg}}{1000 - 5\% \text{ of } 1000} = \frac{38,200 - 200}{950}$$

= Rs. 40 per kg.

Process Account

Dr.

Cr.

Particulars	Units	Rate Rs.	Amount Rs.	Particulars	Units	Rate Rs.	Amount Rs.
To Input	1,000	24	24,000	By Normal Loss A/c	50	4	200
To other expenses			14,200	By process output	950	40	38,000
	1,000		38,200		1,000		38,200

Normal Loss Account

Dr.

Cr.

Particulars	Units	Rate Rs.	Amount Rs.	Particulars	Units	Rate Rs.	Amount Rs.
To process A/c	50	4	200	By cash	50	4	200
	50		200		50		200

Illustration 7.3 : The Harsha chemical Co. Ltd., produced three chemicals during the month of July 1999 by three consecutive processes. In each Process 2 percent of the weight put in lost and 10 percent is scrap which from process (1) and (2) realised Rs. 100 a ton and from process (3) Rs. 20 a ton.

The product of three processes is dealt with as follows :

	Process I		Process II		Process III	
Passed to next process		75%		50%		-----
Stock kept for sale		25%		50%		100%
Expenses incurred :	Process I		Process II		Process III	
	Rs.	tons	Rs.	tons	Rs.	tons
Raw materials	1,20,000	1,000	28,000	140	107,840	1,348
Manufacturing wages	20,500	---	18,520	----	15,000	-----
General expenses	10,300	----	7,240	-----	3,100	-----

Prepare process cost Account, showing the cost per ton of each product.

Process I Account

Dr.				Cr.			
Particulars	Tonnes	Amount Rs.	Particulars	Tonnes	Amount Rs.		
To raw materials	1,000	1,20,000	By loss of weight (2% of 1000 tons)	20	-----		
To Manufacturing wages		20,500	By Sales of Scrap (10 of 1000 tons)	100	10,000		
			By Transfer to ware house	220	35,200		
To General Expenses		10,300	By Transfer to process II (cost per ton Rs. 160)	660	1,05,600		
	1,000	1,50,800		1,000	1,50,800		

Process II Account

Dr.			Cr.		
Particulars	Tonnes	Amount Rs.	Particulars	Tonnes	Amount Rs.
to Transfen from process I	660	1,05,600	By loss of weight (2% of 800 tones)	16	-----
To Raw materials	140	28,000	By Sale of Scrap (10% of tons)	80	8,000
To Manufacturing wages		18,520	By Transfer to ware house	352	75,680
To General Expenses		7,240	By Transfer to process III	352	75,680
	800	1,59,360		800	1,59,360

Process III Account

Dr.			Cr.		
Particulars	Tonnes	Amount Rs.	Particulars	Tonnes	Amount Rs.
To Transfen from process II	352	75,680	By loss of weight (2% of 570 tons)	34	-----
To raw materials	1,348	1,07,840	By Sale of Scrap (10% of 1700 tons)	170	3,400
To Mfg. Wages		15,000	By Transfer to ware house (cost per ton Rs. 132.50)	1,496	1,91,220
To General Expenses		3,100			
	1,700	2,01,620		1,700	2,01,620

7.9. C Problems with Abnormal Loss / Scrap : Any loss due to unexpected or abnormal conditions such as substandard materials, carelessness, accident etc. or loss in excess of the anticipated normal process loss is considered as abnormal process loss. Normal cost of production should not be affected by the abnormal loss. Hence, it is valued like good units and transferred to a seprate account called Abnormal Loss Account. The valuation of abnormal loss should be done with the help of the following formula :

$$\text{Value of Abnormal Loss} = \frac{\text{Normal cost}}{\text{Normal output}} \times \text{Abnormal costs units}$$

All cases of abnormal loss should be looked into careully and suitable steps should be taken by management to prevent their recurrence in future. Where the scrap arising out of abnormal loss possess some value, it should be credited to abnormal loss account and the balance ultimately transferred to costing profit and loss Account.

Illustration 7.4 : In the manufacture of product 'x' 1,000 kgs. of material at Rs. 8 per kg. was supplied to the first process. Labour cost amounted to Rs. 2,000 and production overhead incurred was Rs. 1000. The normal loss has been estimated at 10% which could be sold at Rs. 2 per kg. The actual production of the process was 880 kgs. Show process I Account.

Solution :

Process I Account

Dr.				Cr.			
Particulars	Quantity Rs.	Rate Rs.	Amount Rs.	Particulars	Quantity kg.	Rate Rs.	Amount Rs.
To Direct Materials	1,000	8.00	8,000	By Normal loss	100	2.00	200
To Direct Labour			2,000	By Transferred to Process II	880	12.00	10,560
To production overhead			1,000	By Abnormal loss	20	12.00	240
	1,000		11,000		1,000		11,000

Working Notes :

1. Abnormal loss is calculated as follows :

Normal production

Quantity : Kg. 900

Cost = Rs 10,800

Abnormal loss

quantity = 20 kgs.

$$\text{cost} = \left(\frac{10,800}{900} \times 20 \right) = \text{Rs. 240}$$

Actual production

Quantity = 880 kgs.

$$\text{Cost} = \left(\frac{10,800}{900} \times 880 \right) = \text{Rs. 10,560}$$

2. Further, if scrap value of quantity abnormally lost is (20x2) = Rs 40, to that extent Abnormal loss Account will be credited. Thus net abnormal loss (240-40) = Rs 200 will be transferred to Costing P&L Account.

7.9 D Problems with Abnormal Gain or Effectives : When the actual process loss or wastage is less than the determined percentage of normal loss or wastage, the difference is known as abnormal gain or effectives. Like abnormal loss, abnormal gain should not affect the cost of normal production. The abnormal gain is valued in the same manner as abnormal loss and credited to Abnormal gain Account.

Illustration 7.5 : The particulars for the last process of a manufacturing undertaking are as follows:

	Units	Rs.
Transfer to the last process at cost of the previous process	4,000	9,000
Transfer to be finished stock from the process	3,240	
Direct wages		2,000
Direct materials used		3,000

The factory overhead in the process is absorbed @ 400% of the direct materials.

Allowance for normal loss is 20% of units worked

The scrap value is Rs .5 per unit

You are required to prepare :

- Last process Account
- Normal wastage Account, and
- Abnormal Effectives Account.

Solution :

Last process Account

Dr.

Cr.

Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To Transfer from first process	4,000	9,000	By Normal loss (20% of units worked scrap value @ Rs. 5	800	4,000
To Direct Materials		3,000	By Finished stock @ Rs. 6.875	3,240	22,275
To Direct wages		2,000			
To Factory overhead		12,000			
To Abnormal Effectives	40	275			
	4,040	26,275		4,040	26,275

Normal Wastage Account

To Last process	800	4,000	By Sales (800-40)	760	3,800
			By Abnormal Effectives A/c	40	200
	800	4,000		800	4,000

Abnormal Effectives Account

Dr.			Cr.		
Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To normal Wastage A/c (Loss of income)	40	200	By Last process	40	275
To Profit & Loss A/c		75			
	40	275		40	275

$$\text{Cost per unit} = \frac{22,000}{3,200} = \text{Rs } 6.875$$

Realisation From Empties : In several cases materials are packed in gunny bags, tins, cartons, etc. when purchased. As and when emptied these are sold. Sale of empties is a normal feature and their expected sale proceed is a normal reduction in cost. Hence, normally realisable value of empties should be deducted from the total cost while working out cost per unit.

Illustration 7.6 : Ramesh Ltd. buys 1,000 kg. of input @ Rs. 24 per kg. in 10 gunny bags of 100 kg. each. Other expenses incurred at the process amounted to Rs. 21,400 which included are additional cost Rs 7,000 due to an accident. Normal loss is 5% scrap realises Rs. 4 per kg. and each empty bag is sold for Rs 20. Actual output is 960 kg. of which 250 kg. has been sold @ Rs 60 per kg. and the rest transferred, to the next process. Prepare process Account, Normal Loss Account, Abnormal Gain Account, Empties Account and profit statement.

Solution :

Cost per unit =

All normal costs incurred at the process – Realisable value of normal loss and normal empties
Normal output in units

$$= \frac{[(1,000 \times 24) + (21,400 - 7,000)] - [(50 \times 4) + (10 \times 20)]}{1000 - 50} = \text{Rs } 40.$$

Process Account

Dr.

Cr.

Particulars	Units Kg.	Rate Rs.	Amount Rs.	Particulars	Units kg.	Rate Rs.	Amount Rs.
To input	1,000	24	24,000	By Costing P&L A/c			7,000
To other expenses			21,400	Loss due to accident			
To costing P&L A/c (gain on sale)	250	20	5,000	By Normal Loss A/c	50	4	200
				By Empties A/c	10	20	200
To Abnorma gain A/c	10	40	400	By Bank (Sale)	250	60	15,000
				By process output Transferred to next process	710	40	28,400
			50,800				50,800

Normal Loss Account

Dr.

Cr.

	Units	Rate Rs.	Amount Rs.		Units	Rate Rs.	Amount Rs.
To process	50	4	200	By Bank	40	4	160
				By Abnormal gain	10	4	40
	50		200		50		200

Abnormal Gain Account

Dr.

Cr.

	Units	Rate Rs.	Amount Rs.		Units	Rate Rs.	Amount Rs.
To normal Loss A/c	10	4	40	By process A/c	10	40	400
To costing P&L A/c	---		360				
	10		400		10		400

Empties Accounts

Dr.	Units	Rate Rs.	Amount Rs.		Units	Rate Rs.	Amount Rs.	Cr.
To process A/c	10	20	200	By Bank	10	20	200	
	10		200		10		200	

Income Statement :

Gain on sale of process output - $250 \times 20 = \text{Rs } 5,000$

Abnormal Gain A/c	+ 360
	5,360

Less : Abnormal less due to accident - 7,000

Net Loss Rs. 1,640

Partial Waste and Partial Weight Lost : In manufacturing certain products a portion of input lost is available in the form of waste having some saleable value and a portion just disappears of course realising nothing. For instance, in the process of ginning 95 per cent of input may get converted into fine cotton, 2 per cent may just disappear in atmosphere and 3 per cent may be available as cotton waste with some saleable value. In cases of this type cost per unit and abnormal gain loss is to be carefully calculated giving due consideration to the waste actually available for sale.

Illustration 7.7 : A producer of cotton yarn buys 1000 kgs. of cotton in bags of 100 kg. each at Rs. 24 per kg. Other costs at the process are Rs 14,320. Normal loss is 5% of input. Two-fifth of input lost just disappears and the rest is available as waste which sells at Rs 4 per kg. Each empty bag is sold at Rs. 20. Actual output is 850 kg. Prepare process Account, Abnormal Loss Account and Normal Loss Account.

$$\text{Solution : Cost per unit} = \frac{[(1000 \times 24) + 14320] - \left[(4 \times 50 \times \frac{3}{5}) + (10 \times 20) \right]}{1000 - 50} =$$

$$= \frac{38000}{950} = \text{Rs } 40$$

Process Account

Dr.

Cr.

Particulars	Units Kg.	Rate Rs.	Amount Rs.	Particulars	Units kg.	Rate Rs.	Amount Rs.
To input	1,000	24	24,000	By weight - lost	20	----	----
To other expenses			14,320	By Normal loss A/c	30	4	120
				By Empties A/c	10	20	200
				By Abnormal Loss A/c	100	40	4000
				By Process output	850	40	34000
			38,320				38,320

Normal Loss Account

Dr.

Cr.

	Units	Rate Rs.	Amount Rs.		Units	Rate Rs.	Amount Rs.
To Process A/c	30	4	120	By cash	30	4	120
	30		120		30		120

Abnormal Loss Account

Dr.

Cr.

	Units	Rate Rs.	Amount Rs.		Units	Rate Rs.	Amount Rs.
To Process A/c	100	40	4000	By Bank (100 x 3/5)	60	4	240
				By Weight cost	40		----
				By costing P&L A/c			3760
	100		4,000		100		4,000

Recycling of Materials : In certain cases the nature of the productive process is such that a percentage of output needs to be recycled. It needs to be reprocessed like freshly introduced material. Here normal output is input less normal loss, loss materials to be recycled. Material cost is also reduced by the cost of material to be recycled. This is done by crediting it to process Account.

At times part of materials need reprocessing at an additional cost so as to make them finished product of the process. In cases of this type the reprocessing cost is just like an additional cost to be debited to the process.

These two types of cases are explained in the following two illustrations.

Illustration 7.8 : Process input is 600 units at a cost of Rs. 60 per unit. Other expenses at the process are Rs. 19,080. 5 per cent of input is normal waste. Waste realises Rs 16 per unit. 10 per cent of input needs to be recycled. Actual output is 460 units. Prepare process Account.

$$\text{Solution : Cost per unit} = \frac{[(600 \times 60) - (60 \times 60) + 19080] - [16 \times 600 \times \frac{5}{100}]}{600 - 10\% \text{ of } 600 - 5\% \text{ of } 600}$$

$$= \frac{51,480 - 480}{600 - 60 - 30} = \frac{51,000}{510} = \text{Rs. 100 per unit}$$

Process Account

Dr.				Cr.			
Particulars	Units	Rate Rs.	Amount Rs.	Particulars	Units	Rate Rs.	Amount Rs.
To Direct Material	600	60	36,000	By Normal Loss A/c	30	16	480
To other Expenses			19,080	By Direct Material	60	60	3,600
				By Abnormal Loss A/c	50	100	5,000
				By Process output	460	100	46,000
	600		55,080		600		55,080

Illustration : Same as above illustration but 10% of input is to be reprocessed at a cost of Rs. 20 per unit. There is no recycling of any input. Prepare the process Account.

$$\text{Solution : Cost per unit} = \frac{[(600 \times 60) + (60 \times 20) + 19,080] - (16 \times 600 \times \frac{5}{100})}{600 - 5\% \text{ of } 600}$$

$$= \frac{(36,000 + 1200 + 19,080) - 480}{600 - 30} = \frac{55,800}{570}$$

$$= \text{Rs. 97.894}$$

Process Account

Dr.

Cr.

Particulars	Units	Rate Rs.	Amount Rs.	Particulars	Units	Rate Rs.	Amount Rs.
To Direct Material	600	60	36,000	By Normal Loss A/c	30	16	480
To other expenses			19,080	By Abnormal loss A/c	110	97.894	10,768
To Reprocess cost (60x20)			1,200	By Process Output	460	97.894	45,032
	600		56,280		600		56,280

7.9 E Problems with opening And Closing Stocks of Raw Materials : There may be opening and closing stocks of raw materials in different processes of an undertaking. Therefore cost of raw material consumed in each process has to be worked out. For arriving the raw material consumed in the process we have to add to the opening stock of raw material the purchases for the process from that we have to subtract the closing stock of raw material.

Illustration 7.9 : Cost details at a process are as follows :

Opening stock of raw material = 300 units @ Rs. 28 per unit

Purchases of material = 900 units @ Rs. 30 per unit

Closing stock material = 200 units @ Rs. 30 per unit

Other expenses of the process = Rs 15,600

Normal waste = 10% of Input

Normal waste reatires Rs. 18 per unit

Actual output is 940 units.

$$\begin{aligned} \text{Solution : Cost per unit} &= \frac{[(300 \times 28) + (900 \times 30 - 200 \times 30) + 15,600] - 18 \times 100}{(300 + 900 - 200) - 10\% \text{ of } (300 + 900 + 200)} \\ &= \frac{29,400 + 15,600 - 1,800}{1000 - 100} = \frac{21,600}{900} = \text{Rs } 48 \text{ per unit} \end{aligned}$$

Process Account

Dr.	Rs.		Cr.
			Rs.
To Material			
Opening stock 300 @ 28 = 8,400		By Normal Loss A/c 100 x 18	1800
+ purchases 900 @ 30 = 27,000		By process output 940 x 48	45,120
	35,400		
- Closing stock Rs. 200 @ 30 =	6,000		
Material consumed 1000 units		29,400	
To Other expenses		15,600	
To Abnormal Gain A/c		1,920	
		46,920	46,920

7.9 F. Problems with Stocks of Output At Processes : In certain cases the output of a process is not immediately transferred to the next process but is stocked at the process. Such stock or a part of it may be transferred to the next process at the end of a week or month etc. Here output of a process is first transferred to the process stock A/c from where it may be transferred to the next process. In such cases the transfer to the next process may be valued on the basis of first-in-First out (FIFO), Last-in-first out (LIFO), Weighted average, cost of current production or any other basis. The following illustration explains the flow of process costs.

Illustration 7.10 : The product of a company passes through three separate processes A,B, and C. Normal wastage is :

Process A 4% ; Process B 5% ; Process C 10%

In each case the percentage of wastage is computed on the each number of units entering, the process concerned. The wastage of process A is sold at Re 0.40 per unit, of process B @ Re 0.60 per unit and of process C @ Re. 0.80 per unit.

The following information is obtained for the month of November :

40,000 units of crude material were introduced in process A valued at Rs 30,000

	Process A	Process B	Process C
Material Consumed	Rs. 40,000		
Direct labour	12,000		
Direct expenses	3,840		
Output	38,000	37,000	34,000
Finished Product Stock			
November 1st	6,000	3,000	4,000
November 30	4,000	5,000	9,500
Stock Valuation	Rs.	Rs.	Rs.
Per unit on November 1	2.80	3.60	5.00

Office and administration expenses are Rs. 10,000, Selling and Distribution expenses are Rs 14,000.

Stocks are valued and transferred to subsequent processes at a weighted average cost. Entire output has been sold at Rs. 8 per unit.

Prepare process Accounts, Process stock Accounts, Finished Stock Account, cost of sales Account, Normal loss Account, abnormal loss Account, Abnormal gain Account and costing. P&L Account.

Solution :

Process A Account

Dr.			Cr.		
Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To Units Introduced	40,000	60,000	By normal Wastage		
To materials		40,000	40,000 x 4/100 = 1600 @ . 40	1,600	640
			By Abnormal wastage @ 3.00	400	1,200
To labour		12,000	By Product A Stock		
To direct Expenses		3,840	A/c @ 3.00	38,000	114,000
		40,000		40,000	1,15,840
		1,15,840			

Note : Normal cost per unit at process A = $\frac{(60,000 + 40,000 + 12,000 + 3840) - (0.40 \times 1600)}{40,000 - 4\% \text{ of } 40,000}$

Product A stock Account = $\frac{1,15,840 - 6.40}{38,400} = \text{Rs. } 3 \text{ per unit}$

Product A Stock Account

Dr.

Cr.

Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To stock b/f @ 2.80	6,000	16,800	By process B @ 2.972726	40,000	1,18,910
To process A @ Rs.3	38,000	1,14,000	By Stock c/f @ 2.972726	4,000	11,890
	44,000	130,800		44,000	130,800

Note : Rs. 1,30,800 Distributed in the ratio of 40,000 : 4000

Process B Account

Dr

Cr.

	Units	Amount Rs.		Units	Amount Rs.
To process & stock A/c To Material	40,000	1,18,910 8,000	By normal wastage 40,000 x 5/100 = 2000 @.60	2,000	1200
To labour		6,000	By Abnormal wastage @ 3.60	1,000	3,600
To Direct Expenses		5,090	By Product B Stock A/c @ 3.60	37,000	1,33,200
	40,000	1,38,000		40,000	1,38,000

Note : Normal cost per unit at process B

$$= \frac{(1,18,910 + 8,000 + 6,000 + 5,090) - (0.60 \times 2,000)}{40,000 - 40,000 \times \frac{5}{100}} = \frac{1,38,000 - 1,200}{38,000} = \text{Rs. } 3.60$$

Product B Stock Account

To Stock b/f @ 3.60	3,000	10,800	By Process @ 3.60	35,000	1,26,000
To process B @ 3.60	37,000	1,33,200	By Stock c/f @ 3.60	5,000	18,000
	40,000	1,44,000		40,000	1,44,000

Note : Rs 1,44,000 divide in the ratio of 35000 : 5000

Process C Account

To process B stock A/c @ 3.60	35,000	1,26,000	By normal wastage		
To Material		4,000	35000 x 10/100 = 3500 @ 0.80	3500	2,800
To labour		3,000			
To Direct Expenses		8,400	By product Stock A/c @ 4.40	34,000	149,600
To Abnormal gain @ 4.40	2,500	11,000			
	37,500	1,52,400		37,500	1,52,400

Note : Normal cost per unit at process C =

$$\frac{(1,26,000 + 4,000 + 3,000 + 8,400) - (0.80 \times 3,500)}{35,000 - 3,500} = \frac{141,400 - 2,800}{31,500} = \text{Rs } 4.40$$

Product C Stock Account

To Stock b/f @ 5.00	4,000	20,000	By Transfer to finished stock A/c @ 4.463158	28,500	1,27,200
To Process c @ 4.40	34,000	1,49,600	By stock c/f @ 4.463158	9,500	42,400
	38,000	1,69,600		38,000	1,69,600

Normal Wastage Account

To process A @ 0.40	1600	640	By Cash 1600 @ 0.40	1600	640
To process B @ 0.60	2000	1,200	By Cash 2000 @ 0.60	2000	1200
To process C @ 0.80	3500	2,800	By Cash 1000 @ 0.80	1000	800
			By A and magain A/c 2500 x 80	2500	2000
	7,100	4,640		7,100	4,640

Abnormal Wastage Account

Dr.

Cr.

Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To process A @ 3.00	400	1,200	By Cash meateaticon from Scrap	400	160
To process B @ Rs. 3.60	1000	3,600	@ 0.40 @.60 By Costing P&L ALC	1000 ----	600 4040
	1400	4,800		1400	4800

Abnormal Gain Account

To Normal wastage @ 0.80	2,500	2,000	By Process @ 4.40	2,500	11,000
To costing P&L A/c		9,000			
	2500	11,000		2,500	11,000

Finished Stock Account

To process C stock A/c	28,500	1,27,200	By cost of Sales A/c	28,500	1,37,200
To office & Admn. Exp.		10,000			
	28,500	1,37,200		28,500	1,37,200

Cost of Sales Account

To Finished stock A/c	28,500	1,37,200	By Sales @ Rs. 8	28,500	2,28,000
To Selling & Distin. Ex.		14,000			
To Profit		76,800			
	28,500	2,28,000		28,500	2,28,500

Costing Profit & Loss Account

To Abnormal loss A/c	4,040	By Profit on sale (Cost of Sale A/c)	76,800
To Net Profit	81,760	By Abnormal Gain A/c	9,000
	85,800		85,800

Illustration 7.11 : Prepare the process Account on the bases of the following information.

Transfer from previous process - 1000 units at Rs. 8 per unit.

Labour cost Rs. 1000 Production overheads Rs. 700

Material Rs. 4000

The normal process loss has been estimated at 10% of input, which can be sold at P&L per unit
Actual production realised 850 units.

Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To Transfer from previous Process @ Rs. 8	1000	8,000	By normal Loss A/c	100	200
To Material		4,000	By Abnormal loss A/c	50	750
To Labour		1,000	By process out put @ 15	850	12,750
To production over		700	(Transferred to next process)		
	1,000	13,700			13,700

$$\begin{aligned} \text{Cost per unit of output} &= \frac{\text{Net normal process costs}}{\text{Normal output}} \\ &= \frac{(8000 + 4000 + 1000 + 700) - 100 \times \text{Rs. } 2}{1000 - 10\% \text{ of } 1000} = \frac{13500}{900} = \text{Rs. } 15.00 \end{aligned}$$

Value of output abnormally lost = 50 Units Valued at Rs. 15 perunit = Rs. 750

Illustration 7.12 : The Modern co. Ltd. Processes a patent material used in construction works. The material is produced in three consecutive grades namely soft, medium and hard. Figures relating to production for the six months of 2001 are as follows :

Particulars	Process I	Process II	Process III
Raw material used	1000 tonnes		
Cost per tonne	Rs. 200		
Manufacturing wages and expenses	Rs. 72,500	Rs. 40,800	Rs 10,710
Weight lost	5%	10%	20%
Scrap - sold at Rs 50 tonnes	50 tonnes	30 tonnes	51 tonnes
Sale price per tonne	Rs. 350	Rs. 500	Rs. 800

Management expenses were Rs 17,500 ; Selling expenses Rs 10,000 and interest on borrowed capital Rs 4,000.

Two thirds of process I and one half of process II are passed on to the next process and the balances are sold.

You are required to prepare process cost accounts in a form suitable for presentation to the Directors at their next board meeting when the production policy of the company will be discussed.

Solution :

Process Account

Dr.			Cr.		
Particulars	Tonnes	Amount Rs.	Particulars	Tonnes	Amount Rs.
To Material @ Rs. 200 per tonne	1,000	2,00,000	By sale of scrap @ Rs 50 per tonne	50	2500
To wages and expenses		72,500	By loss in weight	50	
			By Transfer to process I Stock A/c Rs. 300 per tonne	900	2,70,000
	1,000	2,72,500		1,000	2,72,500

Process I Stock Account

To process No. 1	900	2,70,000	By Sales @ Rs. 350 per tonne	300	1,05,000
To profit @ Rs. 50 per tone on 300 tonnes		15,000	By Process II Account	600	1,80,000
	900	2,85,000		900	2,85,000

Process II Account

To process I Stock A/c	600	1,80,000	By Sale of scrap @ Rs. 50 per tonne	30	1,500
To wages and expenses		40,800	By Loss in weight 10 %	60	-----
			By process II Stock A/c @ Rs. 430 per tonne	510	2,19,300
	600	2,20,800		600	2,20,800

Process II Stock Account

Dr.			Cr.		
Particulars	Tonnes	Amount Rs.	Particulars	Tonnes	Amount Rs.
To process II A/c	510	2,19,300	By sales @ Rs. 500 per tonne	255	1,27,500
To profit Rs 70 per tonne on		17,850	By process III A/c	255	1,09,650
	510	2,37,150		510	2,37,150

Process III Account

To process II Stock A/c	255	1,09,650	By Sales of Scrap @ Rs 50 per tonne	51	2,550
To wages and expenses		10,710	By loss in weight 20%	51	----
			By process III Stock A/c @ Rs 770 per tonne	153	1,17,810
	255	1,20,360		255	1,20,360

Process III Stock Account

To process III A/c	153	1,17,810	By Sales @ Rs. 800 per tonne	153	1,22,400
To profit @ Rs. 30 per toone		4,590			
	153	1,22,400		153	1,22,400

Profit and Loss Account

To Management exp.	17,500	By Process I Stock A/c	15,000
To selling expenses	10,000	By Process II Stock A/c	17,850
To Interest on capital	4,000	By process III Stock A/c	4,590
To net profit	5,940		
	37,440		37,440

7.9 G : Problems With Work-In-Progress : In all the earlier illustrations we have not considered the existence of work-in-progress in the process. It has been assumed that all units put-into the process have been completed. But in manufacturing concerns, such a situation seldom exists. At the end of a particular accounting period work-in-progress exists at various stages of completion.

Work-in-progress refers to partly completed units in the process. As most of the processing units run their operations on a continuous basis there will be some work-in-progress, i.e., uncompleted units at the end of the accounting period.

Difficulties Due to Existence of Work-in-progress : Problems due to the existence of uncompleted at the end of the accounting period can be understood with the help of the following example.

During a year a manufacturer has produced 4000 complete tables and 1500 tables are incomplete at the end of the accounting year. With respect to 1500 incomplete tables, 1500 table tops and 1500 $\times 4 = 6,000$ legs have been made, but supporting stocks are yet to be made and these are to be joined and polished, etc. The total cost incurred on these completed and partly completed tables amounted to Rs. 3,99,500. We have to find out the total cost of 4,000 completed tables and 1500 incomplete tables and per unit cost of completed tables.

Cost per completed table is not Rs. $3,99,500 \div 5,500$. It is less than that because total cost of Rs. 3,99,500 includes cost incurred on 1500 incomplete tables. It is also not Rs. $3,99,500 \div 5,500$, but more because for having 5,500 completed tables, some more cost is to be incurred on completing 1500 incomplete tables. For the same reason there is a problem in arriving at the cost of 4,000 completed and 1,500 incomplete tables.

Equivalent Production : The above said problem can be solved by working out equivalent production. Equivalent production refers to the estimation of the equivalent of partly completed units in comparison with the completed units. For instance, in the above case the manufacturer may be in a position to estimate that incomplete tables are broadly how much complete. In other words these incomplete tables have consumed what percentage of cost required for a complete table. Consider that the producer estimates that 1500 incomplete tables are on an average $2/3$ rd complete. They have

consumed that much cost which is required for $1500 \times \frac{2}{3} = 1,000$ completed tables. Thus 1,500 incomplete tables are equivalent to 1000 completed tables. This will solve the entire problem.

Now 4,000 completed + 1500 incomplete tables are equivalent to 4000 + 1000 i.e., 10,000 completed tables.

$$\therefore \text{cost per completed tables} = \frac{\text{Rs. } 3,99,500}{5,000 \text{ tables}} = \text{Rs } 39.95$$

Cost of completed (finished) output of 4000 tables = Rs 39.95 x 4,000 = Rs. 3,19,600

Cost if WIP of 1500 tables = Rs 79.90 x 1000 = Rs 79,900

It should be remembered that the degree or stage of completion of work-in-progress may be quite different from that of the opening work-in-progress.

Relevant Statements in the preparation of process Accounts : In case of problems with WIP the following are the relevant statements in the preparation of process accounts.

- a) Statement of Equivalent Production,
- b) Statement of cost per unit, and
- c) Statement of Apportionment of cost incurred during the period.

After preparing the above statements the process account can be made. Steps involved in the preparation of these statements are indicated below :

a) The statement of Equivalent production is the most important statement. This upon the method of valuation of work-in-progress followed.

Methods of valuation of work-in-progress : The valuation of work-in-progress may be based on any one of the following methods :

i). Average cost Method : This method is follow when input prices fluctuate. The cost of closing WIP of the previous period becomes the cost of opening WIP of the current period. The Opening WIP is added to the expenditure incurred during the current period on completing the opening WIP and the brush input units and are average rate is worked out. While working out equivalent production opening WIP are included in the units completed and transferred.

ii) First-in-First-Out (FIFO) Method : It is assumed, under this method, that material on process moves on a FIFO basis which means that unfinished work on the opening stock is completed first before the new materials put into process are taken up. It is assumed that sq. unit from opening WIP will be left incomplete and some of them will find a place in the closing WIP.

Under this method, the cost added in each process during the current period is pro-rated to the production necessary to complete the opening WIP, to complete the units introduced and completed during the period and to partially completed units in the closing WIP. The cost is divided by the equivalent production during the period. The purpose of this method is to value the closing WIP at current cost. The main difficulty under this method is to compute the equivalent production.

iii) Last-in-First-Out Method : This method is based on the assumption that units introduced last are processed and completed first. On account of this reason the units completed during the current period are valued at current costs and the closing WIP appears wholly or partly at the rates at which opening, WIP appeared.

B) Statement of cost per unit will be prepared by computing per unit material cost, per unit labour cost and per unit overhead cost. For finding out per unit material cost from the total material cost realisable normal loss (if any) is deducted and the resulting figure will be divided by the respective output in equivalent units. The other two per unit costs are also worked out by dividing each cost element with the respective output in equivalent units.

c) In the next stage is concerned with finding out the cost of completing opening WIP, cost of producing fresh output, cost of closing WIP and cost of abnormal loss or gain. For this the "statement of apportionment of cost" is prepared.

d) After preparing the above mentioned statements the process Account is drawn by showing cost of opening WIP, costs of materials, labour overheads on the debit side and the cost of abnormal loss, process output and closing WIP on the credit side.

Illustration 7.13 : Opening Work-in-progress - 1000 units Degree of completion :

Materials 80%, Labour 60%, Overhead 60%

Units introduced 4,000 Units

Closing Work-in-progress 1500 units. Degree of completion : Material 80%, Labour 60% overhead 60% Find out equivalent production using Average method and FIFO Method, assuming that there is no process loss.

Solution :

(a) Computation of Equivalent - Production (Average Method)

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			%	Units	%	Units	%	Units
1,000	Opening WIP							
4,000	Units Introduced							
	Completed Output	3,500	100	3,500	100	3,500	100	3,500
	Closing WIP	1500	80	1200	60	900	60	900
5,000	Equivalent production	5,000		4700		4400		4400

(b) Computation of Equivalent Production (FIFO Method)

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			%	Units	%	Units	%	Units
4,000	Units Introduced							
1,000	Opening WIP							
	Completed	1,000	20	200	40	400	40	400
	Introduced and freshing completed	2,500	100	2,500	100	2,500	100	2,500
	Closing WIP	1,500	80	1,200	60	900	60	900
5,000	Equivalent Production	5,000		3,900		3,800		3,800

Illustration 7.14 : A manufacturing firm produces standard electric meters in one of its departments. From the following particulars relating to a job of 50 meters, you are required to prepare the statement of equivalent production and determine the value of the WIP and the finished goods :

(a) Costs Incurred as per if card :

Direct Material Rs. 15,000

Direct labour Rs. 4,000

Overheads Rs. 12,000

(b) Selling price per meter Rs. 900

(c) Selling and distribution expenses 30% of the sale value

(d) 25 meters are completed and transferred to the stock of finished goods.

(e) Stage of completion of closing WIP : Direct materials 100%, Direct labour 60%, overhead 60%

Solution :

Statement of Equivalent Production

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			%	Units	%	Units	%	Units
50	Input							
	Finished output	25	100	25	100	25	100	25
	WIP at the end	25	100	25	60	15	60	15
50	Equivalent Production	50		50		40		40
	Cost (Rs.)	31,000	15,000		4,000		12,000	
	Cost per unit		15,000/50		4,000/40		12,000/40	
		Rs. 700	=Rs.300		Rs. 100		RS. 300	

Value of WIP :

	Rs.
Materials 25x300	7,500
Labour 15 x 100	1,500
Overheads 15 x 300	4,500
	<u>13,500</u>

Cost of Production per unit of finished goods @ Rs. 700 = 25 x 700 = Rs 17,500, Net Realisable Value of Finished Goods

Selling price per unit 900

Net realisable value per unit 270

630

Note : Finished goods are valued at cost or market value which ever is lower, Finished stock is valued at Rs. 630 per unit i.e., at 25 x Rs. 630 = Rs 15,750 for financial purpose of profit determination.

Illustration 7.15 : During the month of June 4,000 units were introduced into process x The cost of 4,000 units was Rs 46,400. At the end of the month 3,000 units had been produced and transferred to process Y. 720 units were still in process and 280 units were scrapped. A normal wastage of 5% on input is allowed. It was estimated that incomplete units have reached a stage in production as follows :

Material 75% complete, Labour 50% complete, production overhead 50% complete.

The costs incurred in addition to that on 4,000 units introduced were

Direct Materials Rs. 12,320

Direct wages Rs. 27,520

Production overheads Rs. 13,760

Units scrapped realised Rs. 2 each were 100% complete as regards material, labour and overheads. Prepare the process account and abnormal wastage account.

Statement of Equivalent production in June.

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			%	Units	%	Units	%	Units
4,000	Units introduced							
	Normal Wastage	200	----	----	----	----	----	----
	Abnormal Wastage	80	100	80	100	80	100	80
	Finished output	3,000	100	3,000	100	3,000	100	3,000
	Closing WIP	720	75	540	50	360	50	360
4,000	Equivalent Production	4,000		3,620		3,440		3,440

Statement of Cost per Unit

Particulars	Cost	Equivalent Production Units	Cost per unit Rs.
Material :			
Cost of Units introduced :46,400			
Other direct material 12,320			
58,720			
Less : Value of Scarp 800 (200 units @ Rs. 4)	57,920	3,620	16
Labour	27,520	3,440	8
Overheads	13,760	3,440	4
Total		-----	28

Statement of Apportionment of process Cost Incurred in June.

Output Items	Cost Elements	Equivalent Production units	Cost per unit Rs.	Cost Rs.	Total Cost Rs.
Units introduced and completed	Material	3,000	16	48,000	84,000
	labour	3,000	8	24,000	
	Overheads	3,000	4	12,000	
Abnormal wastage	material	80	16	1280	2,240
	Labour	80	8	640	
	overheads	80	4	320	
Closing WIP	Material	540	16	8,640	12,960
	Labour	360	8	2,880	
	Overheads	360	4	1,440	

Process x A/c

Dr.

Cr.

Particulars	Units	Amount Rs.	Particulars	Units	Amount
To Units introduced	4,000	46,400	By Normal wastage	200	800
To Material		12,320	By Process A/c	3,000	84,000
To Labour		27,520	By Abnormal Wastage	80	2,240
To Overheads		13,760	By closing WIP	720	12,960
	4,000	1,00,000		4,000	1,00,000

Illustration 7.16 : The following details are given in respect of Simson Ltd. for the month of April. Prepare (a) Statement of Equivalent production (b) Statement of Apportionment of cost and (c) Process Account

1. Opening Stock as on 1st April @ Rs 8 per unit	200 Units
Degree of completion : Material 100%, Labour & overheads	40%
2. Introduced during April	1,050 Units
3. Transfer to next process	1,100 Units
4. Closing Stock as on 30th April	150 Units

Degree of completion : Material 100%, Labour and overhead 70% Other relevant information regarding the process account is :

Material Cost	Rs. 6,300
Labour Cost	9,000
Production overhead	4,500
Total	19,800

Solution :

(a) Statement of Equivalent Production During June

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			%	Units	%	Units	%	Units
1,050	Input introduced							
200	Opening WIP	200	---	---	60	120	60	120
	Freshly introduced and completed (1,100 - 200)	900	100	900	100	900	100	900
	Closing Stock	150	100	150	70	105	70	105
1,250		1,250		1,050		1,125		1,125

(b) Statement of cost per unit

Particulars	Material Rs.	Labour Rs.	Overheads Rs.
Current costs	6,300	9,000	4,500
Equivalent production units 1,050	1,125	1,125	
Cost per unit	Rs. 6	Rs. 8	Rs. 4

(c) Statement of Apportionment of cost Incurred in June.

Particulars	Cost Elements	Eq Produ..	Cost per unit Rs.	Cost Rs.	Total Cost Rs.
Opening WIP	Material	-----	-----	-----	
Completion Cost in June)	Labour	120	8	960	
	Overheads	120	4	480	1,440
Freshly introduced and completed		900	18		16,200

Closing WIP	Material	150	6	900	
	Labour	105	8	840	
	Overheads	105	4	420	2,160
Total Cost					9,900

Process Account

Dr.			Cr.		
Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To opening WIP	200	1,600	By output transferred to next process	1,100	19,240
To Material	1,050	6,300			
To labour		9,000	By Closing WIP	150	2,160
To Overheads		4,500			
	1,250	21,400		1,250	21,400

Cost of output transferred to next process :

	Rs.
Opening WIP 200 Units @ Rs.8	1,600
Completion cost on opening WIP	1,440
Total cost of first 200 units	3,040
Introduced and completed during June 900 units @ Rs. 8	16,200
Total Cost of 1,100 units transferred to next process :	19,240

Illustration 7.17 : The following particulars are given in respect of a process unit of a manufacturing Undertaking for the month of May :

Physical Data :

Work-in-progress on 1st May (50% Completed)	20,000 units
Receipt during the period	1,80,000 Units
Issues to the next process	1,70,000 units
Work-in-progress as on May - 31st (50% completed) 26,000 Units.	

Financial Data :

Work-in-Progress as an 1st May :

Cost incurred from previous process	Rs. 40,000
Cost incurred in this process total	Rs. 12,000
Total	Rs. 52,000

Cost transferred from the previous department during the month Rs 3,63,600

Cost incurred in the process during the month Rs. 1,92,960

Calculate the cost units in process on 31st May, and the cost of the units transferred to the next process, using FIFO method of inventory valuation. (Ignore lost units as normal)

Solution : Normal Loss = $(20,000 + 1,80,000) - (1,70,000 + 26,000) = 4000$ units

Statement of Equivalent Units and Cost during May

Input Units	Particulars	Output Units	Equivalent Units Previous process	This process
20,000	Opening work-in-progress			
1,80,000	Receipts during May	20,000		
	Normal Loss	4,000		
	Processed during the period (1,70,000 - 20,000)	1,50,000	1,50,000	1,50,000
	Closing work-in-progress	26,000	13,000	13,000
		2,00,000	1,63,000	1,73,000

(iv) Process cost for the period are :

Material Rs 5,00,000 labour Rs 3,90,000 overheads Rs. 1,95,000

(v) The stage of completion of units in closing WIP :

Material 100% labour 50% and overheads 50% you are required to prepare a statement of equivalent production and statement of cost. Also find the value of (i) Output transferred, and (ii) closing work-in-progress, Using average cost method.

Solution :

Statement of Equivalent production

Input Units	Particulars	Output Units	Equivalent Production					
			Material		Labour		Overheads	
			%	Units	%	Units	%	Units
5,000	Opening WIP							
17,500	Input Transferred to next process	17,500	100	17,500	100	17,500	100	17,500
	Closing WIP	5,000	100	5,000	50	2,500	50	2,500
22,500		22,500						
	Equivalent Production			22,500		20,000		20,000

Statement of Cost per unit

Partiulars	Total Rs.	Material Rs.	Labour Rs.	Overheads Rs.
Cost Incurred :				
Opening WIP cost	60,000	37,500	15,000	7,500
Add current cost	10,85,000	5,00,000	3,90,000	1,95,000
Total cost	11,45,000	5,37,500	4,05,000	2,02,500
Equivalent prodn		22,500	20,000	20,000
Cost per unit	54.2638	23.8888	20.250	10.1250

*Cost per unit = Total cost ÷ Eq. prodn

Statement of Apportionment of cost

Particulars	Eq.units	x	cost per unit Rs.		Total cost Rs.
Cost of output transferred	17,500	x	54.2638		9,49,618
Cost of closing WIP :					
Material	5,000	x	23.8888	1,19,444	
Labour	2,500	x	20.250	50,625	
Overheads	2,500	x	10.1250	25,313	1,95,382
Total cost of output	30,000	x	5,42,500		11,45,000

7.10 Key Words

Normal loss : Lost of material which is inherent in the processing operation. This is unavoidable and this must be distributed over normal output.

Abnormal Loss : Any loss due to unexpected or abnormal conditions such as substandard materials, carelessness, accident etc. or loss in excess of the anticipated normal process loss.

Abnormal Gain or Effectives : When the actual process loss or wastage is less than the determined percentage of normal loss or wastage the difference is known as abnormal gain.

Recycling of material : Reprocessing of material like freshly introduced material.

Work-in-progress : Partly completed units in the process or uncompleted units in the process at the end of the accounting period.

Equivalent production : This refers to the estimation of partly completed units in comparison with the completed units.

7.11 Self-assessment Questions / Exercises :

1. What is process costing ? Mention the categories of industries where this method of costing is applied
2. Describe the general features of process costing. Name four industries where process costing can be applied.
3. In what way process costing differs from job costing ? What are the advantages and limitations of process costing.
4. Describe briefly the procedure of recording process costs.
5. Write short notes on process costing.

6. What do you understand by normal and abnormal waste of materials during process manufacture? State briefly how each should be treated in cost accounts.
7. In process accounts abnormal loss rauls with good production. Elucidate how abnormal loss is absorbed.
8. Distinguish between process loss and scrap
9. Write short notes on 'Recycling cost of units at a process' and Treatment of abnormal effectives.
10. What is abnormal effectives ? State with an example when this could arise.
11. What do you understand by 'Equivalent Production' ?
12. The value of scrap generated in a process should be credited to the process Account. Do you agree with the statement ? Give reasons.
13. Analyse the methods of 'FIFO and 'Average cost' for transfer of output in the next process where both opening and closing work-in-progress exist in a process account.
14. Explain normal wastage, abnormal wastage and abnormal gain and stae how they should be dealt with in process cost accounts.
15. From the following particulars calculate :
 - (1) the realisable value of Normal Loss
 - (2) the value of abnormal loss
 - (3) Lost per unit of completed output of process - I, and
 - (4) Show how the process - 1 accounts will appear in the books.

Input of raw material to process I 20,000 kg

@ Rs. 6/- per kg.

Direct labour cost Rs 42,000

Expenses Rs. 48,000

Scrap value of process loss Rs 1/- per kg.

Actual output 18,500 kg.

Normal process loss on input 5%

(Ans.) = Rs. 1000, (2) Rs. 5,000 (3) Rs. 11)

16. Product is produced after three distinct processes. The following information is obtained from process accounts of a period.

Item	Total	Processes		
		I	II	III
Direct Materials	2,200	Rs. 1,800	Rs. 300	Rs. 100
Direct Wages	400	100	200	100
Direct expenses	500	300	---	200

Production overhead incurred is Rs. 800 and is recovered on 200% of direct wages. Production during the period was 100 kgs. There was no opening or closing stock. Prepare process cost accounts.

(Ans. cost per unit in process I Rs. 24, process II Rs. 33, Process III Rs. 39)

17. From the following information relating to process A Prepare process account and abnormal loss account. Material introduced into the process : 10,000 units @ Rs. 1 each ; labour cost Rs. 15,000 ; overheads Rs. 20,000, normal loss 10% ; output 8,500 units.

(Ans. Abnormal loss 500 units @ Rs. 5 per unit)

18. In a factory, 10,000 kgs. of material was transferred from process No. 1 to process No. 2 at a cost of Rs. 80,000 In process No. 2 the following costs were incurred :

Wages	Rs. 6,000
Overheads	Rs. 4,000
Sundry Materials	Rs 2,000

In process 2, 10% of the input is normally lost, Actual output was 9,200 kg. wastage batches Rs. 2 per kg. Prepare process No. 2 account.

(Ans. Abnormal gain 200 kg. at Rs 2,000 finished goods transferred 9,200 kg @ Rs 10 per kg)

19. Particulars	Process		
	A	B	C
Output (Units)	14,000	13,200	11,700
Process loss (units)	1,000	800	1,500
Input	15,000	14,000	13,200

Normal loss % on

Input units	4%	5%	10%
Costs Incurred :	Rs.	Rs.	Rs.
Materials	45,000	20,000	7,000
Labour	12,500	10,000	6,750
Overheads	12,500	12,500	18,750

From the above details, work out the process A/c Showing clearly the treatment of normal and abnormal loss.

(Ans. Abnormal wastage in process A 400 units at Rs. 1944 ; process B 100 units at Rs. 831; Process C 180 units at Rs. 2,155)

Units transferred and their values :

From A to B 1400 units at Rs 68,056

From B to C 13,200 units at Rs 1,09,725

From C to finished stock A/c 11,700 units at All, 40,070)

20. From the following information, prepare a process account : Transfer from previous process : 1000 units at Rs. 4 per unit. labour cost Rs. 500, Material Rs. 2,000 production overhead Rs. 350. The normal process loss is estimated at 10% of the input which can be sold at 1 Rs per unit. Actual production was 850 units.

(Ans. Abnormal loss 50 units @ Rs 7.50 per unit)

21. The product of a manufacturing concern passes through two processes A and B, and then to the finished stock. It is ascertained that in each process normally 5% of the total weight is lost and 10% is scrap which from process A and B realises Rs.80 per tonne and Rs. 200 per tonne respectively. The following are the figures relating to both the processes.

	Process A	Process B
Material (tonnes)	1,000	70
Cost of Materials (Rs.)	125	200
Wages (Rs.)	28,000	10,000
Manufacturing expenses (Rs.)	8,000	5,250
Output (tonnes)	830	780

Prepare process cost account showing cost per tonne of each process. There was no stock of work-in-progress in any process.

(Ans. Rs. 180, Rs. 210)

22. The product of a manufacturing concern passes through two process X and Y and then to the finished stock. It is noticed that in each process 10% of the total weight put in is lost and 5% is scrap.

	Process x	Process Y
Material consumed in tonnes	500	35
Cost per tonne	Rs. 75	Rs. 100
Manufacturing wages	Rs. 9,000	Rs. 6,000
Direct expenses	Rs. 3,000	Rs 2,500

The scrap is realised at Rs 40 per tonne the process x and Rs 100 per tonne in the process y. Prepare the process cost account.

(Ans. Cost per tonne Rs 114.16, Rs. 148.85)

23. Make out the necessary accounts from the following details :

	Process A	Process B
Materials	30,000	3,000
Labour	10,000	12,000
Overheads	7,000	8,600
Input (units)	20,000	17,500
Normal loss	10%	4%
Sales Value of wastage per unit	1	2

There was no opening or closing stock or work-in-progress. Final output from process B was 17,000 units.

(Ans. Process A - Abnormal loss 500 units Rs. 1,250 transferred to process B, Rs. 43,750, Process B - Abnormal gain 200 units Rs. 785 ; Finished goods cost Rs. 66,735)

24. A product Passes through two distinct process A and B and then to finished stock. From the following information you are required to prepare process accounts.

	Process A Rs.	Process B Rs.
Material consumed	12,000	6,000
Direct labour	14,000	8,000
Manufacturing expenses	4,000	8,000
Input in process A (units)	10,000	
Input process A (Value)	10,000	
Output (units)	9,400	8,300
Normal loss (% of input)	5%	10%
Value of normal loss (per 100 units)	8	10

No opening or closing stock is held in process.

(Ans. Output cost - A Rs. 39,539, B. Rs. 56,359)

25. A product of a chemical enterprise passes though two processes A and B, and then to the finished stock. The normal wastage of each process is a follows :

Process A	3%
Process B	5%

The wastage of process A was sold @ Rs. 2.50 per unit and that of process B @ Rs. 5 per unit. 10,00 units were issued to process A in the beginning of April 1999 at a cost of Rs. 10 per unit. The expenses were as under.

	Process A Rs.	Process B Rs.
Sundry materials	10,000	15,000
Wages	50,000	80,000
Manufacturing expenses	10,500	11,880

The actual output of process A was 9,500 units and that of process B, 9,500 units. There were no opening or closing stocks.

Prepare the process accounts and determine the cost per unit of the finished product. Briefly explain the treatment of wastage in the process accounts.

(Ans. Process A abnormal wastage Rs 3,490, Transfer 9,500 units @ Rs. 17.45 = Rs. 1,65,760. Process B abnormal gain Rs. 2,250. Cost per unit Rs 30 approx)

26. X Ltd. processes a patent material used in buildings. The material is produced in three consecutive grades soft, medium and hard.

	Process I	Process II	Process III
Raw material used	1000 tonnes		
Cost per tonne	Rs. 200		
Manufacturing wages and expenses	Rs. 87,500	Rs. 39,500	Rs. 10,710
Weight lost (% of input of the process)	5 %	10 %	20 %
Scrap (Sale price Rs. 50 per tonne)	50 tonnes	30 tonnes	51 tonnes
Sale price per tonne	Rs. 350	Rs. 500	Rs. 800

Management expenses were Rs. 17,500 and selling expenses Rs. 10,000

Two thirds of the output of process I and one half of the output of process II are passed on to the next process and the balances are sold. The entire output of process III is sold. Prepare process accounts.

(Ans. Cost of process I - Rs. 2,85,000, II - Rs 2,28,000; III Rs. 1,22,160 ; total loss Rs 3,760;

27. The following figures show the cost of three processes of manufacture. The production of each process is passed on to the next process immediately on completion.

	Process I	Process II	Process III
Direct material	Rs. 2,000	Rs. 3,020	Rs. 3,462
Wages	3,500	4,226	5,000
Production overheads	1,500	2,000	2,500

1,000 units were issued process I @ Rs. 5 each.

	Normal Loss	Actual production
Process I	10%	920 units
Process II	5%	870 units
process III	10%	800 units.

The wastage realisation is as follows :

Process I	Rs. 3 per unit
process II	Rs. 5 per unit
Process III	Rs. 6 per unit

Prepare the necessary accounts

(Ans. Abnormal gain : Process I 120 units and process III 17 units : abnormal loss : process II 4 units Cost per unit : Rs. 13, Rs. 40)

28. A manufacturing company makes a product by two processes. For the month of June 1992, information recorded for the second process was the a work-in-process balance of 400 units brought forward from May 1992 was valued at Rs 5,760. During June 1992 17040 units were transferred from the first to the second process at a cost of Rs. 1,32,320. Costs incurred by the second process were :

	Rs.
Direct materials used	64,288
Direct wages	31,696
Overhead	15,848

The transfer of finished goods to the stock was 15,120 units. Units scrapped during the period were 880. Work-in-process at the end of the month were 1,440 units.

There was a normal loss of 5% of production. Units scrapped were sold at Rs. 3 each.

The particulars relating to degree of completion were as under :

	Degree of completion		
	Opening Stock	Closing Stock	Scrapped
Direct material	70%	80%	100%
Direct wages	50%	60%	80%

Show the account of second process and also other necessary accounts.

(Ans. Cost per unit Rs. 15; Abnormal loss Rs. 1,152)

29. A fertiliser factory sells fertilisers after the third stage. The particulars are :

	Stage I	Stage II	Stage III
Material (Tons)	100	35	82
Rate per ton	Rs. 50	150	25
Direct Wages	Rs. 4,000	1,745	1,425
Direct expenses	Rs. 1,260	1,200	1,910
Finished goods sent to godown for sale	25%	50%	100%
To the next stage	75%	50%	---
Rate per ton of scrap	Rs. 40	Rs. 30	Rs. 6
Loss in weight at every stage	5%		
Scrap	9%		

Fertilisers were sold at a profit of 25%. The transfers at different stages were made on actual costs.

Prepare process accounts and ascertain the sale price.

(Ans. Cost per ton : Rs 115.12, Rs. 278.35, Rs. 255.25; Sale price at Stage III Rs. 319 approximately)

30. In a process engineering factory A product has to pass through three distinct processes before it is ready for sale. From the information appended below, work out the selling price of the product if the management decides to have a mark up of 25 % over its works cost.

1. Stage of production	I	II	III
2. Input of raw materials at Rs. 4 per kg.	1,00,000 Kg		
3. Normal loss of input in each stage	5%	5%	5%
4. Delivered to next process (kg.)	90,000	80,000	
5. Total Direct labour cost (Rupees)	14,000	15,000	30,000

6. Variable overheads % on direct labour	150	120	100
7. Fixed overheads % on direct labour	250	140	200
8. Finished stocks held back at the stage		4,000	4,000

For the purpose of this exercise abnormal loss, if any, may be charged to the respective stages since output of each stage can also be diverted to other processes for manufacture of other chemicals.

(Ans. Selling price Rs. 9.9)

31. A product passes through three processes, A, B and C. 10,000 units at a cost of Rs. 1 were issued to process A. The other direct expenses were :

	Process A	Process B	Process C
Sundry materials	1,000	1,500	1,480
Direct labour	5,000	8,000	6,500
Direct expenses	1,050	1,188	1,605

The wastage of process A was 5% and process B 4%. The wastage of process A was sold at Rs. 0.25 per unit and that of B at Rs. 0.50 per unit and that of C at Rs. 1.00 per unit. The overhead charges were 168 % of direct labour, The final product was sold at Rs. 10.00 per unit, fetching a profit of 20% on sales. Find the percentage of wastage in process C.

(Ans. 5% wastage in process C = 456 units)

Equivalent Production

32. XYZ company has a single process :

Opening work-in-progress 8,000 units.

Cost : Material	Rs. 29,600
Wages	Rs. 6,600
Overhead	Rs. 5,800

During the period the input was 32,000 units

Additional costs were, material Rs. 1,12,400 ; wages Rs. 33,400 ; overhead Rs. 30,200

At the end of the year 28,000 units were fully processed and 12,000 units were in process. The value of the closing stock includes the full cost of materials and only one third of the cost of wages and overheads.

Tabulate the production and cost figures to give quantities, unit values, total value of completed output and detailed values for the closing work-in-process.

(Ans. Equivalent Units M = 40,000 ; Land O = 32,000 cost per M 3.55 ; L 1.251 01.25)

33. During a month 2,000 units of raw materials at a cost of Rs. 9,500 were issued to process A. At the end of the month 1,500 units had been produced 300; units were still in the process and 200 units had been scapped.

A normal wastage of 5% is allowed. The work-in-progress is complete :

100% as regards raw materials

75% as regards other materials, and

50 % as regards labour and overheads

The total costs incurred were (in addition to raw materials)

	Rs.
Materials	1,825
Direct wages	3,500
Overheads	2,725

A scrapped unit realises Re. 1 prepare the process account.

(Ans. Equivalent units :

Materials Rs.1,190)

Other materials Rs. 1,825

Labour and overheads Rs. 1,750 each

Cost per unit : Rs. 4.94, Re. 1, Rs. 2, Rs. 1.56)

34. From the following details prepare a statement of equivalent production a statement of cost and find the value of :

- (a) Output transferred, and
 (b) Closing work-in-progress.

Opening work-in-progress		(2,000 units)
Materials (100% complete)	7,500	
Labour (60% complete)	3,000	
Overhead (60% complete)	1,500	
Units introduced into this process	8,000	

There are 2,000 units in process and the stage of completion is estimated to be :

Material	100%
Labour	50%
Overheads	50%

8,000 units are transferred to next process.

The process costs for the period are :

Material	Rs. 1,00,000
Labour	Rs. 78,000
Overheads	Rs. 39,000

(Ans. Cost per unit of material = 10.75; Labour = 9.00, Overheads = 4.50, If FIFO is applied than material cost = 12.50; Labour = 10.00; overheads = 5.00)

35. M/s XYZ co. has single process

Work-in-progress (opening)		8,000 units
	Rs.	
Cost material	29,600	
Labour	6,600	
Overheads	5,800	

During the period the input was 32,000 units. Additional cost data were :

Material	29,600
Labour	33,400
Overheads	33,200

At the end of the year, 28,000 units were fully processed and 12,000 units were still in progress. The value of the closing stock included the fully cost of materials as well as only one - third of the cost of wages and overheads.

Tabulate the production and cost figures to give quantities, unit values, total values of the completed output and the detailed values of the closing work-in-progress.

(Ans. Equivalent units : Under Average Method)

Materials

Labour and over heads

per unit Rs. 3.55, Rs. 1.25, Rs. 1.25]

36. AB Ltd. is engaged in process engineering industry. During the month of June 1999, 2000 units were introduced in process 'X'. The normal loss has been estimated at 5% of input. At the end of the month 1,400 units had been produced and transferred to process 'Y', 460 units were incomplete and 140 units after passing through bully the entire process had to be scrapped. The incomplete units had reached the following stage of completion.

Material	75% completed
labour	50% completed
Overhead	50% completed

Following are the futher information on the process 'x'

	Rs.
Cost of the 2,000 units	58,000
Additional direct materials	14,400
Direct labour	33,400
Units scrapped realised Rs. 10 each	16,700

Prepare statement of Equivalent Production, statement of cost, statement of Evaluation and the process 'x' Account.

(Ans. Abnormal loss 2,800; Finished stock 48,000; WIP 20,700; cost per unit Rs. 40,20,10)

37. X Ltd. Produces a chemical, which requires processing in 3 departments. In the second department materials are added doubling number in No. 2 department for the month of september:

	Rs.
Units received from department No. 1	10,000
Units transferred to department No. 3	16,000

The balance of the units were still in process, 100% complete as to material and 50% complete as to labour and overheads.

Cost transferred from department No. 11	20,000
Cost by the department :	
Materials	35,200
Labour	36,000
Factory overhead	28,800

Prepare a cost of production statement for department No. 2 for September

(Ans. Average method; Cost of production of units transferred to dept. 3 Rs. 1,81,760 cost of WIP Rs. 38,240. Cost per equivalent A : Rs 6; material B : Rs 1.76; labour Rs. 2, overheads Rs. 1.60)

38. A company manufactures a product which involves two processes Viz., pressing and polishing For the month of April 1999, the following information is available.

	Pressing	Polishing
Opening stock		
Input of units in process		
Units completed		
Units under process		
Material cost		
Conversion cost		

For incomplete units in process charge material cost 100% and conversion cost at 60% in the pressing process and 50% in the polishing process. Prepare a statement of cost and calculate selling price per unit, which will result in 25% profit on sale price.

(Ans. If FIFO is followed on Rs. = 80; Conversion cost = Rs. 251.14 in pressing process. M=Rs. 345.94 and conversion cost = Rs 69.33 in polishing process)

39. The following details relate to an intermediary process in a factory :

	% Degree of Completion	No. of Units	Cost Rs.
opening work-in-progress		300	1200
(a) Material	50%		
(b) Labour	80%		
(c) Overheads	80%		
Transfer from previous process	100%	3,800	1,36,800
Process material added			7,900
Direct Wages			37,400
Overheads			14,960
Transfer to next process (finished)	100%	3,500	
Closing work-in-progress		600	
(a) Material	100%		
(b) Labour	80%		
(c) Overheads	80%		

Prepare :

- process cost accounts for the intermediary process
- Statement of Equivalent units (on FIFO basis)
- Statement of Distribution of cost on the basis of equivalent units.

(Ans. Equivalent units. material (i) 3,100 units; Material (ii) 3,950, Labour and Overheads 3,740 units each, cost per unit - material (i) Rs 36, Material (ii) Rs. 2 Labour Rs 10; Overheads Rs. 4 Total cost Rs. 52, Value of closing work-in-progress Rs. 29,520; Transfer to next process units 3,500 at Rs. 1,79,840)

7.12 Further Readings :

- Agarwal, M.L., 1989, Theory and Practice of cost Accounting, Sahitya Bhavan : Agra.
- Rathanam, P.V., 1997, Costing Adviser, Kitab mahal : Allahabad
- Maheswari, S.N., 1987 Advanced Problems and Solutions in Cost Accounting, Sultan chand & Sons, New Delhi :
- Arora, M.N., 1999, Vikas sos Cost Accounting, Vikas Publishing House pvt. Ltd. New Delhi.
- Mittal, D.K., Mittal,L.U.V., Cost Accounting.

Lesson - 8**INTER - PROCESS PROFITS****Objectives :**

The objectives of this unit are :

- K to explain you the pros and cons of charging inter - process profits
- K to familiarise with the process of accounting for inter-process profits.

Structure :

- 8.1 Introduction**
- 8.2 Advantages of Inter - process profit**
- 8.3 Difficulties / complications in Inter - Process Profit**
- 8.4 Alternative Method For Determining Efficiency of Each process**
- 8.5 Complication in valuation of stocks**
- 8.6 Segregation of cost and profit**
- 8.7 Illustrations**
- 8.8 Key words**
- 8.9 Self assessment Questions / Exercises**
- 8.10 Further readings**

8.1 Introduction

In some process industries the output of one process is transferred to the next process not at cost but at the market price prevailing at the time of transfer, at standard cost, at standard cost plus profit, at the process cost plus a percentage of profit or any other basis considered as suitable. The difference between cost and transfer price is known as inter - process profit. The purpose of such a practice is to make each process stand on its own efficiency. Normally this results in some profit. However, sometimes this may result in a loss at different process besides profit or loss at the time of sale of finished product. The price at which the transfer takes place from one process to the other is called transfer price.

8.2 Advantages of Inter - Process Profit

The practice of inter - process profits ensures the following advantages :

1. Profit or loss in the working of each process can be found out.

2. The contribution of each process to the over all profitability of the organisation is made manifest.
3. Efficiency / inefficiency of one process does not get transferred to the next process.
4. Each process stands on its own efficiency. It can generate resources required for expansion of operations on it's own through higher level of profitability.
5. Transfer prices will have a positive impact on employees of each process. Employees working by motivated by the contribution of the process in each process to the overall profitability of the organisation.
6. This system enables the firm to take, make or buy decisions before each process or decisions to further produce or sell after the process. Hence, it can be determined as to whether to continue the process or disband it.

8.3 Difficulties or complications in Inter Process Profit

The practice of inter-process profit gives rise to a number of difficulties or complications. Some of them are :

- 1) As there are many different bases for determining transfer prices, determination of transfer price itself may become a bone of contention between processes.
- 2) Unnecessary complications are introduced in accounting.
- 3) Most often market prices are not available for output of initial processes and this calls for inclusion of an agreed rate of profit on cost.
- 4) Work-in-progress and unsold stock contain an element of unearned profit.
- 5) When the actual prices are much higher than the normal costs, the very objective of this system cannot be fulfilled.
- 6) For balance sheet purposes, inter process profits must be eliminated from work-in-progress and finished goods since the firm cannot make any profit by trading with itself. A provision should be created to bring down the stock to costs or market values, which even is lower.

8.4 Alternative Method for Determining Efficiency of Each Process

To avoid the above complications some accountants suggest an alternative method :

1. To adopt standard costing system by which the efficiency of each process can be measured and judged.
2. Comparison with market prices can be made in a separate cost report without - disturbing the basic cost records / statements.

8.5 Complication In Valuation Of Stocks

The practice of inter-process profits gives rise to complication in valuation of stocks. A part of processed output in each process may remain in the process as closing stock at the end of the

accounting period. Such closing stock value includes an element of unearned or unaccrued profit. The reason is obvious. As transfer takes place within the organisation from one process to another, profit is not made in realistic terms. All the closing stocks at the end of the accounting period except the initial process include an element of profit.

The profit element in closing stocks needs to be separated as the accounting principle is to value stocks 'at cost or market price which ever is less'. The preparation of balance sheet requires correct valuation of stocks and correct determination of profit. Hence, it is necessary to separate true cost and profit in total value of stock. In case processes are larger in number, calculation becomes more complicated.

8.6 Segregation Of Cost And Profit.

For separating profit element in closing stocks at different processes and finding out the net realised profit of a certain period, process account is prepared with three columns. For easiness in calculations closing stock at processes is deducted on the debit side of process accounts. The ratio of cost incurred at the process to the cost transferred from the previous process is considered as a basis for computation. By wanting out the ratio of cost at the process to the total value the debit at the process cost of closing stock is determined. Transferred value of the closing stock from the previous process includes the element of profit. The formula for finding out the cost of closing stock is :

$$\text{Closing stock at cost} = \text{Existing value of closing stock} \times \frac{\text{Total cost}}{\text{Total value at the process}}$$

Value of closing stock minus cost of closing stock arrived at above, results in unearned profit hidden in value of closing stocks. To arrive at the true profit unearned profit is deducted from the gross profit

8.7 Illustrations :

Illustration 1 : Kumar Ltd. manufactures a standard product through two successive processes. From the following details prepare the process Accounts and the finished stock account and also calculate the unrealised profits in stocks. State how the profit and stock should appear in the Balance sheet.

	Process I	Process II
	Rs.	Rs.
Materials	8,000	----
Wages	10,000	18,000
Overheads	4,000	7,000
Closing stock (at factory cost)	2,000	6,000

Closing stocks are valued at prime cost plus overheads. While transferring products from process I to process II and from process II to finished stock a profit of 20% on transfer price is made. Out of the products transferred to finished stock account, goods costing Rs. 5,000 remained unsold as on the closing date and the balance was sold for Rs. 60,000. There was no work-in-progress at the beginning and at the end of the accounting period.

Solution : First Method (process Accounts without a separate column for profit) :
Process I Account

Dr.			Cr.
Partiulars	Amount Rs.	Particulars	Amount Rs.
To Materials	Rs. 8,000	By process II A/c (Transfer)	25,000
To wages	10,000		
To Overheads	4,000		
Total cost	22,000		
Less : Closing stock	2,000		
Cost of transfer	20,000		
To Profit (20% on transfer price or 25% on cost)	5,000		
	25,000		25,000

Process II Account

Dr.			Cr.
Particulars	Amount Rs.	Particulars	Amount Rs.
To process I A/c (Transfer)		By finished stock A/c (Transfer)	55,000
	Rs. 25,000		
To wages	18,000		
To overheads	7,000		
Total cost	50,000		
Less : Closing stock	6,000		
Cost of transfer	44,000		

To profit (20% on transfer price or 25% on cost)	11,000		
	55,000		55,000

Second Method (Columnar Process Accounts)

This method is more scientific and easier than the first Method.

Finished Stock Account.

Dr.		Cr	
Particulars	Amount Rs.	Particulars	Amount Rs.
To process II A/c (Transfer)	55,000	By Sales	60,000
To Profit & Loss A/c	10,000	By Balance c/d	5,000
	65,000		65,000

Total Profit = Rs (5,000 + 11,000 + 10,000) - 2000 (Provision for unrealised profit as shown below) = Rs. 24,000

Calculation of Unrealised profit in stocks :

Process I : Stock of Rs. 2,000 includes no unrealised profit

Process I Account

Dr.				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To material	8,000	8,000	----	By closing stock	2,000	2,000	----
To wages	10,000	10,000	----	By process II A/c A/c Transfer)	25,000	20,000	5,000
To overheads	4,000	4,000	----				
	22,000	22,000					
To Profit & Loss A/c	5,000	---	5,000				
	27,000	22,000	5,000		25,000	22,000	5,000

Process II Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To process I A/c	25,000	20,000	5,000	By closing stock	6,000	5,400	600
To wages	18,000	18,000	---	By finished stock			
To overheads	7,000	7,000		A/c (Transfer)	55,000	39,600	15,400
	50,000	45,000	5,000				
To Profit & Loss A/c	11,000		11,000				
	61,000	45,000	16,000		61,000	45,000	16,000

Finished Stock Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To process II A/c	55,000	39,600	15,400	By closing stock	5,000	3,600	1,400
To Profit & Loss A/c	10,000	---	10,000	By Sales	60,000	36,000	24,000
	65,000	39,600	25,400		65,000	39,600	25,400

Working Notes and Verification :

process I : Closing stock is at cost. So there is no unearned profit in closing stock :

Process II : Cost of closing stock = $\frac{\text{Cost column total}}{\text{Total of total column excluding profit}} \times \text{Stock value}$

$$\text{or} = \frac{\text{Rs. } 45,000}{\text{Rs. } 50,000} \times \text{Rs. } 6,000 \text{ or Rs. } 5,400$$

So, Unrealised profit = Rs 6,000 - 5,400 = Rs 600.

Finished stock : Cost of closing stock = $\frac{\text{Rs. } 39,600}{\text{Rs. } 55,000} \times \text{Rs. } 5,000 \text{ or } 3,600$

So, unrealised profit = Rs. 5,000 - Rs. 3,600 or Rs. 1,400

Process II : Ratio of transfer price of products transferred from process I and the total cost of process II is $\frac{25,000}{50,000}$ or $\frac{1}{2}$. Therefore half of the stock of process II (i.e., Rs. 6,000) came from process I i.e., goods costing $\frac{1}{2} \times \text{Rs } 6,000$ or Rs. 3,000 came from process I on which profit of 20% was made. The unrealised profit is 20% of Rs. 3,000 or Rs. 600.

Finished stock : Stock remaining unsold (Rs. 5,000) in finished stock account entirely came from process II. Process II made a profit of 20% on that i.e., Rs. 1,000. So cost of this stock to process II is (Rs. 5,000 - 1,000) or Rs. 4,000. Out of this half came from process I i.e., Rs. 2,000 came from process I. Process I made a profit on that @ 20%. So unrealised profit in the unsold stock in finished stock account is, therefore, Rs. (1,000 + 400) or Rs. 1,400.

	Stock Rs.	Summary Statement Unrealised Profit Rs.	Csost Rs.
Process I	2,000	Nil	2,000
Process II	6,000	600	5,400
Finished stock	5,000	1,400	3,600
	<u>13,000</u>	<u>2,000</u>	<u>11,000</u>

Provision for unrealised profit amounting to Rs. 2,000 has to be made. In the Balance sheet stock will be shown as below :

Balance Sheet (includes)			
Liabilities	Rs.	Assets	Rs.
Profit & Loss A/c	24,000	Stock (2,000 + 6,000 + 5,000) =	13,000
(5,000 + 11,000 + 10,000 - 2000)		Less : provision	2,000
			11,000

Verification Realised profit :

	Process profit Rs.	+	Provision for unrealised profit in opening stock Rs.	-	Unrealised profit in closing stock Rs.	=	Actual profit Rs.
Process I A/c	5,000	+	Nil	-	Nil	=	5,000
Process II A/c	11,000	+	5,000	-	1600	=	15,400
Finished stock A/c	10,000	+	----	-	1,400	=	8,600
	26,000		5,000		2,000	=	29,000

Cost of closing stocks i.e., Balance sheet value of stocks :

Process I	Rs. 2,000
Process II	5,400
Finished stock	3,600
Cost of all closing stocks	11,000

Another verification :

$$\begin{aligned} \text{Cost of all closing stocks} &= \text{Sum total of all costs including} - \text{Cost of sales opening stock at cost} \\ &= [(8,000 + 10,000 + 4,000) + (18,000 + 7,000)] - 36,000 \\ &= 47,000 - 36,000 = \text{Rs. } 11,000 \end{aligned}$$

Note : Closing stocks have been shown on the credit side of the respective process Finished stock Accounts. However, they can be shown on the debit side also. In such a case such amounts can be subtracted from either the prime cost or factory cost of the concerned account depending upon the method of valuation of closing stock. In all the following Illustrations closing stock has been shown on the debit side of the concerned account.

Illustration 2 : A product process through three processes A,B and C after which it is transferred to finished stock. The following information is supplied for the month of July :

	Process A	Process B	Process C	Finished stock
	Rs.	Rs.	Rs.	Rs.
Opening stock	1,000	1,200	800	3,000
Direct materials	2,000	2,100	3,000	---
Direct wages	1,500	1,500	1,600	---
Production overheads	1,400	600	4,000	----
Closing stock	500	600	400	1,500
Profit % on transfer price	25%	20%	20%	---
Inter - process profit				
For opening stock	---	200	200	1,100

Stock in processes are valued at prime cost and finished stock has been valued at the price at which it was received from process C. Sales during the period were valued at Rs. 35,000.

You are required to :

- Prepare process accounts showing profit element ;
- compute actual realised profit ; and
- Compute stock valuation for balance sheet.

Process A Account

Dr.	Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
	To Opening stock	1,000	1,000	---	By Transfer to Process B a/c	7,200	5,400	1,800
	To Direct materials	2,000	2,000	---				
	To Direct wages	1,500	1,500	---				
		4,500	4,500	---				
	Less : Closing stock	500	500	---				
	Prime cost	4,000	4,000	---				
	To overheads	1,400	1,400	---				
		5,400	5,400	---				
	To Profit (25% of transfer price or 33 1/3 of cost price)	1,800	---	1,800				
		7,200	5,400	1,800		7,200	5,400	1,800
	To stock b/d	500	500	---				

Process B Account

Dr.	Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
	To opening stock	1,200	1,000	200	By transfer to process C A/c	15,000	10,100	4,900
	To Transfer from A	7,200	5,400	1,800				
	To direct material	2,100	2,100	---				
	To Direct Wages	1,500	1,500	---				
	Total	12,000	10,000	2,000				
	Less : Closing stock	600	500	100				
	Prime cost	11,400	9,500	1,900				

To overheads	600	---				
Total cost	12,000	10,100	1,900			
To profit (20% of transfer price or 25% of cost)	3,000	---	3,000			
	15,000	10,100	4,900		15,000	10,100 4,900
Total cost b/d	600	500	100			

Process C Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To opening stock	800	600	200	By transfer to Finished stock A/c	30,000	19,000	11,000
To Transfer from procesB	15,000	10,100	4,900				
To Direct materials	3,000	3,000	---				
To Direct wages	1,600	1,600	---				
Total	20,400	15,300	5,100				
Less : Closing stock	400	300	100				
Prime cost	20,000	15,000	5,000				
To overheads	4,000	4,000	---				
	24,000	19,000	5,000				
To profit (20% on on transfer price or 25% of cost)	6,000		6,000				
	30,000	19,000	11,000		30,000	19,000	11,000
To stock b/d	400	300	100				

Finished stock Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To stock b/d	3,000	1,900	1,100	By sales	35,000	19,950	15,050
To Transfer from Process C	30,000	19,000	11,000				
	33,000	20,900	12,100				
Less : Closing stock	1,500	950	550				
	31,500	19,950	11,550				
To Gross profit	3,500		3,500				
	35,000	19,950	15,050		35,000	19,950	15,050
To stock b/d 1,500	950	550					

Working notes and verification

Calculation of profit element in stock :

Process A :Closing stock is at cost. Hence, it does not contain any unearned profit.

$$\text{Process B : Cost of closing stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{10,000}{12,000} \times 600 = \text{Rs. } 500$$

$$\text{Unearned profit in closing stock} = \text{Rs } 600 - 500 = \text{Rs. } 100$$

$$\text{Process C : Cost of closing stock} = \frac{15,300}{20,400} \times 400 = \text{Rs. } 300$$

$$\text{Unearned profit in closing stock} = \text{Rs. } 400 - 300 = \text{Rs. } 100$$

$$\text{Finished Stock} = \text{cost of closing stock} = \frac{20,900}{33,000} \times 1,500 = \text{Rs. } 950$$

$$\text{Unearned profit in closing stock} = \text{Rs. } 1,500 - 950 = \text{Rs. } 550$$

Verification of Realised Profit :

	Process profit	+	Provision for unrealised profit in opening stock	-	Unrealised profit in closing stock	=	Actual profit
	Rs.		Rs.		Rs.		Rs.
Process A A/c	1,800	+	Nil	-	Nil	=	1,800
Process B A/c	3,000	+	200	-	100	=	3,100
Process C A/c	6,000	+	200	-	100	=	6,100
Finished stock A/c	3,500	+	1,100	-	550	=	4,050
	14,300	+	1,500	-	750	=	15,050

Cost of closing stocks i.e. Balance sheet values :

Process A	Rs. 500
Process B	Rs. 500
Process C	Rs. 300
Finished Stock	Rs. 950
	2,250

Another verification :

Cost of all closing stock = Sum total of all costs including opening stock - cost of sales

$$= [(1,000 + 2,000 + 1,500 + 1,400) + (1,000 + 2,100 + 1,500 + 600) + (600 + 3,000 + 1,600 + 4,000)] - 19,950$$

$$= (5,900 + 5,200 + 9,200 + 1,900) - 19,950$$

$$= 22,200 - 19,950$$

$$= 2,250$$

Illustration 3 : A product passes through three processes to completion. These processes are known as x, y and Z. The output of each process is charged to the next process at a price. Calculated to give a profit of 20% on transfer price. The output of process C is charged to finished stock on a similar basis.

There is no partly finished work in any process on December 31, on which date the following information was obtained.

	Process A	Process B	Process C
Material	Rs. 8,000	Rs. 6,000	Rs. 4,000
Labour	Rs. 12,000	Rs. 8,000	Rs. 16,000
Stock : 31st Dec	Rs 4,000	Rs. 8,000	Rs. 12,000

Stocks in each process were valued at cost to the process. Question of overhead was ignored. Of the goods passed into finished stock, Rs. 8,000 remained in hand on 31st Dec., and the balance has been sold for Rs. 72,000. Show process accounts and calculate reserve for unrealised profits

Solution**Process A Account**

Dr.	Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
	To Materials	8,000	8,000	----	By Transfer. to process B a/c	20,000	16,000	4,000
	Labour	12,000	12,000	----				
	Total	20,000	20,000					
	Less : Closing stock c/d	4,000	4,000	----				
	Prime cost	16,000	16,000					
	Profit 25% on cost	4,000	---	4,000				
		20,000	16,000	4,000		20,000	16,000	4,000

Process B Account

Dr.	Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
	To Transfer from Proces A a/c	20,000	16,000	4,000	Bytranser to process C a/c	40,000	28,800	11,200
	To Material	12,000	12,000	----				
	To labour	8,000	8,000	----				
	Total	40,000	36,000	4,000				
	Less : Closing stock	8,000	7,200	800				
	Prime cost	32,000	28,800	3,200				
	To profit (25% on cost)	8,000		8,000				
		40,000	28,800	11,200		40,000	28,800	11,200

Process C Account

Dr.	Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
	To Transfer from process B a/c	40,000	28,800	11,200	By Transfer to Finished stock A/c	60,000	37,040	20,960
	To Material	4,000	4,000	---				
	To labour	16,000	16,000	---				
	Total	60,000	48,800	11,200				
	Less : Closing stock c/d	12,000	9,760	2,240				
	Prime cost	48,000	37,040	8,960				
	To profit (25% on cost)	12,000		12,000				
		60,000	37,040	20,960		60,000	37,040	20,960

Finished stock Account

Dr.	Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
	To Transfer from process C	60,000	37,040	20,960	By Sales	72,000	33,834	38,166
	Less : Closing stock	8,000	5,206	2,794				
		52,000	31,834	18,166				
	To profit	20,000	---	20,000				
		72,000	33,834	38,166		72,000	33,834	38,166

Notes, Explanations and verification :

1. Profit 20% of transfer price = 25% on cost.
2. Cost of closing stock at processes is found out on the basis of ratio of total cost to the total value which includes profit element taken into account till a particular stage. Thus.

$$\text{Cost of closing stock} = \text{Value of closing stock} \times \frac{\text{Cost column total}}{\text{Total column total}}$$

3. Profit figure on the credit side of process account shows accumulated profit till that stage.
4. computation of closing stocks at cost and unearned profit in closing stocks Data processes :
- (i) Process A : Closing stock is at cost. Thus there is no unearned profit in value of closing stock:

$$(ii) \text{ Process B : Cost of closing stock} = 8,000 \times \frac{36,000}{40,000} = \text{Rs. } 7,200$$

Unearned profit in closing stock valued at $8,000 - 7200 = \text{Rs. } 800$

$$(iii) \text{ Process C : Cost of closing stock} = 12,000 \times \frac{48,800}{60,000} = \text{Rs. } 9,760$$

Unearned profit in closing stock is valued at $= 12,000 - 9760 = \text{Rs } 2,240$

$$(iv) \text{ Finished stock : Cost of closing finished stock} = 8,000 \times \frac{39,040}{60,000} = \text{Rs. } 5,206$$

Unearned profit in closing stock valued at $= 8,000 - 5,206 = \text{Rs } 2794$

5. Verification of Realised profit :

	Process profit Rs.	-	Unrealised profit in closing stocks	=	Actual Profit Rs
Process A A/c	4,000	-	Nil	=	4,000
Process B A/c	8,000	-	400	=	3,600
Process C A/c	12,000	-	2,240	=	9,760
Finished stock A/c	20,000	-	2,794	=	17,206
Total	44,000	-	5,834	=	38,166

Cost of closing stocks i.e., Balance sheet value of stocks

Process A	Rs. 4,000
Process B	Rs. 7,200
Process C	Rs. 9,760
Finished Stock	Rs. 5,206
Total cost of all costing stock	= Rs. 26,166

6. Another verification :

Cost of closing stocks = Sum total of all costs - cost of sales

$$= \text{Rs. } 60,000 - \text{Rs } 33,834 = \text{Rs } 26,166$$

Illustration 4 : X ltd. produces a product which passes through two processes before it is completed and transferred to finished stock. The following data relate to the month of January.

	Process I Rs.	Process II Rs.	Finished stock Rs.
Opening stock	15,000	18,000	45,000
Direct materials	30,000	31,500	
Direct wages	22,400	22,500	
Factory overheads	21,000	9,000	22,500
Closing stock	7,400	9,000	16,500
Inter process profit included in opening stock	----	3,000	16,500

Output of process I is transferred to process II at 25% profit on the transfer price. Output of process II is transferred to finished stock at 20% profit on the transfer price. Stocks in process are valued at prime cost. Finished stock is valued at the price at which it is received from process II. Sales during the period are Rs 2,80,000

Prepare the process accounts and finished stock account showing the profit element at each stage :

Process I Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To opening stock	15,000	15,000	----	By Transfer to Process II A/c	1,08,000	81,000	27,000
To Direct materials	30,000	30,000	----				
To Direct labour	22,400	22,400	----				
	67,400	67,400	---				
Less : closing stock	7,400	7,400	----				
Prime cost	60,000	60,000	----				
To overheads	21,000	21,000	----				
Process cost	81,000	81,000	---				

To profit (25% on transfer price or 33 1/3% on cost)	27,000		27,000				
	1,08,000	81,000	27,000		1,08,000	81,000	27,000

Process II Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To opening stock	18,000	15,000	3,000	By Transfer to Finished stock A/c	2,25,000	1,15,500	73,500
To process I A/c	1,08,000	81,000	27,000				
To Materials (Dir)	31,500	31,500	---				
To Direct labour	22,500	22,500	---				
	1,80,000	1,50,000	30,000				
Less : Closing stock	9,000	7,500	1,500				
Prime cost	1,71,000	1,42,500	28,500				
To overheads	9,000	9,000	---				
Process cost	1,80,000	1,51,500	28,500				
To profit (20% on transfer price or 33 1/3% on cost)	45,000	---	45,000				
	2,25,000	1,51,500	73,500		2,25,000	1,51,500	73,500

Finished stock Account

Dr. Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Cr. Profit Rs.
To opening stock	45,000	28,000	16,500	By Sales	2,80,000	1,65,000	1,15,000
To process II A/c	2,25,000	1,51,500	73,500				
	2,70,000	1,80,000	90,000				
Less : Closing stock	22,500	15,000	7,500				

Cost of all closing stocks = Sum total of all costs including opening stock at cost - cost of sales

$$= [(15,000 - 30,000 + 22,400 + 21,000) + (15,000 + 31,500 + 22,500 + 9,000) + 28,500] - 1,65,000$$

$$= (88,400 + 78,000 + 28,500) - 1,65,000 = 1,94,900 - 1,65,000 = 29,900$$

Illustration 5 : Sellwell Ltd. Manufactures a product that passes through three distinct processes. Prepare process accounts and finished stock account from the information given below :

	Process A Rs.	Process B Rs.	Process C Rs.
Direct material	90,000	22,500	22,500
Wages	67,500	45,000	45,000
Closing stock	22,500	26,250	62,900

Finished goods were sold for Rs. 3,90,000 and the value of finished stock at closing was Rs. 16,836. It is the policy of the company to charge 25% on cost price while transferring goods from process A to B and 20% on cost price from B to C finished stock.

Solution

Dr.				Process A Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.				
To Materials	90,000	90,000	----	By Transfer to process B a/c	1,68,750	1,35,000	33,750				
To Wages	67,500	67,500	----								
Total	1,57,500	1,57,000	----								
Less : closing stock	22,500	22,500	---								
Prime cost	1,35,000	1,35,000	---								
To profit (25% on cost)	33,750	----	33,750								
	1,68,750	1,35,000	33,750		1,68,750	1,35,000	33,750				

Dr.				Process B Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.				
To process AA/c	1,68,750	1,35,000	33,750	By Transfer to process C A/c	2,52,000	1,80,000	72,000				

To Materials	22,500	22,500	---				
To Wages	45,000	45,000	---				
Total	2,36,250	2,02,500	33,750				
Less : closing stock	26,250	22,500	3,750				
prime cost	2,10,000	1,80,000	30,000				
To profit (20% on cost)	42,000		42,000				
	2,52,000	1,80,000	72,000		2,52,000	1,80,000	72,000

Dr. Process C Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To process BA/c	2,52,000	1,80,000	72,000	By Transfer to finished stock A/c	3,06,720	1,98,000	1,08,720
To Materials	22,500	22,500	---				
To Wages	45,000	45,000	---				
Total	3,19,500	2,47,500	72,000				
Less : Closing stock	63,900	49,500	14,400				
	2,55,600	1,98,000	57,600				
To profit (20% on cost)	51,120	---	51,120				
	3,06,720	1,98,000	1,08,720		3,06,720	1,98,000	1,08,720

Dr. Finished stock Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To process CA/c	3,06,720	1,98,000	1,08,720	By Sales	3,90,000	1,87,132	2,02,868
Less : closing stock	16,836	10,868	5,968				
	2,89,884	1,87,132	1,02,752				
To profit	1,00,116	---	1,00,116				
	3,90,000	1,87,132	2,02,868		3,90,000	1,87,132	2,02,868

Working Notes and Verification :

Computation of closing stocks at cost :

Process A : Closing stock is at cost, so there is no unearned profit in closing stock

$$\text{Process B : cost of closing stock} = 26,250 \times \frac{2,02,500}{2,36,250} = \text{Rs. } 22,500$$

$$\text{Unearned profit in process B closing stock} = 26,250 - 22,500 = \text{Rs } 3,750$$

$$\text{Process C : Cost of closing stock} = 63,900 \times \frac{2,47,500}{3,19,500} = \text{Rs. } 49,500$$

$$\text{Unearned profit in process C closing stock} = 63,900 - 49,500 = \text{Rs } 14,400$$

$$\text{Finished stock : Cost of closing stock} = 16,836 \times \frac{1,98,000}{3,06,720} = \text{Rs. } 10,868$$

$$\text{Unearned profit in finished stock} = 16,836 - 10,868 = \text{Rs. } 5,968$$

Verification of Realised profit :

	Process profit Rs.	-	Unrealised profit in closing stocks Rs.	=	Actual Profit Rs
Process A A/c	33,750	-	Nil	=	33,750
Process B A/c	42,000	-	3,750	=	38,250
Process C A/c	51,120	-	14,400	=	36,720
Finished stock A/c	1,00,116	-	5,968	=	94,148
Total	<u>2,27,986</u>	-	<u>24,118</u>	=	<u>2,02,868</u>

Cost of closing stocks, i.e., Balance sheet value of stocks :

Process A	Rs. 22,500
Process B	22,500
Process C	49,500
Finished stock	10,868
	<u>Rs. 1,05,368</u>

Another Verification :

Cost of all closing stocks = Sum total of all costs - cost of sales

= (90,000 + 67,500 + 22,500 + 45,000 + 22,500 + 45,000) - 93,566

= 2,93,500 - 1,87,132 = Rs. 1,05,368

Illustration 6 : Product A passes through three processes, before, it is transferred to the finished stock. The following information is obtained for the month of August :

	Process I Rs.	Process II Rs.	Process III Rs.	Finished Stock Rs.
Opening stock	10,000	16,000	20,000	20,000
Direct materials	80,000	24,000	30,000	----
Direct wages	70,000	80,000	70,000	----
Manufacturing overheads	40,000	48,000	40,000	----
Closing stock	20,000	8,000	30,000	60,000
Profit percentage on transfer to next process	25%	20%	10%	---
Inter - process profit for opening stock	----	2790	5380	13,068

Stock in process is valued at prime cost and finished stock has been valued at the price at which it is received from process III. Sales during the period. were Rs. 4,00,000. Prepare process cost accounts.

Dr.				Process I Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.				
To Opening stock b/d	10,000	10,000	---	By Transfer to process II A/c	2,40,000	1,80,000	60,000				
To Direct material	80,000	80,000	---								
To Direct labour	70,000	70,000	---								
Total	1,60,000	1,60,000	---								

Less : closing stock	20,000	20,000	---				
Prime cost	1,40,000	1,40,000	---				
To manufacturing overheads	40,000	40,000	---				
Process cost	1,80,000	1,80,000	---				
To profit [25% on Transfer price or 33 1/3% on cost]	60,000	---	60,000				
	2,40,000	1,80,000	60,000		2,40,000	1,80,000	60,000

Dr.				Process II Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.				
To opening stock	16,000	13,210	2,790	By Transfer to process III A/c	5,00,000	2,42,606	1,61,394				
To Transfer from process I A/c	2,40,000	1,80,000	60,000								
To Direct Materials	24,000	24,000	---								
To Direct Labour		80,000	80,000	---							
Total	3,60,000	2,97,210	62,790								
Less : Closing stock	8,000	6,604	1,396								
Prime cost	3,52,000	2,90,606	61,394								
To Mfg. overheads	48,000	48,000	---								
Process cost	4,00,000	2,42,606	61,394								
To profit [20% on Transfer price or 25% on cost]	1,00,000	---	1,00,000								
	5,00,000	2,42,606	1,61,394		5,00,000	2,46,606	1,61,394				

Dr.				Cr.			
Process III Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To opening stock	20,000	14,620	5,380	By Transfer to Finished Stock A/c	7,00,000	4,71,296	2,28,704
To Transfer from process II A/c	5,00,000	3,38,606	1,61,394				
To Direct Materials	30,000	30,000	----				
To Direct labour	70,000	70,000	----				
Total	6,20,000	4,53,226	11,66,774				
Less : Clsong stock	30,000	21,930	8,070				
Prime cost	5,90,000	4,31,296	1,58,704				
To Mfg. overheads	40,000	40,000	----				
Process cost	6,30,000	4,71,296	1,58,704				
To profit [10%on Transfer price or 1/9 on cost]	70,000	----	70,000				
	7,00,000	4,71,296	2,28,704		7,00,000	4,71,296	2,28,704

Dr.				Cr.			
Finished Stock Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Stock	40,000	26,932	13,068	By Sales	8,00,000	4,57,832	3,42,168
To Transfer from process III A/c	7,00,000	4,71,296	2,28,704				
Total	7,40,000	4,98,228	2,41,772				
Less : Closing stock	60,000	40,396	19,604				
Total	6,80,000	4,57,832	2,22,168				
To profit	1,20,000	----	1,20,000				
	8,00,000	4,57,832	3,42,168		8,00,000	4,57,832	3,42,168

Working notes and Verification :

Computation of closing stocks at cost :

Process I : closing stock is at cost. So there is no unearned profit in closing stock.

$$\text{Process II : Cost of closing stock} = 8,000 \times \frac{2,97,210}{3,60,000} = \text{Rs. } 6,604$$

$$\text{Unearned profit in closing stock} = 8,000 - 6,604 = \text{Rs. } 1,396$$

$$\text{Process III : Cost of closing stock} = 30,000 \times \frac{4,53,226}{6,20,000} = \text{Rs. } 21,930$$

$$\text{Unearned profit in closing stock} = 30,000 - 21,930 = \text{Rs. } 8,070$$

$$\text{Finished stock ; Cost of closing stock} = 60,000 \times \frac{4,98,228}{7,40,000} = \text{Rs. } 40,396$$

$$\text{Unearned profit in closing stock} = 60,000 - 40,396 = \text{Rs. } 19,604$$

Verification of Realised Profit :

	Process profit Rs.	+	Provision for unrealised profit in opening stock Rs.	-	Unrealised profit in closing stock Rs.	=	Actual profit Rs.
Process I A/c	60,000	+	Nil	-	Nil	=	60,000
Process II A/c	1,00,000	+	2,790	-	1,396	=	1,01,394
Process III A/c	70,000	+	5,380	-	8,070	=	67,310
Closing stock A/c	1,20,000	+	13,068	-	19,604	=	1,13,464
	<u>3,50,000</u>	+	<u>21,238</u>	-	<u>29,070</u>	=	<u>3,42,168</u>

Cost of closing stocks : i.e., Balance Sheet value of closing stocks

Process I	20,000
Process II	6,604
Process III	21,930

Finished stock	40,396
Cost of all closing stocks	88,930

Another Verification : Cost of all closing stocks =

$$\begin{aligned} & \text{Sum total of all costs including opening stock at cost - cost of sales} \\ & = [(10,000 + 80,000 + 70,000 + 40,000) + (13,210 + 24,000 + 80,000 + 48,000) + (14,620 + 30,000 + 70,000 + 40,000) + 26,932] - 4,57,832 \\ & = (2,00,000 + 1,65,210 + 1,54,620 + 26,932) - 4,57,832 \\ & = 5,46,762 - 4,57,832 = 88,930 \end{aligned}$$

Illustration 7 : L.M. & Co. produces a product that passes through three processes, before it is transferred to finished stock. Following information is available for the month of August, 2002

	Process I Rs.	Process II Rs.	Process III Rs.	Finished Stock Rs.
Opening stock	40,000	48,000	32,000	1,20,000
Direct Material	80,000	84,000	1,20,000	-----
Direct Wages	60,000	60,000	64,000	----
Production overheads	56,000	24,000	1,60,000	60,000
Closing stock	20,000	24,000	16,000	60,000
Profit on cost of each process	33. 1/3%	25%	25%	----
Inter-process profit for opening stock	-	8,000	8,000	44,000

Stocks in process are valued at prime cost and finished stock has been valued at price at which it is received from process III. Sales during the period were Rs. 14,00,000 Prepare :

- Process cost Accounts showing cost element at each stage.
- Statement showing actually realised profit
- Stock Valuation for Balance sheet purposes.

Solution :

(a) process cost Accounts showing the profit at each stage : L.M. &Co.

Dr.				Cr.			
Process Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To opening stock	40,000	40,000	----	By Process II A/c (Transfer)	2,88,000	2,16,000	72,000
To Direct Material	80,000	80,000	----				
To Direct Wages	60,000	60,000	----				
	1,80,000	1,80,000	----				
Less : Closing Stock c/d	20,000	20,000	----				
Prime cost	1,60,000	1,60,000	----				
To production overheads	56,000	56,000					
	2,16,000	2,16,000					
To Gross profit (33 1/3% on cost)	72,000		72,000				
	2,88,000	2,16,000	72,000				
To Stock b/d	20,000	20,000	----				

Dr.				Cr.			
Process II Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To opening stock b/d	48,000	40,000	8,000	By Process III A/c (Transfer)	6,00,000	4,04,000	1,96,000
To process I (Transfer) a/c	2,88,000	2,16,000	72,000				
To Direct Material	84,000	84,000	----				
To Direct wages	60,000	60,000	----				
	4,80,000	4,00,000	80,000				
Less : Closing stock c/d	24,000	20,000	4,000				
	4,56,000	3,80,000	76,000				
To production overheads	24,000	24,000	----				

	4,80,000	4,04,000	76,000				
To Gross Profit (25% on cost)	1,20,000	-----	1,20,000				
	6,00,000	4,04,000	1,96,000		6,00,000	4,04,000	1,96,000
To Stock b/d	24,000	20,000	4,000				

Dr.				Cr.			
Process III Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To opening stock	32,000	24,000	8,000	By Finished Stock A/c (Trasfer)	12,00,000	7,60,000	4,40,000
To process II A/c Transfer	6,00,000	4,04,000	1,96,000				
To Direct Metiral	1,20,000	1,20,000	-----				
To Direct wages	64,000	64,000	----				
	8,16,000	6,12,000	2,04,000				
Less : closing stock	16,000	12,000	4,000				
Prime cost	8,00,000	6,00,000	2,00,000				
To production overheads	1,60,000	1,60,000	-----				
	9,60,000	7,60,000	2,00,000				
To profit (25%on cost)	2,40,000	-----	2,40,000				
	12,00,000	7,60,000	4,40,000		12,00,000	7,60,000	4,40,000
To Stock b/d	16,000	12,000	4,000				

Dr.				Cr.			
Finished Stock Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To opening stock	1,20,000	76,000	44,000	By Sales	14,00,000	7,98,000	6,02,000
To process II A/c (Transfer)	12,00,000	7,60,000	4,40,000				

	13,20,000	8,36,000	4,84,000				
Less : closing stock	60,000	38,000	22,000				
	12,60,000	7,98,000	4,62,000				
To profit	1,40,000	-----	1,40,000				
	14,00,000	7,98,000	6,02,000		14,00,000	7,98,000	6,02,000
To Stock b/d	60,000	38,000	22,000				

Computation of Closing stocks at cost :

Process I : Closing stock is at cost. So there is no unearned profit in closing stock.

Process II : Cost of Closing stock = $\frac{\text{Cost column total}}{\text{Total column total}} \times \text{closing stock}$

$$= \frac{40,000}{4,80,000} \times 24,000 = \text{Rs. } 20,000$$

Unearned profit in closing stock = 24,000 - 20,000 = Rs. 4,000

Process III : Cost of Closing stock = $\frac{6,12,000}{8,16,000} \times 16,000 = \text{Rs. } 12,000$

Unearned profit in closing stock = 16,000 - 12,000 = Rs. 4,000

Finished stock : Cost of closing stock = $\frac{8,36,000}{13,20,000} \times 60,000 = \text{Rs. } 38,000$

Un earned profit in closing stock = 60,000 - 38,000 = Rs. 22,000

(b) Statement Showing Apparent Profit and Actually Realised Profit

Stage	Apparent Profit from processes Rs.	Add : Unrealised profit in op. stock Rs.	Less : Unrealised profit in clo. stock Rs.	Actual profit Rs.
Process I	72,000	-----	-----	72,000
Process II	1,20,000	8,000	4,000	1,24,000
Process III	2,40,000	8,000	4,000	2,44,000

Finished stock	1,40,000	44,000	22,000	1,62,000
	<u>5,72,000</u>	<u>60,000</u>	<u>30,000</u>	<u>6,02,000</u>

(c) Stock valuation for Balance sheet purposes

closing stock of process I : at cost	Rs. 20,000
Closing stock of process II ;at cost	Rs. 20,000
Closing stock of process III : at cost	Rs 12,000
Closing stock of finished stock A/c at cost	Rs. 38,000
Closing stock to be exhibited in Balance Sheet	Rs. 90,000

The result can be cross checked as follows :

Total cost incurred in all processes

process I	Rs.
Material	80,000
Labour	60,000
Overhead	56,000
Process II	
Material	84,000
Labour	60,000
Overhead	24,000
Process III	
Material	1,20,000
Labour	64,000
Overheads	1,60,000
	<u>7,08,000</u>
Add : Cost of opening stock	
(40,000 + 40,000 + 24,000 + 76,000)	1,80,000

	8,88,000
Less : Cost of goods sold	7,98,000
Closing stock to be exhibited in balance sheet	90,000

Illustration 8 : A manufacturing company produces a standard product through three successive processes after which the product passes to finished stock. Each process passes its output to the next process at a price to show a profit of 20% on the transfer price. Process III passes its output to finished stock Account on the same basis. The following data relate to the year ended 31st December 2002 :

	Process I Rs.	Process II Rs.	Process III Rs.
Materials consumed	30,000	35,000	70,000
Wages paid	50,000	40,000	80,000
Stock on 31.12.2002 at prime cost	20,000	30,000	60,000

There was no opening stock or work-in-progress, nor there was any closing work-in-progress. Out of the goods transferred by process III to finished stock Account, goods worth Rs. 2,60,000 was sold for Rs. 4,00,000 the balance remained in stock on 31.12.2002

Prepare the process accounts and finished stock Account showing the amount of unrealised profit in stock in each case separately.

Dr.	Process I Account						Cr.
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To materials	30,000	30,000	----	By process II A/c (Transfer)	75,000	60,000	15,000
To wages	50,000	50,000	----				
	80,000	80,000	----				
Less : Closing stock	20,000	20,000	----				
	60,000	60,000	----				
To P&LA/c	15,000		15,000				
	75,000	60,000	15,000		75,000	60,000	15,000

Dr.				Cr.			
Process II Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To process I A/c	75,000	60,000	15,000	By process III A/c (Transfer)	1,50,000	1,08,000	42,000
To Materials	35,000	35,000	----				
To wages	40,000	40,000	----				
	1,50,000	1,35,000	----				
Less : closing stock	30,000	27,000	3,000				
	1,20,000	1,08,000	12,000				
To profit & loss A/c	30,000		30,000				
	1,50,000	1,08,000	42,000		1,50,000	1,08,000	42,000

Dr.				Cr.			
Process III Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To process II A/c	1,50,000	1,08,000	42,000	By Finished Stock stock A/c (transfer)	3,60,000	2,06,400	93,600
To Materials	70,000	70,000	----				
To wages	80,000	80,000	----				
	3,00,000	2,58,000	42,000				
Less : closing stock	60,000	51,600	8,400				
	2,40,000	2,06,400	33,600				
To P&L A/c	60,000	----	60,000				
	3,00,000	2,58,000	93,600		3,60,000	2,58,000	93,600

Dr.				Cr.			
Finished stock Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To process III A/c transfer	3,00,000	2,06,400	93,600	By Sales	4,00,000	1,78,000	2,21,120
Less : Closing stock	40,000	27,520	12,480				
	2,60,000	1,78,880	81,120				
To P&LA/c	1,40,000	-----	1,40,000				
	4,00,000	1,78,880	2,21,120		4,00,000	1,78,880	2,21,120

Working notes and Verification :

Computation of closing stocks at cost :

Process I : closing stock is at cost. So there is no unearned profit in closing stock

Process II : Cost of closing stock = $\frac{\text{Cost column total}}{\text{Total column total}} \times \text{Rs. } 30,000$

$$\text{or } \frac{1,35,000}{1,50,000} \times 30,000 = \text{Rs } 27,000$$

Unearned profit in process II closing stock = $30,000 - 27,000 = \text{Rs. } 3,000$

Process III : Cost of closing stock = $\frac{2,58,000}{3,00,000} \times \text{Rs. } 60,000 = \text{Rs. } 51,600$

Un earned profit in process III closing Stock = $60,000 - 51,600 = \text{Rs. } 8,400$

Finished stock : Cost of closing stock = $\frac{2,06,400}{3,00,000} \times \text{Rs. } 40,000 = \text{Rs. } 27,520$

Unearned profit in finished stock A/c = $40,000 - 27,520 = \text{Rs. } 12,480$

Verification of Realised Profit :

	Process profit Rs.	-	Unrealised profit in closing stocks	=	Actual Profit Rs
Process I A/c	15,000	-	Nil	=	15,000
Process II A/c	30,000	-	3,000	=	27,000
Process III A/c	60,000	-	8,400	=	51,600
Finished stock A/c	1,40,000	-	12,480	=	1,27,520
	<u>2,45,000</u>	-	<u>23,880</u>	=	<u>2,21,120</u>

Cost of closing stocks i.e., Balance Sheet Values :

Process I	Rs. 20,000
Process II	Rs. 27,000
Process III	Rs. 51,600
Finished stock	<u>Rs. 27,520</u>
	<u>Rs. 1,26,120</u>

Another Verification :

Cost of all closing stocks = Sum total of all costs - cost of sales

= [(30,000 + 50,000) + (35,000 + 40,000) + (70,000 + 80,000)] - 1,78,880

= Rs. 1,26,120

Illustration 9 = XYZ & Co. produces a product which passes through three processes. Following information is given at the end of 31st Dec., 2002

	Process I Rs.	Process II Rs.	Process III Rs.
Direct material	60,000	15,000	15,000
Direct Wages	45,000	30,000	30,000
Stock on 31st Dec. 2002	15,000	17,500	42,600

Finished goods were sold for Rs. 2,60,000, value of closing finished stock was Rs. 10,224

Output of process I is transferred to process II to give a profit of 20% on transfer price. The output of process II is transferred to process III to give a profit of 20% on cost. Similarly, output of process III is transferred to finished stock account to give a profit of 20% on cost.

From the above information prepare :

- Process cost Accounts showing the profit element at each stage.
- Actual realised profit
- Value of closing stock for Balance sheet purposes.

Solution :

(a) Process cost Accounts showing the profit at each stage.

Dr.				Cr.			
Process I Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Direct Material	60,000	60,000	----	By process II A/c [Transfer]	1,12,500	90,000	22,500
To Direct wages	45,000	45,000	----				
	1,05,000	1,05,000	----				
Less : Closing stock	15,000	15,000	----				
Prime cost	90,000	90,000	-----				
To Gross profit [20% on Transfer price or 25% on cost]	22,500	-----	22,500				
	1,12,500	90,000	22,500		1,12,500	90,000	22,500
To stock b/d	15,000	15,000	----				

Note : Profit, relating to process I should be determined by applying the relationship of cost and profit. In this problem relationship of profit and transfer price is given. Profit of 20% on transfer price is the same as 25% on cost price.

Dr.				Process II Account				Cr.			
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.				
To Process I A/c (transfer)	1,12,500	90,000	22,500	By process II A/c [Transfer]	1,68,000	1,40,000	28,000				
To Direct Material	15,000	15,000	-----								
To Direct Wages	30,000	30,000	-----								
	1,57,500	1,35,000	22,500								
Less : stock	17,500	15,000	2,500								
To prime cost	1,40,000	1,20,000	20,000								
To Gross profit [20% on cost]	28,000	-----	28,000								
	1,68,000	1,20,000	48,000								
To stock b/d	17,500	15,000	2,500								

Note 1 : profit element in closing stock has been determined as follows :

$$\begin{aligned}
 &= \frac{\text{Profit}}{\text{Total}} \times \text{closing stock} \\
 &= \frac{22,500}{1,57,500} \times 17,500 = \text{Rs. } 2,500
 \end{aligned}$$

Relationship used for determining profit element in closing should be noted

Note : Profit relating to process I has been determined as follows :

$$= \frac{1,40,000}{100} \times 20 = \text{Rs. } 28,000$$

Note 3 : For the purpose of calculation of profit, Rs. 1,40,000 will be taken as the cost of process II. Profit is to be added to it to arrive at the transfer price. The cost of Rs. 1,20,000 is the cost for analysis purpose and not the cost of process II

Dr.				Cr.			
Process III Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Process II A/c	1,68,000	1,20,000	48,000 (transfer)	By Finished stock	2,04,480	1,32,000	72,480
To Direct Material	15,000	15,000	----				
To Direct wages	30,000	30,000	----				
	2,13,000	1,65,000	48,000				
Less : closing stock	42,600	33,000	9,600				
Prime cost	1,70,400	1,32,000	38,400				
Gross profit [20% on cost]	34,080	-----	34,080				
	2,04,480	1,32,000	72,480		2,04,480	1,32,000	72,480
To stock b/d	42,600	33,000	9,600				

Note 1. Profit element in closing stock has been determined as follows :

$$= \frac{\text{profit}}{\text{Total}} \times \text{Closing stock}$$

$$= \frac{\text{Rs. 48,000}}{\text{Rs. 2,13,000}} \times \text{Rs. 42,600} \text{ or Rs. 9,600}$$

Note 2 : Profit relating to process III has been determined as follows :

$$= \frac{1,70,400}{100} \times 20 = \text{Rs. 34,080}$$

Note 3 : For the purpose of calculation of profit, 1,70,400 will be taken as the cost of process III. Profit is to be added to it to arrive at the transfer price. The cost of Rs. 1,32,000 is the cost for analysis purpose and not the cost of process III.

Dr.				Cr.			
Finished stock Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Process III (transfer)	2,04,480	1,32,000	72,480	By Sales	2,60,000	1,25,400	1,34,600
Less : stock b/d	10,224	6,600	3,624				
	1,94,256	1,25,400	68,856				
To Profit	65,744	-----	65,744				
	2,60,000	1,25,400	1,34,600		2,60,000	1,25,400	1,34,600
To stock b/d	10,224	6,600	3,624				

Note : Profit element in closing stock has been determined as follows :

$$= \frac{\text{Profit}}{\text{Total}} \times \text{Closing stock}$$

$$= \frac{72,480}{2,04,480} \times 10,224 = \text{Rs. } 3,624$$

(b) Actual Realised Profit :

Statement showing Actually Realised Profit

Stage	Apparent profit Rs.	Unrealised profit in closing stock Rs.	Actual profit Rs.
Process I	22,500	-----	22,500
Process II	28,000	2,500	25,000
Process III	34,080	9,600	24,480
Closing stock	65,744	3,624	62,120
Total	1,50,324	15,724	1,34,600

(c) Statement showing value of closing stock for exhibition in Balance sheet

Costing stock Process No. 1 at cost Rs 15,000 (Refer to particulars of closing stocks in process No. 2. figure taken form 2 nd column)

Costing stock Process No. 2 at cost Rs 15,000

Costing stock Process No. 3 at cost Rs 33,000 (Refer to particulars of closing stock in process no. 3
Second column figure)

Costing stock Finished stock at cost Rs. 6,600 (Refer to particulars of closing stock in Finished stock
Figure taken from 2nd column)

Closing stock to be exhibited in Balance Sheet Rs. 69,600

To profit can be checked as follows :

Total cost incurred in all processes :	Rs.
Process No. 1 (Direct material + Direct labour = 60,000 + 45,000)	1,05,000
Process No. 2 (Direct material + Direct labour = 15,000 + 30,000)	45,000
Process No. 3 (Direct material + Direct labour = 15,000 + 30,000)	45,000
Total	1,95,000
Less : Cost of goods sold	1,25,400
Stocks to be exhibited in Balance Sheet	69,600

Illustration 10 : A product passes through three processes, Viz, A,B, and C and then is transferred to Finished stock. The output of process A is transferred to process B at a profit of 25% on transfer price and the output of process B and C is transferred at profit of 20% each on the transfer price

The following information was obtained as on 31st December :

	Process A Rs.	Process B Rs.	Process C Rs.	Finished Stock Rs.
Opening stock	5,000	6,000	4,000	15,000
Direct Material	10,000	10,500	15,000	-----
Direct Wages	7,500	7,500	8,000	-----
Works Overhead	7,000	3,000	20,000	-----
Closing stock	2,500	3,000	2,000	7,500
Inter-process Profit in				
opening stock	-----	1000	1000	5,500

Stocks in the process are valued at prime cost. The finished stock has been valued at the price at which it was received from process C. Sales of the finished stock amounted to Rs. 1,75,000

You are required to (a) prepare the element at each stage, (b) compute the actual realised profit and (c) show stock valuation for Balance sheet purpose.

Solution :

(a) Process Accounts and Finished stock Account showing profit :

Dr.				Cr.			
Process A Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Opening stock b/d	5,000	5,000	----	By process B A/c (Transfer)	36,000	27,000	9,000
To Materials	10,000	10,000	----				
To wages	7,500	7,500	----				
	22,500	22,500	----				
Less : closing stock	2,500	2,500	----				
Prime cost	20,000	20,000	----				
To overheads	7,000	7,000	----				
	27,000	27,000	----				
To Gross profit [33 1/3% on cost	9,000		9,000]				
	36,000	27,000	9,000		36,000	27,000	9,000
To Stock b/d	2,500	2,500	----				

Dr.				Cr.			
Process B Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Opening stock b/d	6,000	5,000	1,000	By Process 'C' A/c [transfer]	75,000	50,500	24,500
To process A a/c [transfer]	36,000	27,000	9,000				
To Materials	10,500	10,500	----				
To Wages	7,500	7,500	----				
	60,000	50,000	10,000				
Less : closing stock	3,000	2,500	500				
Prime cost	57,000	47,500	9,500				
To overheads	3,000	3,000	----				
	60,000	50,500	9,500				
To Gross profit [25% on cost]	15,000		15,000				
	75,000	50,500	24,500		75,000	50,500	24,500
To stock b/d	3,000	2,500	500				

Dr.				Cr.			
Process C Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Opening Stock b/d	4,000	3,000	1,000	By Finished stock A/c (transfer)	1,50,000	95,000	55,000
To process B a/c (Transfer)	75,000	50,500	24,500				
To Materials	18,000	15,000	----				
To wages	8,000	8,000	----				
	1,02,000	76,500	25,500				
Less : closing stock c/d	2,000	1,500	500				
Prime cost	1,00,000	75,000	25,000				
To overheads	20,000	20,000	----				
	1,20,000	95,000	25,000				
To Gross (profit 25% on cost)	30,000		30,000				
	1,50,000	95,000	55,000		1,50,000	95,000	55,000
To stock b/d	2,000	1,500	500				

Dr.				Cr.			
Finished stock Account							
Particulars	Total Rs.	Cost Rs.	Profit Rs.	Particulars	Total Rs.	Cost Rs.	Profit Rs.
To Opening stock A/c	15,000	9,500	5,500	By Sales	1,75,000	99,750	75,250
To process (A/c transfer)	1,50,000	95,000	55,000				
	1,65,000	1,04,500	60,500				
Less : Closed stock	7,500	4,750	2,750				
	1,57,500	99,750	57,750				
To Gross Profit	17,500	----	17,500				
	1,75,000	99,750	75,250		1,75,000	99,750	75,250
To Stock b/d	7,500	4,750	2,750				

(1) Calculation of profit in closing stock

Process A : No profit included

Process 'B' : $\frac{50,000}{60,000} \times 3,000 = 2,500$; Profit included = $3,000 - 2,500 = 500$

Process C : $\frac{76,500}{1,02,000} \times 2,000 = 1,500$; Profit included = $2,000 - 1,500 = 500$

Finished Stock : $\frac{1,04,500}{1,65,000} \times 7,500 = 4,750$; Profit included = $7,500 - 4,750 = 2,750$

(2) Actual profit Realised

Stage	Process profit Rs.	+	Unrealised profit in opening stocks Rs.	-	Unrealised profit in Closing stock Rs.	=	Actual profit Rs.
Process 'A'	9,000	+	Nil	-	-----	=	9,000
Process 'B'	15,000	+	1000	-	500	=	15,500
Process 'C'	30,000	+	1000	-	500	=	30,500
Finished stock	17,500	+	5,500	-	2,750	=	20,250
	71,500	+	7,500	-	3,750	=	75,250

Verify this figure with that shown in the credit profit column of finished stock Account

(3) Valuation of closing stock for Balance sheet . The amount of cost column of finished stock A/c Will be taken to Balance sheet. It comprises of :

	Rs.
process A	2,500
Process B	2,500
Process C	1,500
Finished stock	4,750
Total	11,250

(4) Verification / Check

Total cost of all processes = Rs 88,500 i.e. (A : 24,500 + B : 21,000 + C : 43,000) fixed

(+) cost of opening stock = Rs. 22,500 i.e., (5000 + 5000 + 3,000 + 9,500)

1,11,000

(-) cost of sales 99,750

closing stock Rs. 11,250.

8.8 Key words

Inter process profit : Profit that is so added while transferring the output of one process to the subsequent process

Transfer price : is the price at which output of a process is transferred to the subsequent process which includes an element of profit.

Closing stock : Stock which is left unsold in any process which should be valued at its cost only

Unrealised profit : is the profit which is included in value of closing stocks.

Realised profit : Profit included in the output which is already sold.

8.9 Self - Assessment Questions / Exercises

1. What is meant by inter - process profits ? what purpose does it serve ?
2. What are the complications in inter-process profit ?
3. In case inter - process profit system is observed in an organisation, What complication takes place in valuation of stocks ?
4. The following are the details in respect of two processes x and y, of a processing industry :

	Process X Rs.	Process Y Rs.
Materials	10,000	-----
Labour	12,000	20,000
Overheads	6,000	10,000
Closing stock (valued at total cost)	4,000	8,000

The output of process x is transferred to process Y at a price calculated to give a profit of 20% on the transfer price and the output of process Y is charged to finished stock on a similar basis.

Of the output transferred to finished stock, stock costing Rs. 10,000 remained unsold at the end of the accounting period and the balance realised Rs. 1,00,000. There was no opening stock and no closing work-in-process Show.

- (i) Process Accounts and total profit ;
 (ii) Value of closing stocks for Balance sheet purpose.

[Ans : Stock of process A/c - x Rs. 4,000 ; Y Rs. 8,000 ; Fin. stock 10,000]

Provision to be made - x Rs. nil ; y Rs. 800 ; Fin stock 2,800

Stock for B/S purpose - x Rs. 4,000; y Rs. 7,200 : Fin. stock 7,200]

5. Profit 'B' Pases through two processes before it is transferred to finished stock. The following data are available for the month of Dec. 2001 :

Particulars	Process I	ProcessII
Opening stock (At prime cost)	5,000	8,000
Direct Materials	40,000	12,000
Direct Labour	35,000	40,000
Production overheads	20,000	24,000
Closing stock (At prime cost)	10,000	4,000

Output of processes are transferred to the next ones at the following transfer prices :

Process I - @ 25% on the Transfer price to process II

Process II - @ 20% on the Transfer price to finished stock.

Finished stocks are valued at the price at which they are received from process II, and as follows:

Opening stock	Rs. 20,000
Closing stock	Rs. 30,000
Sales for the month amounted to	Rs. 3,00,000

Provisions for internal process profits as on 1st Dec, 2001 were as follows :

Included in work-in-process II	Rs. 1,500
Included in Finished stock	Rs. 6,500

Rs. 8,000

Calculate :

- (a) Process Costs,
- (b) Gross profit, and
- (c) Write up the provision for inter process profit account.

Illustration 6 : A certain product passes through three processes before it is transferred to finished stock. The following information is obtained for the month of August :

	Process I Rs.	Process II Rs.	Process III Rs.	Finished Stock Rs.
Opening stock	2,000	12,000	10,000	25,000
Direct material	13,000	20,000	40,000	-----
Direct Wages	10,000	10,500	50,000	-----
Production overheads	10,000	25,000	25,000	-----
Closing stock	5,000	6,000	32,000	33,000
Profit % on transfer price to the next process	20%	25%	10%	-----
Inter process-profits for opening stock	-----	2,000	2,800	10,000

Stocks in process are valued at prime cost and finished stock has been valued at the price at which it was received from process III. Sales during the period were Rs. 3,00,000

Prepare and compute :

- (a) process cost Accounts showing profit element at each stage :
- (b) Actual Realised profit ; and
- (c) Stock valuation for Balance Sheet purpose.

[Ans : Cost of closing stock in process II Rs. 3,750, Fin. Stock A/c Rs. 7,500

Profit (Unrealised) in closing stock of process II Rs. 750

Profit (unrealised) in closing stock of finished stock A/c Rs. 3,750)

7. Product X passes through three processes, process I, process II and process III to completion. The output of each process is charged to the next process at a price calculated to give a profit of 20%

on the transfer price and the output of process III is changed to finished stock on a similar basis. The following information is available for the year ended 31st December 2002

	Process I	Process II	Process III
	Rs.	Rs.	Rs.
Material consumed	40,000	60,000	20,000
Wages paid	60,000	40,000	80,000
Stock on 31st December	20,000	40,000	60,000

Stock in each process has been valued at prime cost to the process. There were no stocks in hand on Jan. 1st and no work-in-progress in any process at 31st Dec. 2002. Of the goods passed into finished stock Rs. 40,000 remained in hand at 31st December, and the balance has been sold for Rs. 3,60,000

Show :

(i) Process Accounts and total apparent profits ;

(ii) Realised profit

[Ans : Apparent profit - Process I Rs. 20,000 ; II Rs. 40,000 ; III Rs. 60,000 ; Fini. Stock A/c Rs.1,00,000

Provision for unrealised profit : Process I Rs. 8,907 ; II 12,267 ; III 8,000 fin. Stock A/c Nil

Realised profit - process I Rs. 11,093 ; II 27,733 ; III 52,000 Fin. stock A/c 1,00,000]

8. Mandex Ltd. Processes a patent material used in building. The material is produced in three consecutive grades namely soft, medium and Hard. Figures relating to production for the first 6 months of 2002 are as follows :

	Process I	Process II	Process III
Raw material used	1,000 tonnes		
cost per tonne	Rs. 200		
Manufacturing wages and expenses	Rs. 72,500	Rs. 40,800	RS. 10,710
Weight lost	5%	10%	20%
Scrap sold at Rs. 50 per tonne	50 tonnes	30 tonnes	51 tonnes
Sale price per tonne	Rs. 350	Rs. 500	Rs. 800

Management expenses were Rs. 17,500 ;

and selling expenses Rs. 10,000

Two thirds of process I and one-half of process II are passed on to the next process on to the balances are sold.

You are required to prepare a cost statement in a form suitable for presentation to the directors at their, next meeting when the production policy of the company will be discussed.

(Ans : Cost - process I - Rs. 2,70,000, II = Rs. 2,19,300, III - Rs. 1,17,810. Net profit - Rs. 9,940)

8.10 Further Readings :

1. Theory and practice of cost Accounting By M.L. Agarwal
2. Cost Accounting principles and practice BY M.N. Arora
3. Advanced problems and solutions in cost Accounting By S.N. Maheswari
4. Cost Accounting by Mittal & Mital.

Lesson - 9**BY PRODUCTS AND JOINT PRODUCTS ACCOUNTING****Objectives :**

The objectives of this unit are :

- κ to explain you as to what By - Products and Joint Products are, and the distinctions between By- Products and Joint Products
- κ To familiarise you with the methods of Accounting for By-Products and Joint Products.

Structure :

- 9.1 Introduction**
- 9.2 By-Products and Joint Products**
- 9.3 Distinctions Between By-Products and Joint Products**
- 9.4 Apportionment of Joint Costs**
- 9.5 Accounting for By-Products**
- 9.6 Accounting for Joint Products**
- 9.7 Key words**
- 9.8 Self assessment Questions / Exercises**
- 9.9 Further Readings**

9.1 Introduction

There are certain industries where two or more products of equal importance are simultaneously produced. These industries include extractive industries, agricultural product industries and chemical process industries. There are others where certain products may emerge in the course of processing operation of a principal product. Yet, in another case, to ensure complete utilisation of the raw materials, the scrap or waste materials resulting from processing operations may be profitably utilised in the production of other products which may or may not be of significant importance. In all such cases, the management is confronted with various problems, such as, problem of valuation of inventory, product pricing and income determination, problem of taking decision in matters of further processing of by - products and, or joint-products after a certain stage, etc. Thus, the various problems relate to (i) apportionment of costs incurred commonly for various products and (ii) aspects other than mere apportionment of costs incurred upto the point of separation. Therefore, before processing further, it is necessary to explain various turn's which will be frequently used.

9.2 By products And Joint Products :

By products

By-products are define as “products recovered from material discarded in a main process, or from the production of some major products, where the material value is to be considered at the time severance from the main product” (Cost Accountants, Handbook, edited by T. Lang) White (Journal of Accountancy, Vol 51) defines the term as any saleable or usable value incidentally produced in addition to the main product”.

Thus by-products emerge as result of processing operation of another product or they are produced from the scrap or waste materials of a process. In short, these products are usually considered to be relatively less important.

Illustration :

1) Oil refinery : Crude oil is processed and the following by - products are obtained along with the main product refined oil :

- (a) Sulphar
- (b) Bitumen
- (c) Chemical fertilizer, etc.

2) Dairy industry : Butter and cheese are main products while butter milk is by-product.

3) Soap making Industry : In the process of mixing and boiling ingredients many rejections takes place. These rejections are collected for recovery as by products (e.g., glycerine)

4) In coke ovens, gas and tar are, treated as by - products.

Joint Products : In certain industries, two or more products of equal importance and value are produced, simultaneously in a process. Such products are called joint products. These, in other words, represent “two or more products separated in the course of the same processing operation, usually requiring further processing, each product being in such proportion that no single product can be designated as a major product” (cost Accountants, Hand book, edited by T. Lang). Motor spirit, kerosene oil, fuel oil, lubricating oil, wax, tar, and asphalt are the examples of joint products produced from crude petroleum. Thus joint products have the following features :

(1) The products are the simultaneous outcome of the joint process and from the same raw materials.

(2) The products have equal commercial value.

(3) The products require processing to finish them into more useful and valuable products.

On the other hand, co-products, if and when a distinction must be made, refer to the production of two or more products at the same time, but not necessarily from the processing operations or the

same raw material. For instance, in lumbering operations, it is possible to obtain, oak, pine and walnut boards at the same time, but from different trees (raw materials)

9.3 Distinction Between By-Products and Joint Products

From the definitions it appears that :

- 1) Joint products are of equal importance while by products are of small economic value, and
- 2) Joint products are simultaneously one produced unlike the by-products which are incidentally produced in addition to the main products.

But cases are not uncommon when the main products of one industry become the by-products of another. In such a case two following factors may be taken into consideration in making distinction between by-products and joint products.

- 1) **Manufacturing objective** : If the objective of an industry is to produce, say, product A, other products B and C, produced incidentally, will be treated as by-products because the plant objective is to produce only one product, i.e., product A. On the other hand, if the objective of an other industry is to produce products B and C, and if product A emerges incidentally, then products B and C will be treated as joint products while product A will be treated as by-products in as much as the plant objective, in this case, to produce products B and C only. Again if the objective, of a third company is to produce products A, B and C simultaneously, then all the three products will be termed as joint products or main products.
- 2) **Value** : If the value of one type of product is considerably low as compared to that of other types which are simultaneously produced, then the first mentioned product is liable to be classified as by-product. On the other hand, if the value of a product, which is incidentally produced, is of considerable importance, as compared to that of a main product, products which are incidentally produced may be classified as joint products.
- 3) **Managerial policy** : In case two or more products are produced simultaneously and some of larger value and others of smaller value, managerial policy may indicate whether the smaller value product is treated as by product or joint product depending on its importance. Sometimes, realisable value of smaller value product determines the profitability of entire product-mix. Product of this type may be considered as joint product.
- 4) **Categorisation of By - products based on further processing** : Some of the by - products sold as they are without further processing. For instance, molasses, bagasse, or rice husk may be sold as they are. Certain other by products may need further processing. Management may consider it profitable to further process by - products and sell these as a refined or divergent product. For instance, molasses may be further processed into industrial alcohol, bagasse and husk may be further processed into cardboard etc.

9.4 Apportionment of Joint Costs

When by-products and or joint products are produced from the same materials and common conversion costs are incurred for these products, the main problem is to apportion total costs incurred upto the point of separation to by-products and or joint products. For costs incurred after the split off

point, there is no problem because these costs can be directly allocated to individual products, whether they are by-products or joint products. In short, after the separation point, these products become independent products and costs independently incurred are borne by them.

9.5 Accounting for By-products

By-products are sometimes classified as :

- (a) those requiring no further processing after separation from the main product, and
- (b) those requiring additional processing after separation from the main product.

Costs incurred after the point of separation can be directly allocated to individual products without any difficulty. But the main problem is to apportion joint costs of processing to main products and by-products. By - products are considered to be of minor importance and apportionment of joint costs is mainly designed for the correct cost ascertainment of the joint products or main products.

Accounting Methods : The methods of accounting for by-products can be grouped under two broad types :

I. Non cost Methods / Sales Methods, that is, those which do not attempt to cost the by-products or its inventory ; and

II. Cost methods, that is those which attempt to apportion some portion of the joint costs to by-products.

I. Non - Cost / Sales Methods : Included in this group arise :

1. Miscellaneous Income or other income method

Under this method, by-products do not bear any portion of joint costs. On the other hand, income from the sale of by-products is treated as "other income or miscellaneous income". This method of accounting is suitable where -

- a) The market value of by-products is negligible as compared to main products ;
- b) The use of other detailed methods will result in too much costs in comparison with the resulting benefits,
- c) The cost of joint or main products does not vary appreciably as a result of non-costing of by-products and there is no clearly defined basis of apportionment.

This method results in certain drawbacks distorts cost of main product, vitiates comparisons of product profitability, indicates a wrong picture of financial profits especially when a product is manufactured during one period and by-product is sold during the next period.

2. By - product sales added to the main product sales : Under this method all costs incurred on main and by - products are deducted from the combined sales of the main product and by-products. This method is adopted where by - products are of small value and they are sold without any further processing.

3. By-products Sales Deducted from Total cost

Under this method the sale proceeds of the by-products are treated as deductions from total costs. The sales value is deducted either from the production costs or cost of sales.

Other variations of the method are :

(i) Main product account is credited by the sales value of by-product less selling and distribution expenses on by-products sale.

(ii) Main product account may be credited by sales value of by-product less selling and distribution expenses on also all post separation costs incurred on by-products.

4. Reverse cost methods : Under this method, an estimated profit from the sales of by - products, selling and distribution expenses and further, processing costs after the split off points are deducted from the sale value of by - products and the net amount is credited to the main product.

Illustration 9.1 : During August, 2002 ; 1,000 units of main product were produced at a total cost of production of Rs. 80,000. The production also resulted in 4,000 units of a by - product which was sold @ Rs. 4 per unit. However, this sale of by - product led to additional selling expenses of Rs. 1,000. 800 units of main product were sold at a price of Rs. 120 per unit. Calculate the amount of gross profit after crediting the realisation from by-product

a) to cost of production, and b) to cost of sales

Solution :

(a) Realisation from by- product credited to cost of production :

Particulars	Amount Rs.	
Sales of main product in Aug. 2002 (800 units @ Rs. 120)	96,000	
Less : cost of sales :		
Total cost of 1,000 units	Rs. 80,000	64,000
Sale of by - product = 4000 x 4 Rs.	16,000	
Less : selling expenses	1,000	
Less : Net realisation from by - product -	-15,000	
Net production cost of 1,000 units	65,000	
Less : Closing stock of 200 units Rs. 65	13,000	
Less : Cost of sales of 800 units		- 52,000
Gross profit		44,000

Note : The difference in gross profit is due to difference in value of closing stock which is Rs. 13,000 in the first method and Rs. 16,000 in the second method. In the first method net realisation from scrap of Rs. 15,000 has been deducted from the cost of entire output of 1,000 units while in the second case it has been deducted only from the cost of goods sold.

Illustration 9.2 : In the process of manufacturing a main product 400 units of a by-products are also generated. After further processing these units are sold for Rs. 60 per unit. Further processing cost amounted to Rs 4,000 and selling expenses for the by - product accounted to Rs. 1,600. Ascertain the amount to be credited to process Account in respect of by-product.

Solution : Sale value of by-product 400 x 60 =		Rs. 24,000
Less : Further processing cost	4,000	
Selling costs on by product	1,600	5,600
Amount to be credited to process A/c in respect of by - product		<u>18,400</u>

Illustration : In a small scale sugar producing factory together with sugar, two by-products molasses and bagasse are also Produced. Cost details are :

Total cost before separation state Rs. 5,00,000

	Sugar Rs.	Molasses Rs.	Bagasse Rs.
Sale of entire output	8,00,000	3,20,000	1,60,000
Post separation costs	1,20,000	20,000	10,000
Estimated profit margin on sale		20%	10%
Estimated selling expenses as a percentage of sales	10%	20%	20%

Prepare comparative profit and loss statement for the three products using reverse cost method of by-product accounting

Solution :

Reverse cost Statement for By-products

Particulars	Molasses		Bagasse	
	Rs.	Rs.	Rs.	Rs.
Sales		3,20,000		1,60,000
Less : Estimated profit 20% & 10%	64,000		16,000	
Selling expenses 20% & 20%	64,000		32,000	
Post separation cost	<u>20,000</u>	-1,48,000	<u>10,000</u>	<u>-58,000</u>
Share in Joint costs		<u>1,72,000</u>		<u>1,02,000</u>

The share of main product sugar in Joint cost is total joint cost less share of molasses and bagasse in joint cost = 5,00,000 - 1,72,000 and 1,02,000 = Rs. 2,26,000

Comparative Profit and Loss Statement

Particulars	Sugar	Molasses	Bagasse	Total
	Rs	Rs.	Rs.	Rs.
Pre-separation cost	2,26,000	1,72,000	1,02,000	5,00,000
Post-separation cost	1,20,000	20,000	10,000	1,50,000
Cost of production	3,46,000	1,92,000	1,12,000	6,50,000
Selling expenses	80,000	64,000	32,000	1,75,000
(1) cost of sales	4,26,000	2,56,000	1,44,000	8,26,000
(2) Sales	8,00,000	3,20,000	1,60,000	12,80,000
Profit = (2) - (1)	3,74,000	64,000	16,000	4,54,000

Illustration 9.3 : In manufacturing the main product A, a company processes the resulting waste material into two by-products - B1 and B2. Using the method of working back from sale values to an estimated cost, prepare a comparative profit and loss statement of the three products from the following data :

	A	B ₁	B ₂
	Rs.	Rs.	Rs.
Sales (all production)	1,64,000	16,000	24,000
Cost after separation		4,800	7,200
Estimated net profit percentage to sales value		20%	30%
Estimated selling expenses as percentage to sales value	20%	20%	20%

Solution :

In order to ascertain comparative profit and loss, statement total cost upto separation point should be apportioned to main product A and by-products B1 and B2. Here the Reverse Cost Method is to be used.

	B1	B2
	Rs.	Rs.
Sales	16,000	24,000
		Rs.
Less : Estimated profit	3,200	7,200
Selling expenses	3,200	4,800
Cost after separation	<u>4,800</u>	<u>7,200</u>
	<u>11,200</u>	<u>19,200</u>
Joint costs to be borne	<u>4,800</u>	<u>4,800</u>

Therefore, main product A will bear Rs. 58,400 (i.e., Rs. 68,000 - Rs. 4,800 - Rs. 4,800).

Comparative profit and loss statement

Particulars	Products			
	A Rs.	B1 Rs.	B2 Rs.	Total Rs.
1. Sales	1,64,000	16,000	24,000	2,04,000
2. less : Cost of Sales :				
Pre-separation costs	58,400	4,800	4,800	68,000
Post separation costs	-----	4,800	7,200	12,000
Cost of production	58,400	9,600	12,000	80,000
Selling expenses	32,800	3,200	4,800	40,800
	91,200	12,800	16,800	1,20,000
3. Profit (1-2)	72,800	3,200	7,200	83,200
As% of Sales value	44.4%	20%	30%	40.8%

II. Cost Methods : These methods will include the following :

1. Opportunity cost / Replacement cost / Comparative price method : If the by-products, having no or low market value, are used in the factory either as raw material or as partly finished material, valuation of these products may be made at comparative price of similar or an alternative material. For example, in manufacturing 2,000 units of product A, 300 units of by-product B are obtained and these 300 units are used in the factory as raw material. If the market price of this type of material is, say, Rs. 2 per unit, then the process Account will be credited with Rs. 600 (300 units @ Rs. 2). On the other-hand, if the price of this type of material is not readily available, the process account may be credited with an amount in respect of by - products valued at the price of an alternative material. Normally, this method is used by organisations which used by-products internally in the organisation as raw material for some other purposes :

2. Standard cost Method : Standard cost is predetermined 'should be' cost. Like joint products, standard cost may be determined in respect of each by-product and the process account may be credited with the standard cost. The standard cost may be at past average prices or may be fixed according to the principles of standard costing.

3. Proration of Joint costs or Apportionment Like joint products : When by-products are of considerable value, it is desirable to apportion the joint costs to major products and by-products on some acceptable basis. Otherwise, the cost of products will be misleading. Under this method, by-products are charged with costs incurred after the separation point and with a reasonable portion of joint-cost. In apportioning the joint cost to major products and by-products, this method follows the same principles which are applicable to joint products.

Sell at split off or Further Processing : Sometimes, by-products and/or joint products do not have any realisable value unless they go through further processing after the separation point. Sometimes, further processing after the point of separation is done to make these products work profitable. In all such cases, decision has to be taken as to the profitability of further processing.

Further processing will be profitable if the sales value at the end of processing less the sales value that could be obtained if no further processing was done is more than sufficient to cover the costs of further processing. In short, if incremental revenue as a result of further processing exceeds the additional costs of processing, further processing may be recommended. However, before taking a final decision in the matter, non cost factors should also be taken into consideration.

Illustration 9.4 : ABC Ltd. has obtained four products P,Q., Rand S. Total cost till the separation point amounted to Rs. 4,50,000. The output and sales during the previous year were as follows :

Products	Output Units	Sales Rs.	Post Separation Costs (Rs)
P	60,000	40,000	40,000
Q	10,000	1,60,000	24,000
R	2,000	32,000	12,000
S	5,000	1,28,000	44,000

Required :

(1) Calculate the net income from each product if the joint costs are apportioned on the bases of sales value at split off point

(2) What would be the net income if all joint products are sold at split off point P @ Rs. 4, Q @ Rs.12, R @ Rs. 7 and S@ Rs. 24 per unit.

(3) Show by relevant calculations, which of these four products should be further processed with the above information remaining were in the current year.

Solution : (i)

Income statement : Joint Costs Apportioned Based on Sales Value at Split off					
Products	Final Sales Value	Post-Separation Costs	Sales value of Split. off	Share in Joint cost	Net Income
(1)	(2) Rs.	(3) Rs.	(4) i.e. (2)-(3) Rs.	(5) Rs.	(6) Rs.
P	4,00,000	40,000	3,60,000	$4,50,000 \times 3,60,000/6,00,000 =$	2,70,000
Q	1,60,000	24,000	1,36,000	$4,50,000 \times 1,36,000/6,00,000 =$	1,02,000
R	32,000	12,000	20,000	$4,50,000 \times 20,000/6,00,000 =$	15,000
S	1,28,000	44,000	84,000	$4,50,000 \times 84,000/6,00,000 =$	63,000
	<u>7,20,000</u>	<u>1,20,000</u>	<u>6,00,000</u>		<u>4,50,000</u>

(ii) Income Statement : Sale at split off point

Products	Sale at Split off	Apportionment of Joint costs	Net Income (2)-(3)
(1)	(2)	(3)	(4)
P	$60,000 \times \text{Rs. } 4 = 2,40,000$	$4,50,000 \times 2,40,000/4,94,000 =$	2,18,624
Q	$10,000 \times \text{Rs. } 12 = 1,20,000$	$4,50,000 \times 1,20,000/4,94,000 =$	1,09,312
R	$2,000 \times \text{Rs. } 7 = 14,000$	$4,50,000 \times 14,000/4,94,000 =$	12,752
S	$5,000 \times \text{Rs. } 24 = 1,20,000$	$4,50,000 \times 1,20,000/4,94,000 =$	1,09,312
	<u>4,94,000</u>	<u>4,50,000</u>	<u>44,000</u>

Solution : (iii)

Products (1)	Which product - To process Further : Incremental Gain or Loss					
	Sales after Processing (2)	Sales at Split off (3)	Incremental sales (2)-(3) (4)	Post split off costs (5)	Incremental gain/loss (4)-(5) (6)	
P	4,00,000	2,40,000	1,60,000	40,000	1,20,000	
Q	1,60,000	1,20,000	40,000	24,000	16,000	
R	32,000	14,000	18,000	12,000	6,000	
S	1,28,000	1,20,000	8,000	44,000	-36,000	
	<u>7,20,000</u>	<u>4,94,000</u>	<u>2,26,000</u>	<u>1,20,000</u>	<u>1,06,000</u>	

ABC Ltd. should further process P,Q and R but not S. It can increase its total profit by Rs. 36,000, if product S is sold immediately after split off point.

Illustration 9.5 : A company manufactures product X which yields two by-products A and B. In a period, the amount spent up to the point of separation was Rs. 41,200 Subsequent expenses were :

	X	A	B
	Rs.	Rs.	Rs.
Materials	600	400	300
Direct wages	800	600	400
Overheads	600	540	560
	<u>2,000</u>	<u>1,540</u>	<u>1,260</u>

Gross sales value of products X, A and B were Rs. 30,000, Rs. 20,000 and Rs. 10,000 respectively. It was estimated that the net profit as percentage of sales in case of A and B would be 25 percent and 20 percent respectively.

Ascertain the profit earned on X.

Solution :

Statement of Apportionment of Joint - Costs to By-products

Particulars	By-products		
	A Rs.	B Rs.	Total Rs.
Gross sales value	20,000	10,000	30,000
Less : Estimated profit 25% & 20%	5,000	2,000	7,000
Cost of production	15,000	8,000	23,000
Less:Subsequent expenses	1,540	1,260	2,800
Share of A and B in Joint cost	13,460	6,740	20,200

Process A/c

Dr.

Cr.

Particulars	Amount Rs.	Particulars	Amount Rs.
To Joint cost	41,200	By by-product A A/c	13,460
To Subsequent expenss :		By Product B A/c	6,740
Materials	600	By Sales	30,000
Direct Wages	800		
Overheads	600		
To profit & Loss A/c			
	50,200		50,200

Illustration 9.6 : The yield of a certain process is 80% as to the main product, 15% as to the by - product and 5% as to the process loss. The material put in process (5,000 units) cost Rs. 47.50 per unit and all other charges are Rs. 28,500 of which power cost accounted for 33 1/3 %. It is ascertained that power is chargeable as to the main product and by-product in the ratio of 10:9. Draw up a statement showing the cost of the by-product. Show complete working.

Solution :

Material input - 5,000 units @Rs 47.50	Rs. 2,37,500
Power (33 1/3% of 28,500)	9,500
Other charges (28,500 - 9,500)	19,000
Total Joint cost	Rs. 2,66,000
Main product 80% of 5,000	4,000 units
By-product 80% of 5,000	750 units
Process Loss 5% of 5,000	250 Units

Statement showing the cost of the By-Product

Cost Items	Total	Main product	By-product
Production (Units)		4,000	750
Materials (4,000 : 750)	Rs. 2,37,500	Rs. 2,00,000	Rs. 37,500
Power (10:9)	9,500	5,000	4,500
Other charges in the ratio of production units	19,000	16,000	3,000
Total Cost	2,66,000	2,21,000	45,000

Illustration 9.7 : Work out the estimated pre-separation cost per ton of by-products y and z from the following data :

Cost of manufacture before separation : Rs. 51,20,000

Main product is X. There are two by-products Y and Z

Whose normal selling prices are under :

Sale price of Y : Rs. 1,000 per ton ; Sale price of Z : Rs. 1,600 per ton

Selling and distribution expenses have been estimated to be 25% of selling price and the net profit is expected to be 10% of selling price and the net profit is expected to be 10% of selling price. Costs to manufacture each ton after separation from main products are :

Rs. 190 for By-Product Y ; Rs 290 for By-product Z

Assume equal weight for Y and Z

Solution :

Statement of Estimated pre - separation costs per ton of By - Products

Cost Item	By products	
	Y Rs. per ton	Z Rs. per ton
Sales prize	1,000	1,600
Less : Profit 10% on selling price	-100	-160
Total cost	900	1,440

Less : Selling & Distn. Exp. (25% of selling price)	-250	-400	
	750	1.040	
	-190	-290	
Estimated pre-separation cost per ton of by-products	560	750	

Illustration 9.8 : A factory is engaged in the production of a chemical Bomex and in the course of manufacture, a by-product Brucil is produced, which after further processing has a commercial value. For the month of May, the following are the summarised cost Data :

	Separate Expenses		
	Joint Expenses	Bomex	Brucil
Material	Rs. 2,00,000	Rs. 12,000	Rs. 6,000
Labour	1,00,000	40,000	36,000
Overheads	60,000	20,000	12,000
Selling price per unit		198	68
Estimated profit per unit on sale of Brucil			8
No. of units produced		2,000 units	2,000 units

The factory uses reverse cost method of accounting for by-products whereby the sales value of by-products after deduction for the estimated profit, post-separation costs and selling and distribution expenses relating to the by-products is credited to the joint process cost account.

You are required to prepare statements showing :

- (i) The joint cost allocable to Bomex :
- (ii) The product-wise and over all profitability of the factory for May.

Solution :

Statement of Apportionment of Joint costs (Share of Brucil)

Particulars	Amount
	Rs.
Sales value of Brucil 2,000 units @ Rs. 68	1,36,000
Less : Estimated profit (2,000 x 8)	16,000
Total cost	1,20,000
Less : Post-separation expenses (8,000 + 36,000 + 12,000)	56,000
Share of Brucil in Joint Expenses	64,000
Total Joint Expenses	3,60,000
Less : share of Brucil in joint expenses	64,000
Share of Bomex in joint expenses	2,96,000

II Statement of Profitability For the month of May

Particulars	Main product Bomex (Rs)	By-product Brucil (Rs.)	Total (Rs.)
Share in Joint expenses	2,96,000	64,000	3,60,000
Separate expenses	72,000	56,000	1,28,000
Total cost	3,68,000	1,20,000	4,88,000
Sales	3,92,000	1,36,000	5,28,000
Profit	24,000	16,000	40,000

Illustration 9.9 : From the following information find out the cost of x and y, the latter being the by-product on whose sale a profit of 20% on selling price is obtained.

	Joint Expenditure	Separate Expenditure	
	Rs.	X Rs.	Y Rs.
Materials	18,000	4,000	2,000
Labour	8,000	1,600	600
Expenses	4,000	2,000	800

The amount realised by sale was Rs. 7,000. Prepare a statement of cost.

Solution :

Determining share of Y in joint costs :	Rs.
Realisation from sale of Y	7,000
Less : Profit (20% on sales)	1,400
Total cost of Y	5,600
Less : Separate Expenditure on Y (2,000 + 600 + 800)	3,400
Share of Y in Joint Expenses	<u>2,200</u>
Determining share of X in joint Costs	Rs.
Total Joint costs (18,000 + 8,000 + 4,000)	30,000
Less : Share of Y	2,200
Share of X in joint cost	<u>27,800</u>

Statement of cost of X and Y

Particulars	Main product X	By- Product Y
Separate cost (4,000 + 1,600 + 2,000)	Rs.7,600	Rs 3,400
Share in joint costs	27,800	2,200
Total Cost	<u>35,400</u>	<u>5,600</u>

Illustration 9.10 : A company produces a main chemical product M and, in the process by - product B. The costs up to point of separation are Rs 2,40,000. Additional costs incurred after separation are Rs 66,000 and Rs. 6,000 respectively

The quantities emerging at separation point are 1,50,000 kg. and 30,000 kg. respectively. Entire production is sold at the following process :

M at Rs. 3.92 per kg. and B at Rs.0.40 per kg.

Selling and distribution overheads Rs 3,800 and Rs. 730 respectively. Prepare statement of profit or loss for both Mand B on each of the following bass :

- Value of B nil at separation point.
- Apportion costs upto separation on quantity bases, and
- Apportion costs upto separation on the basis of sales.

Solution :

Statement of Estimated Joint cost and profit

particulars	Main chemical M Rs.	By-product B Rs.	Total Rs.
(a) When value of B is nil :			
Costs upto point of separation	2,40,000	nil	2,40,000
Additional costs after separation	66,000	6,000	7,000
Cost of Production	3,06,000	6,000	3,12,000
Selling and Distibution on overheads	3,800	730	4,530
Cost of Sales	3,09,800	6,730	3,16,530
Net profit (Balancing figure)	2,78,200	5,270	2,83,470
Sales : 1,50,000 x Rs. 3.92 and 30,000 x R.e 0.40	5,88,000	12,000	6,00,000

(B) Joint cost Apportioned on Quality Basis :

Output (K.g)	3,00,000	60,000	-----
Joint cost in 15:3 ratio	Rs. 2,00,000	Rs. 40,000	Rs. 2,40,000
Costs after separation	66,000	6,000	72,000
Cost of Production	2,66,000	46,000	3,12,000

Selling and Distribution overheads	3,800	730	4,530
Cost of Sales	2,69,800	46,730	3,16,530
Net Profit / Loss (Balancing figure)	3,18,200	26,730	2,83,470
Sales	5,88,000	12,000	6,00,000

(C) Joint cost Apportioned on Sales Basis :

Joint Cost in 49:1 ratio	2,35,200	4,800	2,40,000
Costs after separation	66,000	6,000	72,000
	3,01,200	10,800	3,12,000
Selling Distribution on costs	3,800	730	4,530
Cost of Sales	3,05,000	11,530	3,16,530
Net : Profit (balancing figure)	2,83,000	470	2,83,470
Sales	5,88,000	12,000	6,00,000

Note : Apportionment of joint costs affects profit of individual products. It does not affect total profit.

Illustration 9.11 : In a manufacturing concern production of 'A' yields by products 'B' and 'C'. The joint expenses of manufacture are as follows :

Materials Rs. 17,000, Labour Rs. 18,000, Overheads Rs. 15,000

Subsequent expenses are :

	Material	Labour	Overheads
	Rs.	Rs.	Rs.
A	5,000	3,800	3,000
B	2,400	3,200	1,800
C	2,800	4,000	2,100

Selling prices : A Rs. 60,000, B Rs. 40,000; C Rs. 30,000. Profit on selling price A 40%, B 30% C 25%. Show how you would apportion joint expenses and ascertain selling prices.

Solution :

Statement of Apportionment of Joint Costs

Particulars	Products			
	A Rs.	B Rs.	C Rs.	Total Rs.
Sales	60,000	40,000	30,000	1,30,000
Less : Profit on sales 40%, 30% & 25%	24,000	12,000	7,500	43,500
Cost of sales	36,000	28,000	22,500	86,500
Less : Selling & Distn. expenses (Apportioned on the basis of sales)	3,876	2,586	1,938	8,400
Less : Subsequent expenses	11,800	7,400	8,900	28,100
Joint cost apportioned to A,B & C	20,324	18,014	11,662	50,000

Estimation of Selling and distribution expenses :

The joint cost Rs. 50,000 plus subsequent expenses of all the three products Rs. 28,100 is Rs. 78,100. Total cost of sales is Rs. 86,500. Excess of cost of sales over total joint costs + subsequent costs i.e., cost of production is $86,500 - 78,100 = \text{Rs. } 8,400$ is estimated selling expenses.

Illustration 9.12 : A factory production article A also yields B and C as by-products. The Joint cost of manufacture is.

Materials Rs. 20,000 ; Labour Rs. 4,000 ; Overheads Rs. 6,000.

Subsequent costs are as under :

	A Rs.	B Rs.	C Rs.
Material	3,000	2,600	2,000
Labour	400	300	200
Overheads	1,600	1,100	800
	<hr/> 5,000	<hr/> 4,000	<hr/> 3,000
Selling prices	60,000	48,000	40,000
Estimated profit on selling prices	30%	25%	20%

Show how you would apportion the joint costs of manufacture and prepare the necessary statements in respect of A,B and C

Solution :

Statement of Apportionment of Joint Costs

Particulars	A	B	C	Total
	Rs.	Rs.	Rs.	Rs.
Sales	60,000	48,000	40,000	1,48,000
Less : Profits	-18,000	-12,000	8,000	-38,000
	<u>42,000</u>	<u>36,000</u>	<u>32,000</u>	<u>1,10,000</u>
Less : Subsequent costs	-5,000	-4,000	-3,000	-12,000
	<u>37,000</u>	<u>32,000</u>	<u>29,000</u>	<u>98,000</u>
Less : Selling & Distn. Expenses	23,514	18,810	15,676	58,000
Share in joint cost	13,486	13,190	13,324	40,000

The difference between 98,000 and joint cost of 40,000 = Rs 58,000 is selling and distribution expenses which are apportioned in the ratio of sales i.e., 30:24:20. Also selling expenses = cost of sales-cost of production = 1,10,000 - (Total Joint cost + Total Subsequent costs) = 1,10,000 - (40,000 + 12,000) = 58,000.

Main Product Account

Dr.

Cr.

Particulars	Amount Rs.	Particulars	Amount
To Joint Expenses :			
Materials	20,000	By By-Product B a/c	13,190
Labour	4,000	By By - product C a/c	
To overheads	16,000	(share in joint Expenses)	13,324
To subsequent Expenses :			
To Materials	3,000		
To Labour	400	By Sales	60,000

To overheads	1600		
To Selling and Distn. Expenses	23,514		
To Profit	18,000		
Total	86,514		86,514

By product B A/c

Dr. Cr.

Particulars	Amount Rs.	Particulars	Amount Rs.
To Product A A/c (Share in Joint expenses)	13,190	By Sales	48,000
To Materials	2,600		
To Labour	300		
To Overheads	1,100		
To Selling & Distin... Ex.	18,810		
To Profit	12,000		
	48,000		48,000

By Product C A/c

Dr. Cr.

Particulars	Amount Rs.	Particulars	Amount Rs.
To product A A/c (Share in joint expenses)	13,324	By sales	40,000
To Material	2,000		
Labour	200		
Overheads	800		
To Selling & Distn. Exp.	15,676		
Profit	8,000		
To	40,000		40,000

Illustration 9.13 : A factory produces a main product x and a by-product y upon which further costs are incurred to render it saleable. The joint costs of manufacture are given below :

Materials Rs. 3,00,000 ; Labour Rs. 1,80,000, Overheads Rs. 1,20,000 Subsequent costs are :

	X Rs.	Y Rs.
Material	1,80,000	90,000
Labour	84,000	60,000
Overheads	36,000	30,000
	3,00,000	1,80,000
Selling prices	9,60,000	4,80,000
Estimated profit on selling price	25%	20%

Selling expenses were also incurred on products.

Prepare a statement showing apportionment of Joint costs and process account X and Y to show cost of production.

Solution :

Statement of Apportionment of Cost

Particulars	X Rs.	Y Rs.	Total Rs.
sales value	9,60,000	4,80,000	14,40,00
Less : Profit 25% & 20% on sales	-2,40,000	-96,000	-3,36,000
Total Cost	7,20,000	3,84,000	11,04,000
Less : Subsequent Total product	-3,00,000	-1,80,000	-4,80,000
Estimated total Joint cost inclusive of Selling & Distn. Exp.	4,20,000	2,04,000	6,24,000

But total cost before segregation is given Rs. 3,00,000 + Rs. 1,80,000 + Rs.1,20,000 = Rs. 6,00,000

The excess as per estimate represents selling and distribution costs

= Rs. 6,24,000 - Rs. 6,00,000 = Rs. 24,000 to be apportioned in the ratio of sales value i.e.,
9,60,000 : 4,80,000 i.e., 2:1

	x	Y	Total
Estimated total cost	4,20,000	2,04,000	6,24,000
Less : Selling & Distn. Exp.	-16,000	-8,000	-24,000
(apportioned in proportion to sales i.e., 2 : 1)			
Share of X and Y in Joint Cost	4,04,000	1,96,000	6,00,000

Main Product X A/c

Dr.

Cr.

Particulars	Amount	Particulars	Amount
To Materials (3,00,000 + 1,80,000)	4,80,000	By Transfer of Share in joint Expenses product Y (2,04,000 - 8,000)	1,96,000
To Labour (1,80,000 + 84,000)	2,64,000	By Sales	9,60,000
To Overheads (1,20,000 + 30,000)	1,56,000		
To Selling & Distn... Exp...	16,000		
To Profit on Product X	2,40,000		
	11,56,000		11,56,000

By Product Y A/c

Dr.

Cr.

Particulars	Amount Rs.	Particulars	Amount Rs.
To X (main product) A/c (Share in Final cost)	1,96,000	By Sales	4,80,000
To Materials	90,000		
To Labour	60,000		
To overheads	30,000		
To Selling & Distn.... Ex..	8,000		
To Profit on Y	96,000		
	4,80,000		4,80,000

Illustration 9.14 : In a manufacturing process, in the course of manufacture of the product X, the by-products P and Q also emerge. The pre-separation expenses amount to Rs. 2,30,100. All the three products are processed further and sold in the market. (Details Given below)

	Main product		By product	
	X	P	Q	
Sales value (Rs.)	1,80,000	1,20,000	80,000	
Post separation cost (Rs.)	12,000	10,000	8,000	
Profit on percentage of sales	25	20	15	

Total fixed selling and distribution expenses are 10% of the total cost of sales and are apportioned to the three products in the ratio of 20:40:40

(i) Prepare a statement showing the apportionment of pre-separation costs to the main product and the two by-products.

(ii) If the by-product P is not processed further and can be sold just after separation at Rs. 1,17,000 without incurring any selling and distribution expenses, would you advise its disposal at that stage ?

Solution :

(i) Statement showing Apportionment of pre-separation cost to the main product and the by products.

Particulars	Main product	By products		Total
	x	P	Q	
Sales	Rs. 1,80,000	Rs. 1,20,000	Rs.80,000	Rs. 3,80,000
Less : Profit (25%,20%&15%)	-45,000	-24,000	-12,000	-81,000
Total cost of sales	1,35,000	96,000	68,000	2,99,000
Less : Total fixed selling & Distn. [Exp. 10% of Rs. 2,99,000 apportioned in the ratio of 20:40:40]	-5,980	- 11,960	-- 11,960	29,900
Cost of production	1,29,020	84,040	56,040	2,69,100
Less:Post-separation cost	-12,000	-10,000	- 8,000	- 30,000
Joint-cost apportion or costs at split off point	1,17,020	74,020	48,040	2,39,100

(ii) By-product P : Impact on profit at the point of separation

	Rs.
Sales of P :	1,17,000
Joint costs opporioned i.e., cost at split off point	-74,040
Profit if P is sold immediately after separation	42,960
Profit after futher processing	24,000
Reduction in profit if processed further	18,960

It is therefore advised that by-product P should be sold at the point of separation. This can be explained as follows also through.

Incremental cost and sales :

Incremental sales revenue (1,20,000 - 1,17,000)	3,000
Additional cost	
Post-separation cost 10,000	
Selling and Distn. Expenses <u>11,960</u>	-21,960
Reduction in profit if sold after function processing	18,960

9.6 Accounting for Joint Products :

The Joint products cannot be identified as separate products upto a certain stage in manufacturing. That stage is known as the split off point. Costs incurred prior to this stage are joint costs, and costs there after are called subsequent costs. The cost before the separation stage has to be distributed to each product. There are various accounting methods adopted for this purpose.

Average Unit Cost Method : In this method, the total process costs upto the point of split off are divided by the total weight or units produced to get average cost per unit of production. The process losses are - borne by the joint products in the ratio of their output weight units. This method can be - applied where the joint products can be measured in terms of common unit such as litre, gallon, kg. etc. where the end products cannot be expressed in common unit, this method is not helpful. This method ensures two advantages : 1. computations are simple, and 2. costs of joint products are determined in a uniform manner.

Illustration 9.15 : From the following ptarticulars, find out the cost of joint products A,B and C under Average unit cost method.

(a) Pre-separation point costs Rs. 30,000

(b) other production data :

Product	Units Produced	Raw Materials Used (Units)
A	1,000	4,000
B	400	8,000
C	600	8,000
Total	2,000	20,000

Solution :

$$\text{Cost per unit} = \frac{\text{Rs. } 30,000}{2,000} = \text{Rs. } 15$$

Costs of Products

Products	Units Produced	Cost per unit Rs.	Total Rs.
A	1,000	15	15,000
B	400	15	6,000
C	600	15	9,000
	2,000		30,000

Illustration 9.16 : One tonne of raw material put into common process yields four products, M,N,O, and P, their weights being 63 kg., 117 kg., 180 kg., and 540 kg. respectively. The balance in weight is considered as a normal loss. Based on the total processing cost of Rs. 20,000 per tonne of raw material input, you are required to apportion the joint cost to products M,N,O and P

Solution :

Product	Weight of output in Kgs.
M	63
N	117
O	180
P	540
Total	900
Normal loss	100
Weight of raw material	1,000

Total Joint cost of Rs. 20,000 is apportioned in the ratio of weight of product produced.

$$M = \text{Rs. } 20,000 \times \frac{63}{900} = \text{Rs. } 1,400$$

$$N = \text{Rs. } 20,000 \times \frac{117}{900} = \text{Rs. } 2,600$$

$$O = \text{Rs. } 20,000 \times \frac{180}{900} = \text{Rs. } 4,000$$

$$P = \text{Rs. } 20,000 \times \frac{540}{900} = \text{Rs. } 12,000$$

Illustration 9.17 : A producer of tiles has produced the following Quantities of tiles of the following size during the month of August.

4" x 4" 2,000 sq. ft. 4" x 6" 6,000 sq. ft.

6" x 9" 12,000 sq.ft . 9" x 12" 10,000 Sq.ft.

Total cost incurred till split off point accounted to Rs. 2,40,000. Calculate cost of the four products till the spit off stage using average unit cost method.

Solution :

$$\begin{aligned} \text{Average per unit} &= \frac{\text{Total cost till split off stage}}{\text{Total nubfer of cost units of all jointproducts}} \\ &= \frac{\text{Rs. } 2,40,000}{30,000 \text{ sq.ft}} = \text{Rs. } 8 \text{ persqft} \end{aligned}$$

Tile size	Quantity produced (sq. fit)	Average cost per sq. ft Rs.	cost of products till split off stage Rs.
4" x 4"	2,000	8	16,000
4" x 6"	6,000	8	48,000
6" x 9"	12,000	8	96,000
9" x 12"	10,000	8	80,000
Total	30,000		Rs. 2,40,000

Physical Unit Method : A physical base e.g., raw materials, is the proportion used to apportion pre separation costs to joint products. In other words the physical volume of materials found in joint products at the point of separation is found out and on that very basis the cost is apportioned. Process loss is borne by joint products in the ratio of their output weight. This method can be applied when physical units of products in the ratio of their output weight. This method can be applied when physical units of production are similar or can be correlated by a factor or coefficients. This method cannot be helpful where costs have no relationship to the output weight of individual products.

Illustration 9.18 : The following data have been extracted from the books of M/s. East India coke Co. Ltd.

Joint Products	Yield in lbs. of recovered Product per tonne of coal
Coke	1,420
Coal Tar	120
Benzol	22
Sulphate of Ammonia	26
Gas	412
	2,000

The price of coal is Rs. 80 per tonne. Direct labour and overhead cost upto point of split off are Rs. 40 and Rs. 60 respectively per tonne of coal. Calculate the material labour overheads and total cost of each product on the basis of weight.

Solution :

Item	Yield (in lbs of recovered products per tonne of coal)	Percentage of total	Apportioned cost			
			Cost Rs.	Direct labour Rs.	Overheads Rs.	Total Rs.
Coke	1,420	71.0	56.80	28.4	42.60	127.80
Coal Tar	120	6.0	4.80	.40	3.60	10.80
Benzol	22	1.1	0.8	0.44	0.66	1.98
Sulphate Ammonia	26	1.3	1.04	0.52	0.78	2.34
Gas	412	20.6	16.48	8.24	12.36	37.08
Total	2,000	100	80.00	40.00	60.00	180.00

Technical Evaluation Method or Surve method or Point value method or weighted Average Method: In this method, all important factors such as volume, selling price, technical side, marketing process etc. affecting costs are ascertained by means of an extensive survey. Points, values or percentages are given to individual products according to their relative importance and costs are apportioned on the basis of total points. These ratios should be revised from time to time depending upon the factors affecting production and sales. This method is useful where joint products are substantially different from one another and various factors are to be considered for assigning joint costs to joint products. An important drawback of this method is that assignment of weights is based on intuitive judgement and an arbitrariness in appropriate with passage of time and receive frequent revision.

Illustration 9.19 : In a steel factory the following pre-separation costs have been incurred on three products X, Y and Z : Materials Rs. 50,000, labour Rs. 8,000 and production overheads Rs. 20,000. The output of the three products is : X 500 units, Y 400 units, and Z 100 units. After detailed survey the products X, Y and Z were assigned weights of 6, 5 and 10. Determine shares of X, Y and Z in joint costs and cost per unit at the point of separation.

Solution :

Pre separation costs :	Rs.
Materials	50,000
Labour	80,000
Production overheads	20,000
Total Joint cost to be Apportioned	Rs. 1,50,000

Statement of Apportionment of Joint Costs

Products	Units	Weights Points	Weight units (2)x(3) = (4)	Cost per Weighted unit	Apportioned cost (4) x (5) = (6)	Cost per units (6) ÷ (2) = (7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A	500	6	3,000	Rs. 25	Rs. 75,000	Rs. 150
B	400	5	2,000	25	50,000	125
C	100	10	1,000	25	25,000	250
			6,000		1,50,000	

$$\text{Cost per Weighted Unit} = \frac{\text{Total Joint Cost}}{\text{Total Weighted units}} = \frac{\text{Rs. 1,50,000}}{6,000} = \text{Rs. 25}$$

Standard Cost Method : Under Standard cost method joint costs are apportioned to individual joint products on the basis of pre determined Standard cost of these products. Efficiency of this

method can be made manifest by the degree of over or under recovery. This method can be applied only in organisation in which standard costing is in operation.

Contribution or Gross Margin Method : Under this method joint costs are split into two categories variable costs and fixed costs. Variable joint costs are apportioned on the basis of units turned out, their weight, volume or on some other physical basis, Fixed costs are apportioned in the ratio of contribution of the products. This method can be implemented in organisations using the system of marginal costing.

Illustration 9.20 :

A bakery is producing three types of biscuits X, Y and Z at a total cost of Rs. 22,000 including fixed cost of Rs. 4,000. The quantities produced and sold are 40 kgs, 30 kgs. and 20 kgs and respective selling prices are Rs. 200, Rs. 300 and Rs. 400 per kg. Apportion variable and fixed costs on the basis of contribution margin and ascertain profit from each product.

Solution :

Total Variable cost = Total cost - Total Fixed cost

$$= \text{Rs. } 22,000 - \text{Rs. } 4,000 = 18,000 \text{ Rs.}$$

Total output = 40 + 30 + 20 = 90 kgs

$$\text{Variable cost per kg.} = \frac{\text{Rs. } 18,000}{90 \text{ kg.}} = \text{Rs. } 200 \text{ per Kg.}$$

Statement of Apportionment of cost

Products	Sales value	Variable cost margin	Contribution (2)-(3) = (4)	Apportioned Fixed cost	Profit (4) - (5) = (6)
(1)	(2)	(3)	(4)	(5)	(6)
X	40 x 200 = 8,000	40 x 200 = 8,000	Nil	Nil	Nil
Y	30 x 300 = 9,000	30 x 200 = 6,000	3,000	1,714	1,286
Z	20 x 400 = 8000	20 x 200 = 4,000	4,000	2,286	1,714
	<u>25,000</u>		<u>7,000</u>	<u>4,000</u>	<u>3,000</u>

Total Fixed cost of Rs. 4,000 is to be distributed to X, Y and Z in the ratio of their contribution margin, i.e., Nil : 3,000 : 4,000 i.e., Nil : 3:4

Thus Fixed cost apportioned to X = Nil

Thus Fixed cost apportioned to Y = $4,000 \times \frac{3}{7} = 1,714$

Thus Fixed cost apportioned to Z = $4,000 \times \frac{4}{7} = 2,286$

Market Value Method : This is the most popular method because it makes use of a realistic basis for apportioning joint costs. In this method joint costs are apportioned after ascertaining "What the traffic can bear". In other words, the products are made to bear a proportion of the joint cost on the basis of their ability to absorb the same. Market value means weighted market Value, i.e., units produced x price of a unit of a joint product.

(a) Market value at the point of Separation or Relative market value Method :

This method involves the following steps :

1. The physical output of each product i.e., multiplied with the market price at the split off point.
2. Resultant market value of all products are then added.
3. The percentage of market value of each product to the total of the market values under (z) above is found out.
4. These percentages are used to allocate the total input cost among the joint products.

Illustration 9.21 : A factory has produced 200 units of product P, 300 units of Q and 100 units of R with joint costs of Rs. 50,000. The market prices of products are as follows :

Product	Market price at split off point (Rs. per unit)	Final Selling price after further processing (Rs. per unit)
P	Rs. 15	Rs. 24
Q	Rs. 20	Rs. 40
R	Rs. 10	Rs. 18

Apportion the joint costs among joint products on the basis of market value at the point of separation.

Statement of Apportionment of Joint Costs

Products	Units	Market price at split off	Sales Value at Split off (2)x(3)	Allocation Share	Apportioned Joint Costs
(1)	(2)	(3)	(4)	(5)	(6)
P	200	15	3,000	$3,000/10,000 \times 50,000$	15,000
Q	300	20	6,000	$6,000/10,000 \times 50,000$	30,000
R	100	10	1,000	$1,000/10,000 \times 50,000$	5,000
			10,000		50,000

(b) Market Value after Further processing : Here the basis of apportionment of Joint costs is the total sales value of finished products and involves the same principles as stated in average unit cost method. This method has been developed on account of the drawbacks in determining market values of joint products at split off point. This method is based on the assumption that incurrence of further costs results in corresponding increase in sale value of products. As the market prices of saleable products are easily available this method is advantageous and easy to follow.

Illustration 9.22 : Given below are cost details of three joint products X,Y and Z.

Joint Costs :	Rs.
Material A 500 kg @ Rs. 20	10,000
Material B 200 gallons @ Rs. 40	8,000
Direct labour	4,000
Production overheads	2,000
Total Joint cost at split off points	Rs. 24,000

The three joint products were further processed and marketed as follows :

Products	Further processing Cost	Quantity Produced	Selling price per unit Rs.
X	2,000	200 kgs	50
Y	4,000	50 kgs	240
Z	4,000	100 gallons	180

Apportion Joint costs on the basis of sales value and prepare detailed statement of cost.

Solution :**a) Apportionment of Joint Cost**

Products	Quantity	Selling price Rs.	Sales Value Rs.	Share in joint cost Rs.	Rs.
X	200 kgs	50	10,000	$24,000 \times 10,000/40,000 =$	6,000
Y	50 Kgs	240	12,000	$24,000 \times 12,000/40,000 =$	7,200
Z	100 gallons	180	18,000	$24,000 \times 18,000/40,000 =$	10,800
			<u>Rs. 40,000</u>		<u>Rs. 24,000</u>

(b) Statement of Cost and Profit

Products	Units	Apportioned Cost	Further Cost	Total Cost	Cost per unit	Selling price	Sales	Profit	Profit per unit (9) (10)
(1) Rs.	(2)	(3) Rs.	(4) Rs.	(5) Rs.	(6) Rs.	(7) Rs.	(8) Rs.	(9) Rs.	(10) Rs.
X	200	6,000	2,000	8,000	40	50	10,000	2,000	10
Y	50	7,200	4,000	11,200	224	240	12,000	800	16
Z	100	10,800	40,000	14,800	148	180	18,000	3,200	32
		24,000	10,000	34,000			40,000	6,000	

(C) Market Value less cost to complete Individual Joint Products :

Under this method further processing cost is deducted from the sales value of joint products for the purpose of calculating the ratio in which the joint costs are apportioned to joint products.

Illustration 9.23 : Solve the Illustration given for (b) above according to sales value less further processing cost method and determine the share of joint products x,y and z in joint costs.

Solution :

Statement of Apportionment of Joint cost

Products	Final sales Value of products	Post split off processing cost	Sales less further costs (2) - (3)	Apportionment of Joint costs
(1) Rs.	(2) Rs.	(3) Rs.	(4) Rs.	(5) Rs.
X	10,000	2,000	8,000	$24,000 \times 8,000/30,000 = 6,400$
Y	12,000	4,000	8,000	$24,000 \times 8000/30,000 = 6,400$
Z	18,000	4,000	14,000	$24,000 \times 14,000/30,000 = 11,200$
	40,000	10,000	30,000	24,000

(d) Net realisable value or Reverse Cost Method : From the sales value of the joint products the following are deducted :

1. Estimated profit margins
2. Selling and distribution expenses, if any and
3. Post - split off costs

The resultant figure so obtained is known as net realisable value of joint products. Joint costs are apportioned in the ratio of net realisable values. This method is widely used in manoj Industries. A proforma of statement of apportionment of joint costs is given below :

Apportionment of Joint Costs

Particulars	Joint Products		
	X Rs.	Y Rs.	Z Rs.
Sales	----	----	----
Less : Estimated profit	----	----	----
Less : Selling & Distn. Exp	---	---	----

Less : Post separation processing Expenses	---	----	---
Net Realisable value at split off point	---	----	----

The Ratio in which joint costs are apportioned.

Illustration 9.24 : Nimra Ltd. is producing three products P,Q and R. Joint manufacturing cost for the three products amounted to Rs. 1,20,000. The estimated profit margin on three products are 10%; 20% and 30% of sales respectively. subsequent costs are :

Particulars	P Rs.	Q Rs.	R Rs.
Direct Materials	20,000	50,000	16,000
Direct Labour	34,000	22,000	14,000
Overheads	6,000	8,000	10,000
Total Subsequent Costs	<u>60,000</u>	<u>80,000</u>	<u>40,000</u>
Sales	1,00,000	1,80,000	80,000

Prepare a statement showing apportionment of joint costs to products P,Q and R.

Solution :

Statement of Apportionment of Joint costs

Particulars	Joint Products			Total
	P	Q	R	
Sales	Rs.1,00,000	Rs.1,80,000	Rs. 80,000	Rs. 3,60,000
Less : Estimated profit	-10,000	-36,000	-24,000	-70,000
@ 10%, 20% and 30% res	90,000	1,44,000	56,000	2,90,000
Less:Post split off costs	-60,000	-80,000	40,000	1,80,000
Net Realisable value at Split off point	<u>30,000</u>	<u>64,000</u>	<u>16,000</u>	<u>1,10,000</u>

Products	Apportionment of Joint cost	Post Split off cost	Total Cost	Sales	Profit
P	$1,20,000 \times 30,000 / 1,10,000 = 32,728$	60,000	92,728	1,00,000	7,372
Q	$1,20,000 \times 64,000 / 1,10,000 = 69,818$	80,000	1,49,818	1,80,000	30,182
R	$1,20,000 \times 16,000 / 1,10,000 = 17,454$	40,000	57,454	80,000	22,556
Total	1,20,000	1,80,000	3,00,000	3,60,000	60,000

Illustration 9.25 : From the information, find the profit made by each product, apportioning joint-costs on the sales-value basis :

Joint costs	Rs.	
Direct Materials	1,26,000	
Power	25,000	
Petrol, oil lubricants	5,000	
Labour	7,500	
Other charges	4,100	
	Product X	Product Y
Selling cost	20,000	80,000
Sales	1,52,000	1,68,000

Solution :

Statement of Apportionment of Joint Costs

Particulars	Product X Rs.	Product Y Rs.	Total Rs.
Sales	1,52,000	1,68,000	3,20,000
Joint cost (apportioned in the ratio of 152 : 168)			
Direct materials	59,850	66,150	1,26,000
Power	11,875	13,125	25,000
Petrol, oil, lubricants	2,375	1,625	5,000

Labour	3,563	3,936	7,500
Other Changes	1,947	2,153	4,100
Cost of production	79,610	87,990	1,67,600
Selling costs	20,000	80,000	1,00,000
Cost of Sales	99,610	1,67,990	2,67,600
Profit (Sales-cost of sales)	52,390	10	52,400

Illustration 9.26 : In a process line of X Ltd. three Joint products are produced. For the month of August, the following data are available.

Product	A	B	C
Sale price per kg.	Rs. 10	Rs. 20	Rs. 40
Post separation costs	20,000	10,000	30,000
Output in kg.	5,000	2,000	3,000

Pre-separation point costs amounted to Rs. 40,000

The joint products are manufactured in one common process, after which they are separated and many undergo further individual processing. The pre-separation joint costs are apportioned to joint products according to weight, You are required to prepare a statement showing the estimated profit or loss for each period and in total.

Solution :

Apportionment of Pre-separation Joint costs in proportion to weight

Product	Output in kg	Apportionment of joint cost (Rs.)
A	5,000	$\frac{5,000}{10,000} \times 40,000 = 20,000$
B	2,000	$\frac{2,000}{10,000} \times 40,000 = 8,000$
C	3,000	$\frac{3,000}{10,000} \times 40,000 = 12,000$
Total	10,000	40,000

Statement showing the estimated profit or loss

Product	A	B	C	Total
Estimated pre-separation costs	20,000	8,000	12,000	40,000
Post-separation costs	20,000	10,000	30,000	60,000
Total Cost	40,000	18,000	42,000	1,00,000
Less : Sales Value	25,000	20,000	60,000	1,05,000
Profit / Loss	(15,000)	2,000	18,000	5,000

9.7 Key words

By-product : A by-product is product which is incidentally produced along with the other product which is the main product.

Joint products : Joint products are products which are produced out of a common process known as joint process which command more less the equal value.

Joint Costs : Costs incurred for a joint process through which more than one product are produced which are known as joint products.

Apportionment : The process of distribution of joint cost over various products produced jointly out of a joint process.

9.8 Self - Assessment Questions / Exercises**Theory Questions :**

1. Distinguish between by-products and joint products with examples. ?
2. Explain the various methods for apportioning joint costs to joint products ?
3. Distinguish between joint products and by-products and explain various methods of accounting for them. ?
4. Explain briefly the accounting methods for by-products. ?
5. How do you deal with the by-products in costing :
 - (i) Where they are of small in value
 - (ii) where they are of considerable value.
 - (iii) Where they require further processing.

2. Calculate the estimated cost of production of by-products x and y at the point of separation from the main product.

	By-Product X	By-Product Y
Selling price per unit	Rs. 12	Rs.24
Cost per unit after separation from the main product	Rs.3	Rs. 5
Units produced	500	200

Selling expenses amount to 25% of total work cost, i.e., including both pre-separation and post separation works cost.

Selling prices are arrived at by adding 20% of total cost, i.e., the sum of works cost and selling expenses.

(Ans. Cost at the point of separation X = 2,500, Y = 2,200)

From the following information, find out the profit made by each product apportioning joint costs on sales. Value basis.

Joint Costs :	Rs.	
Direct materials	1,26,000	
Power	25,000	
Petro, oil, lubricants	5,000	
Labour	7,500	
Other charges	4,100	
	product X	Product Y
Selling costs	Rs. 20,000	Rs. 80,000
Sales	1,52,000	Rs. 1,68,000

(Ans. Profit X = Rs 52,390, Y = 10)

3. The cost of 100 litres of crude oil and processing it into different products is Rs. 120 in XYZ oil refinery ltd. The standard yield per 100 litres of crude oil and its market value per litre are indicated below . compute the unit cost of each product.

	Standard yield per 100 litres of crude oil litre	Market value per litre Rs.
Petrol	32.0	1.20
Lubricating oil	5.0	2.00
Fuel oil	50.0	0.50
Kerosene	8.0	0.75
Gas oil	3.0	0.30
Loss	2.0	.00

(Ans. unit cost : Petrol Rs 1.80, Lubricating oil Rs. 3, Fuel oil Rs. 0.74; kerosene Rs. 1.12; Gas oil Rs. 0.43)

A certain chemical process yield 75% of the material introduced as main product, 20% as a by-product and 5% being lost. The percentage of material consumed by main product and by-product is 80:20. Time taken to produce one unit of by-product is half the time taken by main product. Overheads have been allocated 200% of wages of each product.

Cost data	Rs.	Units
Raw material	10,000	2,000
Labour	8,500	
Overheads	17,000	
Total	35,500	

Ascertain the costs of two products.

(Ans. Main product Rs. 30,500; By-products Rs. 5,000)

Hints : Ratio of units between main and by - products 1500 : 400, Labour Ratio 15:2

4. A Vegetable oil refining company obtains four Products whose cost details are :

Joint costs of the four products : Rs, 8,29,600

Output : A 5,00,000 litres, B 10,000 litres, C 5,000 litres, and D 9,000 kgs.

Further processing costs : A Rs. 2,40,000, B Rs. 48,000, C Rs. Nil and D Rs. 8,030.

The products can be sold as intermediates i.e., at split off point without further processing. The sale prices are :

	As Finished product	As Intermediate
A Rs. per litre	1.84	1.20
B Rs. per litre	8.00	4.00
C Rs. per litre	6.40	6.40
D Rs. Per kg	26.67	24.00

(a) Calculate the product wise profit allocating joint costs on realisable values.

(b) Compare the profitability in selling of the products with and without further processing)

(Ans. (a) profit = Rs. 39,459, A = 2,631, B=2,105 Cand 14,205 D)

(b) A =1,19,452, B = - 5,369, C= 30,205)

5. In the course of manufacture of the main product 'p' by-products 'A' and 'B' also emerge. The joint expenses of manufacture amount to Rs. 1,19,550. All the three products were processed further after separation and sold as per details given below :

	Main Product	By-products	
	'P' Rs.	'A' Rs.	'B' Rs.
Sales	90,000	60,000	40,000
Cost incurred after separation	6,000	5,000	4,000
Profit as percentage of sales	25%	20%	15%

Total fixed selling expenses are 10% of total cost of sales which are apportioned to the three products in the ratio of 20:40:40.

(i) Prepare a statement showing the apportionment of joint costs to the main product and the two by-products.

(2) If the by-product A is not subjected to further processing and is sold at the point of separation, for which there is a market, at Rs. 58,500 without incurring any selling expenses, would you advise its disposal at this stage. Show the workings.

(Ans (i) Rs. 58,510, Rs 37,020, Rs 24,020

(ii) Advisable to sell before further processing)

6. A product 'Beta' is derived in the course of manufacturing a product Alpha. The by-products are further processed for sale. From the following data available from the records prepare an account showing the cost per kg. of the product 'Alpha' and the by-product 'Beta'

Cost items	Joint Expenses	Separate Expenses	
		'Alpha'	'Beta'
Materials	10,000	6,000	500
Labour	7,000	5,000	2,000
Overheads	2,500	1,500	600

The quantities produced during the period under consideration were : Alpha 100 kg. and beta 50 kg. The selling price of Beta was Rs. 1.0 kg on which the profit earned was at 30%

(Ans. cost per kg. of alpha Rs. 309, cost per kg of beta Rs. 84)

7. The progressive Manufacturing company manufactures one main product and two By-products. Data for a month are shown below :

	Main product Rs.	By-product 'A' Rs.	By product 'B' Rs.
Sales	1,50,000	12,000	7,000
Manufacturing cost :			
(i) Before separation	75,000	----	----
(ii) After separation	23,000	2,200	1,800
Administration cost	12,000	1,500	1,000
Ratio of Distribution of selling cost	85%	10%	5%
Net profit in sales	20%	15%	10%

Assuming no beginning or ending inventories, apportion the joint cost among main product and the by-products.

(Ans. Main product Rs. 68,000; A Rs 4,500 and B Rs. 2,500; Selling Expenses Rs. 20,000)

8. A factory producing article P also produces a by-product which is further processed into finished product. The joint cost of manufacture is given below :

	Rs.
Material	5,000
Labour	3,000
Overheads	2,000
	<u>10,000</u>

Subsequent costs are given below :

	P Rs.	Q Rs.
Material	3,000	1,500
Labour	1,400	1,000
Overheads	600	500
	<u>5,000</u>	<u>3,000</u>

Selling prices are : P = Rs 16,000 ; Q = Rs. 8,000

Estimated profits on selling prices are 25% for P and 20% for Q. Assume that selling and distribution expenses are in proportion of sales prices.

Show how you would apportion joint costs of manufacture and prepare a statement showing cost of production of P and Q.

[Ans : Share in joint cost Rs. 6,733 3,267

Cost of production Rs. 11,733 6,267).

9. In a process industry, the input of materials gives an output of three joint products. The relative market value method is used in allocating the joint cost among the products. Calculate the cost per unit of each product from the following data :

Input :	Quality	Cost per unit Rs.
Material A	100 lb.	0.12
Material B	50 gallons	0.15
Direct labour	3 Hrs	2.00
Mfg. Overheads	3 Hrs	3.50

Output :

Products	Quality	Selling cost per unit
I	30 Lb.	0.60
II	60 Lb.	0.40
III	20 gallons	0.30

(Ans. Product I - Rs. 0.45, II Rs. 0.30, III - Rs. 0.225 on sale value basis)

10. A factory is engaged in the production of a product 'x' and in the course of its manufacture a by-product 'Y' is produced which after a separate process has a commercial value. The following is the information for the month of January.

	Joint Expenses Rs.	Separate Expenses Rs.	Expenses Rs.
Material	10,000	2,000	2,800
Labour	4,000	2,500	2,500
Expenses	2,000	1,400	1,000

The output for the month was 150 quintals of 'X' and 50 quintals of 'Y'. The selling price of product 'Y' is 200 per quintal. The profit on 'Y' is 33 1/3% on the cost price.

Prepare the necessary accounts to show the cost of X per quintal.

(Ans. Cost of production of X = Rs. 21,200; Y = Rs. 7,500)

11. A food processing company produces four products from a single raw material. These four products are obtained simultaneously at the point of separation. The product does not require further processing before being taken to the market. The other three products P, Q and S require further processing before being sold. The company follows net market value method for allocating common costs to products. The cost of raw material used for the year ended was Rs. 18,000. The initial processing costs were Rs. 30,000 for the same period. The output, sales and further processing costs for the last year were as follows :

Product	Output (Units)	Sales (Rs.)	Further Processing Cost (Rs.)
P	4,000	36,000	5,000
Q	3,500	14,000	1,750
R	2,500	20,000	----
S	1,200	12,000	3,250

Your are required to :

(a) prepare a comparative profit and loss statement showing the profit/loss made on each of the four products ;

(b) Assess the change in the profit / loss, if the following proposal made by the top management is accepted.

Proposal : To sell all the products directly after separation,without any further processing. The expected price per unit for the products are :

P-Rs.7, Q-Rs. 3.50, R - Rs. 8, S-Rs. 9

(Ans.Profit @ P Rs. 10,333, Q. Rs. 4,083 ; R-Rs. 6,667 ; S Rs. 2,917

(b) P Rs. 7,333, Q Rs. 4,083, R. Rs. 6,667, S Rs. 4,967)

12. In a manufacturing company 10,000 kilolitres of A is processed to produce 6,000 kilolitres of B and 4,000 kilolitres of C. The joint cost before separation point came to an amount of Rs. 24,000. From the following particulars calculate the apportionment of joint cost and the profit of each product under (a) physical measurement, (b) Market value at separation point, and (c) Market value after further processing.

	B	C
Unit selling price at separation Point	Rs. 5	Rs. 3.75
Unit selling price after futher processing	7	7.50
Further processing costs after separation	5,000	7,500

(Ans. (a) Joint cost B Rs. 14,400, C Rs. 9,600, (b) Joint cost Rs. 16,000 ; C Rs. 8,000, Profit Rs. 14,000, Rs. 7,000 ; (c) Joint cost B Rs. 14,000, C Rs. 10,000 profit Rs. 23,000 and Rs. 12,500;

Total cost Rs. 19,000 and Rs. 17,500)

13. The sunshine oil company purchases crude vegetable oil. It does refining of the same. The refining process results in four products at the split off point - M,N,O and P

Product is fully processed at the split off point. Products M,N,O and P can be individually further refined into Super M, 'Super N' and 'Super P'. In the most recent month (October 2002) the output at the split off point was :

Product M	3,00,000 gallons
Product N	1,00,000 gallons
Product O	50,000 gallons
Product P	50,000 gallons

The Joint cost of purchasing the crude vegetable oil and processing oil were Rs 40,00,000. Sunshine has no beginning or ending inventories. Sales of product O in October were Rs. 20,00,000. Total output of products M,N and P was further refined and then sold. Data related to October, 2002 are as follows :

	Further processing cost To make Superproducts (Rs.)	Sales (Rs.)
'Super M'	80,00,000	1,20,00,000
'Super N'	32,00,000	40,00,000
'Super P'	36,00,000	48,00,000

Sunshine had the option of selling products M,N and P at the split off point. This alternative would have yielded the following sales for october, 2002 production.

Product M	Rs. 20,00,000
Product N	Rs. 12,00,000
Product P	Rs. 28,00,000

Your are required to answer :

(i) How the joint cost of Rs. 40,00,000 would be allocated between each product under each of the following methods :

(a) Sales value at split off (b) Physical output (gallons), (c) Estimated net realisable value.

(ii) Could sunshine have increased it's october, 2002 operating profits by making different decisions about the further refining of product M,N or P ? Show the effect of any change you recommend on operating profits.

(Ans. (i) (a) Rs. 10,00,000, Rs. 6,00,000, Rs. 10,00,000 and Rs. 14,00,000 MNOP respectively

(b) Rs. 24,00,000, Rs. 8,00,000, Rs. 4,00,000 and Rs. 4,00,000.

(c) Rs. 20,00,000, Rs. 4,00,000, Rs. 10,00,000 and Rs. 6,00,000

(ii) Sell P at the split off point because incremental revenue in the case of product - P is less than the additional processing cost.

9.10 Further Readings :

1. N.K. Prasad : principles and practice of cost Accounting
2. Nigam and Jain : "Cost Accounting"
3. S.N. Maheswari : "Cost Accounting"
4. D.K. Mittal and L.U.V. Mittal : "Cost Accounting"
5. P.V. Rathnam : "Costing Adviser".

Lesson - 10**COST CONTROL TECHNIQUES - BUDGETING AND BUDGETARY CONTROL, FLEXIBLE BUDGETING****Objectives :**

of this unit is to explain :

- K Meaning of budget, budgeting and budgetary control.
- K Objectives of budgetary control, its advantages and limitations.
- K Prerequisites for adoption of a system of budgetary control
- K To familiarise with you
- K How to establish functional budgets ?
- K Flexible budgeting and its preparation
- K Zero based budgeting and its significance.

Structure :

- 10.1 Introduction
- 10.2 Objectives of Budgetary control
- 10.3 Preliminaries for the adoption of a system of budgetary control
- 10.4 Organization for budgetary control
- 10.5 Types of budgets
- 10.6 Establishment of Functional budgets and master budget
- 10.7 Fixed budget and Flexible budget
- 10.8 Zero-Base Budgeting
- 10.9 Advantages and Limitations of budgetary control
- 10.10 Summary
- 10.11 Key words
- 10.12 Self-Assessment Questions / Exercises
- 10.13 Further Readings

10.1 Introduction

The very objective of cost accounting system is cost control and cost reduction. But an ordinary costing system aims at ascertaining the true cost per unit of products manufactured and or services rendered. It helps the management to compare the actual cost with that of preceding years, which is no way better than post mortem. But for effective running of a business, management must know:

- a) Where it intends to go, i.e., organisational objectives,
- b) How it intends to accomplish its objectives, i.e., plans,
- c) Whether individual plans fit into the overall objectives, i.e., coordination
- d) Whether actual operations conform to the plans, i.e., control.

Budgetary control is the technique that a firm uses for all these purposes. Budgetary control refers to controlling through budgets.

Definition of the term "Budget" : The Chartered Institute of Management Accountants (CIMA), England defines a budget as below :

"A Plan quantified in monetary terms prepared and approved prior to a defined period of time usually showing planned income to be generated and / or expenditure to be incurred during that period and the capital to be employed to attain a given objective."

An analysis of this definition reveals the following essentials of a budget :

- a) A budget is expressed in terms of money or quantity or both.
- b) It is prepared prior to a defined period of time.
- c) It is prepared for a definite future period.
- d) It relates to the policies of the organisation
- e) It is prepared for the purpose of attaining given objectives.

Thus, a budget fixes a target in terms of rupees or quantities against which the actual performance is measured. As the size of the organisation increases, the need for budgeting is correspondingly more because a budget is an effective tool of planning and control. Budgets are helpful in coordinating the various activities such as production, sales, purchases etc. Budgets are means of communication. The top management translate their ideas into budgets and passed on to the subordinates, who give them the practical shape. As the activities of all the departments are coordinated, it is helpful in developing team work among various departmental heads in the organisation.

10.1.1 Budget, Budgeting and Budgetary Control : Rowland and William have distinguished the concepts budget, budgeting and budgetary control as follows :

“Budgets are the individual objectives of a department, etc. Whereas budgeting may be said to be the act of building budgets Budgetary control embraces all this and in addition includes the science of planning the budgets themselves and the utilisation of such budgets to effect an overall management tool for the business planning and control.”

Thus, a budget is financial and or quantitative plan prepared for a definite future period of time for attaining an objective, while budgeting involves the preparation of such budgets. Budgetary control, on the other hand, covers preparation of budgets and their utilisation for the purpose of controlling.

Definitions of Budgetary Control : Budgetary Control is a managerial controlling technique by which all operations and output are forecasted in advance and actual results when known are compared with budget estimates. Budgetary control concept has been defined as follows :

1. Brown and Howard : “Budgetary Control is a system of controlling costs which includes the preparation of budgets, coordinating the departments and establishing responsibilities, comparing actual performance with the budgeted and acting upon results to achieve maximum profitability”.

2. CIMA, London : “Budgetary Control is defined as the establishment of the budgets relating to the responsibilities of executives to the requirements of a policy and the continuous comparison of actual with budgeted result either to secure by individual action the objectives of that policy or to provide a firm basis for its revision.”

The Essentials of Budgetary Control : From the above definitions the following essentials of budgetary control can be had :

- i) Establishment of budgets for each function and section of the organisation.
- ii) continuous comparison of the actual performance with the budgets so as to know the variations.
- iii) Taking remedial action to achieve the desired objective, in case of variations.
- iv) Revision of budgets in the light of changed circumstances.

10.2 Objectives of Budgetary Control :

Budgetary control is an important controlling technique in the hands of management It assists the management to evaluate the efficiency of operations. The general objectives of budgetary control are as follows :

1. Planning : A budget is a plan of policy to be pursued during the defined period of time to attain a given objective. A budget as a plan of action achieves the following purposes :

a) Action is guided by well thought out plan because a budget is prepared after a careful study and research.

b) Budgets help achieving managements objectives and policies.

c) It is a bridge through which communication is established between top management and the executives who are to implement the policies of the top management.

d) The most profitable course of action is selected from the various alternatives available.

e) A budget is the formulation of the policy of the firm to be pursued for the purpose of attaining a given objective.

2. Coordination : Budgetary control coordinates the various activities of the firm and secures cooperation from all the people concerned so that the common organisational objective may be successfully achieved. It is also helpful in coordinating the policies, plans and actions.

3. Control : Control consists of the action necessary to ensure that the actual performance of the firm conforms to the plans and objectives. This is possible through continuous comparison of actual performance with predetermined standards laid down in a budget. The variations from the budgeted figures are reported to the management for corrective action.

10.3 Preliminaries for the Adoption of a System of Budgetary Control :

The following prerequisites or steps are essential for the successful implementation of a sound budgetary control system :

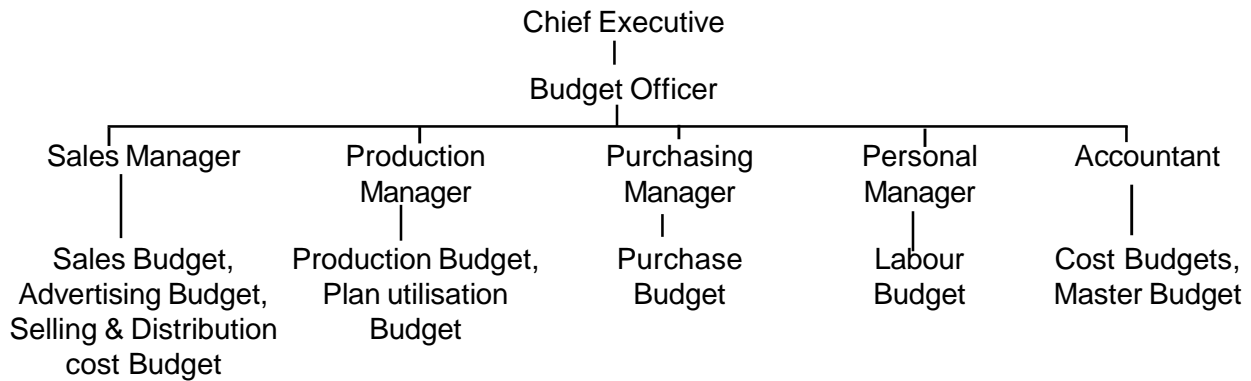
1. Organisation for budgetary control
2. Budget Officer
3. Budget committee
4. Budget Manual
5. Budget period.
6. Budget centres :

1. Organisation for Budgetary Control : Proper organisation is needed for the successful preparation, maintenance and administration of budgets. A budget committee is formed with the heads of various departments. All the functional heads, who are entrusted with the responsibility of ensuring proper implementation of their respective departmental budgets are involved in the Budget committee.

Preparation of Organisational Chart : An organisational chart defining functional responsibilities of various executives must be prepared. The chart defines :

- a) Functional responsibility of a particular executive
- b) Delegation of authority to various levels
- c) Relative position of a functional head with other functional heads.

The organisational chart may be as follows :



2. Budget Controller or Budget Officer : The organisation chart shows that Chief Executive is the head of the budgetary control system. He delegates his authority to the budget officer who sees that all budgets are coordinated and drawn in time. The budget officer makes sure that the entire budgetary function operates according to the budget manual.

As his work deal with the drafting and co-ordinating of figures, he will usually be a person with accountancy knowledge. He should also have a technical knowledge of the business. The Chief accountant or the cost accountant usually acts as Budget officer.

3. Budget Committee : The Budget controller is assisted by the Budget committee. The Budget committee will include the chief executive, Sales Manager, Purchase Manager, Production Manager, Personnel Manager, Finance Manager, Departmental Managers and the Budget Director. The committee is headed by the Chief Executive and Budget Director acts as the convenor of the committee. Budget committee performs advisory function. Various functional Managers submit their functional budgets to the committee for approval.

Functions of Budget Committee :

1. Scrutinising, revising and approving the budgets received from functional / departmental managers.
2. Receiving budget reports in the prescribed format and analysing them.
3. Fixing responsibility for deviations
4. Suggesting remedial measures to be taken according to specific schedules.
5. Evaluating projects and programmes having direct impact on budgets.

4. Budget Manual : Budget Manual is a written document which specifies the budget objectives of the organisation and its segments, the organisation for budgeting, rights, duties and obligations of all officers involved in budgetary process, budget time table, and other procedures regarding this function. CIMA defines budget manual as "a document which sets out, inter alia, the responsibilities of the persons engaged in, the routine of, and the forms and records required for, budgetary control."

The contents of Budget Manual include the following :

- i) Statement of objectives of the organisations, departments and of different budgets.
- ii) It clearly states the duties and responsibilities of executives relating to budgetary process.
- iii) Authority of each executive for approving expenditures, the type of expenditures and the approval limit are clearly stated.
- iv) Authority of each executive for approving expenditures, the type of expenditures and the approval limit are clearly stated.
- v) Length of the budget period and the time of revision of budgets are stated
- vi) Time table for each stage of each budget and for budget reporting is clearly specified.
- vii) List of documents to be used in the budget process and the standard format for each document is specified.
- viii) Method of accounting and control of all revenues and expenditures.
- ix) Budget factor for different types of budgets
- x) Codes for all costs, revenues and other expenditures are clearly stated.
- xi) Scope of each budget and the areas to be covered, e.g. whether fixed or flexible budget will be set, are mentioned.
- xii) Procedure for disposal of variations.

Advantages of Budget Manual : For entire budgetary process, it serves as a rule book. It is useful in the following ways :

- i) It provides clarity to the budgetary process. Every executive is in a position to know what is to be done, how it is to be done and by what time it is to be done.
- ii) As every thing is in writing, there will be no ambiguity
- iii) Uniformity of the process is maintained over a period of time as budgetary process in the organisation remains on a uniform pattern.
- iv) Revisions and modifications in the budget process are carried on scientific lines.
- v) Synchronisation of the efforts of various executives is possible due to budget manual.
- vi) In case of any doubt regarding budgetary methods, budget manual serves as a ready reference.

5. Budget Period : Budget period is the period for which a budget is prepared and employed. Budgets may be prepared for a month, a quarter or a year or any other appropriate period. For example, in a seasonal industry there may be a peak season budget and a slack season budget. The length of the budget period depends on i) the nature of business, and ii) costing techniques and control requirements.

In case of businesses where operating cycle is short, budget period is generally shorter, and it is longer if the operating cycle is long. In seasonal industries, the budget period is linked to seasons, whereas the capital expenditure budgets are prepared for longer periods. From control point of view, the budget period should be short so that the actuals may be compared with the budget, the causes of deviations are more quickly and easily ascertained, and remedial action is also taken faster and it will be more effective. Generally businesses have annual plans.

The time plan for various budget may be as follows :

- a) Long-term budgets for three to five years or even more may be prepared for capital expenditure, new product promotion, Research Development etc.
- b) Annual Budgets coinciding with the accounting year are prepared for operational activities, such as, sales, purchases, production, operating expenses, etc.
- c) Short-term Budgets like monthly budgets may be prepared for the purpose of exercising effective control.

6. Budget Centres : A budget centre is the lowest level in an organisation for which costs and revenues are budgeted. Costs and revenues are separately assigned to each budget centre for measuring their performance and fixing responsibility. An organisation divided into various budget centres. A budget centre should satisfy the following conditions for effective control.

- i) Each budget centre should be distinct from the other and there should not be any overlapping of functions.
- ii) Those costs and revenues which are controllable by a budget centre should only be assigned to that centre.
- iii) Common costs or joint costs should not be assigned to a budget centre.
- iv) In case of joint costs or common costs, responsibility should be separately assigned.
- v) Each budget centre should be headed by an officer who is responsible for deviations of actual performance from the budgeted.

7. Key Factor or Limiting Factor or Principal Budget Factor : Key factor or limiting factor refers to that resource which restricts or limits the level of activity, otherwise possible. Hence, this factor is very important while preparing budgets. The CIMA, London, defines a principal budget factor as "the factor the extent of whose influence must be first assessed in order to ensure that the functional budgets are reasonably capable of fulfillment".

Some important key factors are : Sales, availability of raw materials, availability of a particular type of labour (labour hours key factor) availability of machine capacity (Machine hours being the key factor)

Preparation of budgets should be based on the Key factor. For example, if sales is the key factor, the sales budget should be prepared first keeping in view the key factor. Later, budgets for

production, purchases, personnel and finance should be based on the sales budget. On the other hand, if availability of raw material is the key factor, production budget should be prepared first and basing on this, sales, purchases, personnel and finance budgets should be prepared.

Key factors may change over a period of time due to managerial effort or change in demand and supply conditions. Hence, the key factor should be indentified and carefully considered while preparing budgets, otherwise budgets will be unrealistic and unachievable.

10.5 Types of Budgets :

Keeping in view the purpose served by the budgets, different types of budgets have been developed. They are classified as below :

1. On the basis of budget conditions :

- a) Current budgets
- b) Basic budgets.

2) On the basis of budget period :

- a) Long term budgets
- b) short-term budgets

3) On the basis of scope and function :

- a) Functional budgets
- b) Master budget.

4.) On the basis of flexibility :

- a) Fixed or rigid budgets
- b) Flexible budgets.

10.5.1 On the Basis of Conditions :

a) Current Budgets : A current budget is a budget which is related to the current conditons and is prepared or use over a short period of time when compared to basic budget, this budget is more useful, because the budget targets can be corrected to current conditions.

b) Basic Budgets : A basic budget is a budget which is prepared for use unchanged over a long period of time. Current conditions are not considered while preparing this budget. The targets of this budget can be attainable under standard conditions only.

10.5.2 On the Basis of Budget period :

a) Long-term budgets : A budget which is prepared for periods longer than one year are termed as long-term budget. These budgets are helpful in business for casting and forward planning. The examples for these budgets are capital Expenditure budget and Research and Development expenditure budget.

b) Short - term budgets : A budget which is prepared for period less than a year and is very useful to lower levels of management for control purposes is termed as a short-term budget. These budgets are normally prepared for those activities where the trend is very difficult to foresee over longer periods. Cash budget and materials budget are examples of short-term budgets.

10.6 Functional Budgets And Master Budget

Functional budgets relate to various functional activities of the business, e.g., sales, purchases, production, personnel, cash etc. Functional budgets commonly prepared are :

Budget	Prepared by
1. Sales Budget	
2. Selling and Distribution Cost budget	Sales Manager
3. Materials Budget	Purchase Manager
4. Production Budget	
5. Production Overhead Budget	Production Manager
6. Plant utilisation Budget	
7. Labour and Personnel Budget	Personnel Manager
8. Research & Development Cost Budget	R & D Manager
9. Capital Expenditure Budget	Chief Executive
10. Administration cost budget	
11. Cash Budget	Finance Manager

10.6.1 Sales Budget : Sales Budget is the most important budget in an organisation. Sales being the Principal budget factor, this budget forms the basis on which all other budgets like production, purchase, Machine utilisation, labour and personnel etc., are built up. This budget is a forecast of quantities and values of sales to be achieved in a budget period. Utmost care should be taken while preparing the budget to ensure that the budgeted figures as accurate as possible because this is the basis for several other budgets. The Sales Manager should be directly made responsible for the preparation and execution of this budget.

Sales budget may be prepared according to the products, sales territories, types of customers, salesmen etc.

Factors to be considered while preparing the Sales Budget : While preparing the Sales Manager should take the following factors into consideration

- i) **Past Sales Trends** : Past is the starting point for estimating the future. While preparing the sales budget correct data of the past sales for a few years should be taken as the basis.
- ii) **Estimates from Salesmen** : These are the people in the field who know best about how the customers feel about the products, competition, future prospects in the market etc. The information supplied by them should be carefully evaluated and cross checked. Due allowance should be made for over enthusiasm or excessive conservatism by some salesmen.
- iii) **General Trade Prospects** : Generally sales go up during boom and go down during depression. The general trade prospects influence the sales of a product a firm. The Sales Manager, in this connection, should gather information from various financial news papers and magazines to ascertain the future general trade prospects.
- iv) **Plant Capacity** : The sales budget should be prepared within the available plant capacity and should ensure proper utilisation of the plant facilities available.
- v) **Availability of Raw materials and other supplies** : Adequate supply of raw materials and other supplies should be ensured while preparing the sales estimates. If raw materials are in short supply, the sales budget should be adjusted accordingly.
- vi) **Orders on Hand** : The value of orders on hand may have considerable influence on the budgeted sales, where production process is lengthy.
- vii) **Seasonal Fluctuations** : Understanding of the seasonal behaviour of prices and demand is necessary for preparing seasonal as well as annual budgets because sales are affected by these seasonal fluctuations. The effects of these seasonal fluctuations sales can be minimised and evenflow of production can be ensured by offering special off-season discounts or concessions.
- viii) **Competition** : The nature and degree of competition faced by the firm should be taken into consideration while preparing the sales budget, because competition influences the level of sales of the firm.
- ix) **Financial Requirement** : Sales expansion requires more fixed and working capital. Hence, sales budget should be prepared within the financial capacity of the firm.
- x) **Results of Market Research** : A firm should carry on market research on a continuing basis to ascertain the sales potential of different products produced by the firm. The results of market research should be incorporated while preparing the sales budget.
- xi) **Return on capital employed** : The sales volume should be budgeted in such a way that the firm makes an adequate return on capital employed.
- xii) **Miscellaneous factors** : In addition to the above, the sales manager should consider other factors such as advertising and other sales promotion efforts, government regulations import possibility, product profitability, pricing policies etc.

Sales Forecast and Sales Budget : These two are different concepts. Sales forecast is just a guess of sales without considering production capacity, availability of material, labour and working

capital and many other factors. It may lack any objective to control the actual performance. On the other hand, the estimate of sales in the sales budget is not a mere guess. It is based on all the factors such as plant capacity etc. Hence, it is capable of being achieved and so amenable to control.

10.6.2 Production Budget : Production budget provides a well planned forecast of total volume of production with break up for each product and with detailed schedule of operations (by weeks and months) to be performed. It also provides a forecast of closing stocks of work-in-progress and finished goods. It is generally prepared in physical units, though it can also be prepared in monetary value, which is known as cost of production budget. This cost of production budget gives separately the budgets for materials, labour, machine utilisation and overheads. Preparation of production budget is the responsibility of production manager. Production budget is prepared on the basis of sales budget.

Factors considered in preparing production budget.

1. Sales requirements including the quantity, product changed and design of products.
2. Inventory policies determining the size of stocks of work-in-progress and finished goods desired at different times of the year
3. Availability of production resources, such as plant capacity, availability of manpower, materials etc.
4. Key factors restricting the production process
5. Time lag between production and sales should be considered so as to allow for the time required for the dispatch of goods from factory to place of customers.
6. Time involved in production process
7. Economic Batch quantity of production and the relation between cost and production run should be taken into consideration.
8. Production control procedures, their effectiveness and flexibility should be considered.

Generally, the production budget is prepared in the following format.

Production Budget (in units)		Department..... Product						
For the period		Jan	Feb	March	April	May	June	Total
Budgeted sales								
Add; Budgeted closing stock of finished product								
Less : Budgeted opening Stock of Finished product								
Add : Equivalent units of closing budgeted work- in progress								
Less : Equivalent units of opening budgeted work-in-progress								
Total Budgeted production in equivalent units								

Illustration : 1

ABC company Ltd plans to sell 1,08,000 units of a certain product line in the first fiscal quarter, 1,20,000 units in the second quarter, 1,32,000 Units in the third quarter and 1,56,000 units in the fourth quarter and 1,38,000 units in the first quarter of the following year. At the beginning of the first quarter of the current year, there are 18,000 units of product in the stock. At the end of each quarter,

the company plans to have an inventory equal to one - sixth of the sales for the next fiscal quarter. Prepare production budget or each quarter of the current year.

Solution :

ABC Co. Ltd PRODUCTION BUDGET				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	Units	Units	Units	Units
Sales Budget	1,08,000	1,20,000	1,32,000	1,56,000
Add : Estimated Closing stock at the end of quarter	20,000	22,000	26,000	23,000
	1,28,000	1,42,000	1,58,000	1,79,000
Less : Estimated opening stock in the beginning	18,000	20,000	22,000	26,000
Budgeted production at the end of each quarter	1,10,000	1,22,000	1,36,000	1,53,000

Cost of Production Budget : Having determined the volume of output to be produced, the next step is to determine the cost of estimated production by preparing cost of production budget. This budget may be classified into material cost budget, labour cost budget and overhead budget.

10.6.3 Materials Budget : Materials used in production are of two types - direct materials and indirect materials. Materials budget deals with direct materials whereas, indirect materials are dealt in overhead budgets. Materials budget is prepared on the basis of production budget because the type and quantity of materials to be procured depends on the budgeted production.

The preparation of materials budget covers the following :

- a) Estimating different types of raw materials needed for various products
- b) Procuring or purchasing raw materials in required quantities at the required time.

Factors to be considered : In preparing materials budget the following factors are taken into consideration.

- i) Budgets for various types of production
- ii) Units of different types of raw materials required for each item of output.

- iii) An approximate percentage of each type of raw material cost to cost of production in order to have a broad idea regarding raw material requirement.
- iv) Consideration of standard time lag between purchase of raw materials and their actual use in production.
- v) Safety stocks for each type of material.
- vi) Overall stocking policy of the organisation.
- vii) Time lag between placement of an order and actual delivery of materials.
- viii) The seasonal fluctuations in the availability of raw material
- ix) The price tend in the market.

Illustration 2

Prepare a material procurement budget from the following information :

Estimated sales of a product : 40,000 Units. Each unit of the product requires three units of material A and five units of material B.

Estimated opening balances at the beginning of the next year.

Finished product - 5,000 Units
Materials on order :

Material A - 12,000 Units A - 7,000 Units

Material B - 20,000 Units B - 11,000 Units

The desirable closing balances at the end of next year :

Finished product - 7,000 units

Material A - 15,000 units

Material B - 25,000 units

Materials on order :

A - 8,000 units

B - 10,000 units

Solution :

Estimated Production during next year :

Estimated sales of the product	:	40,000 units
Add Desired closing balance of finished goods :		7,000 units
		47,000 units
Less Estimated opening balance A finished goods :		5,000 units
Estimated Production	:	42,000 units

Material Procurement Budget

	Material A Units	Material B Units
Material required for budgeted production :		
Material A ; 42,000 x 3 units	1,26,000	
Material B = 42,000 x 5 units		2,10,000
Add : Desired closing balance	15,000	25,000
Estimated materials on order at the end of the budgeted period.	8,000	10,000
	1,49,000	2,45,000
Less : Estimated opening balance at the beginning of the budgeted period	12,000	20,000
	1,37,000	2,25,000
Less : Estimated material on order at the beginning of the budgeted period	7,000	11,000
Material to be procured	1,30,000	2,14,000

10.6.4 Direct Labour Budget : This budget comprises the estimates of direct labour requirements necessary to produce the types and quantities of output planned in the production budget. The direct labour budget should be developed in terms of both direct labour hours and direct labour costs. This budget may be classified into labour requirement budget and labour requirement budget. The labour requirement budget is prepared on the basis of requirements of the production budget given and detailed information about the different classes of labour required for each department, their scales of pay and hours to be spent.

Labour recruitment budget is prepared basing on labour requirement budget after considering the available workers in each department. This budget provides information about the workers to be recruited during the budget period, the degree of skills and experience required and the rates of pay.

Objectives of the Budget : Following are the objectives of this budget

- i) Determining total labour requirement of different types.
- ii) Determining direct labour cost of different products
- iii) Ascertaining recruitment to be made
- iv) Providing for training of different types of labour and their placement.

10.6.5 Production Overhead Budget : This budget provides an estimate of manufacturing overhead expenses to be incurred during a budget period to achieve the targeted production. It covers cost of indirect materials, indirect labour and indirect works expenses. This budget can be classified into fixed, variable and semi-variable overhead expenses. In order to facilitate control, this budget can be broken into departmental overhead budget.

In this budget variable overheads are estimated on the basis of budgeted output because these overheads are bound to change with the change in output and variable overhead costs per unit tend to be constant. Fixed works overheads can be estimated on the basis of past records, making adjustment for anticipated changes in rates during the budget period.

10.6.6. Administration Overhead Budget : This budget covers expenses relating to formulation of policies and plans, directing organisation and overall control. These expenses include expenses of central office relating to general administration, i.e., salaries, printing and stationary, telephone, office equipment etc. Most of the administrative expenses are fixed in nature and a small change in level of output will not affect these expenses. Hence, past experience is of great help in preparing this budget. Only small changes required for changes in rates, salaries, or the number of administrative personnel however, if there is a persistent fall in production and sales, there will be greater pressure to exercise economy in administrative expenses.

This budget is prepared for each administrative department for effective control on office and administrative expenses. Actual administrative cost incurred is also recorded department wise, so that responsibility for increase in such expenses can be fixed and the executive concerned can be made accountable.

10.6.7 Selling and Distribution Overhead Budget : This budget gives a forecast of the cost of selling and distribution for the budget period. The expenses covered include salaries of people in the sales administration selling commission, advertising expenditure and distribution expenses. This budget is closely related to sales budget and budgets are prepared for each item of selling distribution overhead.

For proper control and correct forecasting it is desirable that this budget is divided according to sales territories and product-line. Selling and distribution overheads are divided into fixed and variable and separate budgets are prepared for fixed and variable items. Long-term heavy expenditures like advertising will be treated as deferred expenditure and they are spread over different periods.

10.6.8. Plant Utilisation Budget : This budget lays down the requirements of plant capacity for meeting the production programme. The preparation of this budget is based on production budget. This budget is expressed in appropriate physical units, e.g., weight or number of products or working hours.

Objectives or Functions of the budget :

- i) It gives a clear picture of machine load in different departments at different times.
- ii) It indicates overloading of machines or groups of machines in different departments during different periods.
- iii) It brings to light idle capacity of different machines at different times.
- iv) It encourages a search for alternative production techniques so that some production may be shifted from overloaded machines to idle machines, wherever practicable
- v) To effectively deal with idle capacity the management is encouraged to explore sales promotion strategies, such as, improvement in after sales service, efficiency in marketing effort, publicity campaign etc.

10.6.9. Capital Expenditure Budget : This budget gives an estimate of the amount of capital that may be required for acquiring fixed assets needed for fulfilling production requirements as per the production budget. The budget is prepared considering the available production capacities, possible reallocation of the existing assets and possible improvements in production techniques. The firm may prepare separate budgets for different items of fixed assets such as plant and equipment budget, building budget etc.

While preparing this budget the following factors should be taken into consideration

- i) The existing assets to be replaced
- ii) Additional assets to be purchased to meet proposed increase in production
- iii) Purchase of additional assets because of starting new product - lines
- iv) Installation of improved model of machinery for reducing production cost.

10.6.10. Research and Development Cost Budget : Research and Development (R&D) activity is necessary in any organisation so as to keep pace with the time, or rather continuously planning for times ahead in terms of product quality, design, technology, sales strategies etc. while preparing research and development budget, it should be kept in mind that R&D activity is entirely different from manufacturing function. Manufacturing function gives quicker results than R&D which may go on for several years. Hence, these budgets are established on a long-term basis, say for 5 to 10 years. These again are subdivided into short-term budgets on an annual basis. This budget is prepared taking into consideration the research projects in hand and the new projects to be taken up. So, this budget gives an estimate of the expenditure to be incurred on Research & Development during the budget period. This budget is prepared by the Research Director / Executive giving his assessment of priorities of different research and development projects. These details are submitted to the budget committee in the form of R&D project authorisation forms. The committee after making a cost benefit analysis of each project gives authorisation for projects considered most viable. After the approval of the budget, it is necessary to keep a close watch on the expenditure so that it may not exceed the budgeted expenditure. However control on R&D projects is relatively more difficult.

10.6.11. Cash Budget : Cash budget is a crucial budget for an organisation. It helps in forecasting and controlling the cash requirements of a firm. Cash budgets are prepared annually, quarterly, monthly, fortnightly or even weekly. This budget provides an estimate of the anticipated receipts and payments of cash during the budget period.

cash budget comprises two parts - estimated cash receipts and estimated cash payments during the period. Estimated cash receipts include cash sales, credit collections and miscellaneous cash receipts, while estimated cash payments include cash purchases, payments to creditors, wages payable, indirect expenses payable, income tax, dividend payable, budgeted capital expenditure etc. Cash budget covers each and every cash item irrespective of the nature of receipt or payment.

Cash budget provides for a minimum cash balance which will be available at all times. Generally, this balance should be equal to an amount sufficient to cover one month's operating expenses plus some provision for contingencies. This budget is prepared by the chief accounting.

Advantages of cash Budget : The following advantages can be had from the preparation of cash budget :

- 1) It gives the estimated cash position due to business operations for the future period.
- 2) It clearly states planned cash payments of capital expenditure, debt repayments, capital redemption, dividend payment etc.
- 3) It provides information regarding cash generation due to capital receipts at one place.
- 4) When there is a cash deficit as shown in the budget, the management will be in a position to make arrangements in advance to cover that shortage.
- 5) If cash budget shows large surplus of cash, it will be possible to plan for most profitable ways in which it can be invested.
- 6) Preparation of cash budget helps create confidence in financial institutions and banks, so that more funds can be obtained from them.
- 7) It serves as a sound method of cash control.

Methods of preparing cash Budget : There are three methods of preparing a cash budget :

- 1) Receipts and Payments Method
- 2) The Adjusted Profit & Loss Account Method
- 3) The Balance Sheet Method.

Of these three methods, Receipt and payment method of preparing cash budget is the most popular one.

1. Receipts and payments Method : Under this method, cash budget is prepared on the basis of anticipated cash receipts and cash payments during the budget period. One part of the budget shows anticipated cash receipts of all types and the other part shows all anticipated cash payments. These receipts and payments are accumulated on monthly or quarterly or any other basis. In case of monthly budget, for example, opening cash balance of the first month + anticipated cash receipts - anticipated cash payments during the first month gives anticipated closing balance of cash at the end of that month, which becomes opening cash balance for the next month, and so on. The budgeted cash balance may be positive or negative.

Illustration - 3

From the following particulars prepare a cash budget for three months June to August.

	Sales Rs.	Purchases Rs.	Wages Rs.	Factory Expenses Rs.	Administration & Selling Expenses Rs.
April	80,000	41,000	5,600	3,900	10,000
May	76,500	40,500	5,400	4,200	14,000
June	78,500	38,500	5,400	5,100	15,000
July	90,000	37,000	4,800	5,100	17,000
August	95,000	35,000	4,700	6,000	13,000

Sales commission at 5% on sales is payable two months after sales (in addition to selling expenses). Plant valued at Rs. 65,000 will be purchased and paid for in August. Dividend for the last financial year of Rs. 15,000 will be paid in July. There is a two month credit period allowed to customers and received from suppliers. Wages, factory expenses and administration and selling expenses are paid in the following month. Opening cash balance as on 1st June is Rs. 1,00,000.

Solution :

Cash Budget for three months ending 31st August.

	June Rs.	July Rs.	August Rs.
Opening balance	1,00,000	1,11,400	1,03,075
Budgeted Receipts :	80,000	76,500	78,500
Collections from debtors			
Total (a)	<u>1,80,000</u>	<u>1,87,900</u>	<u>1,81,575</u>
Payment to creditors	41,000	40,500	38,500
Wages	5,400	5,400	4,800
Factory expenses	4,200	5,100	5,100

Administration & Selling expenses	14,000	15,000	17,000
Sales commission	4,000	3,825	3,925
Purchase of plant	-----	-----	65,000
Payment of dividend	-----	15,000	-----
Total Payments (b)	<u>68,600</u>	<u>84,825</u>	<u>1,34,325</u>
Closing balance : (a) - (b)	1,11,400	1,03,075	47,250

Illustration 4

Based on the following information prepare a cash budget for the three months ended 31st December 2003.

	Rs.			
Cash at bank on 1st October, 2003	25,000			
Estimated Monthly salaries and wages	10,000			
Interest payable in November, 2003	5,000			
Estimated	September Rs.	October Rs.	November Rs.	December Rs.
Cash Sales	1,20,000	1,40,000	1,52,000	1,21,000
Credit Sales	1,00,000	80,000	1,40,000	1,20,000
Purchases	1,60,000	1,70,000	2,40,000	1,80,000
Other expenses	18,000	20,000	22,000	21,000

Credit sales are collected 50% in the month of sale and 50% in the month following. Collections from credit sales are subject to 10% discount if received in the month of sale and to 5% if received in the month following. 10% of the purchases are in cash and the balance is paid in next month.

Solution :

Cash Budget for the three months ended 31st December, 2003

	October	November	December
	Rs.	Rs.	Rs.
Opening balance	25,000	57,500	96,500

Receipts :			
Cash Sales	1,40,000	1,52,000	1,21,000
Credit Sales :			
Preceeding month	47,500	38,000	66,500
Current month	36,000	63,000	54,000
Total Cash (A)	2,48,500	3,10,500	3,38,000
Payments :			
Cash Purchases (10%)	17,000	24,000	18,000
Credit purchases (Preceeding month)	1,44,000	1,53,000	2,16,000
Salaries and wages	10,000	10,000	10,000
Other expenses	20,000	22,000	21,000
Interest	-----	5,000	----
Total payments (B)	1,91,000	2,14,000	2,65,000
Closing balance (A-B)	57,500	96,500	73,000

2. Adjusted Profit and Loss Account Method : According to this method cash budget is prepared by making adjustments to net profit as shown by the profit and loss account. Cash budget prepared according to this method is known as cash flow statement. Since net profit is not equal to net inflow of cash from operations, this requires certain adjustments. All non-cards expenses, such as depreciation, preliminary expenses written off, goodwill written of etc. are added back to net profit and all non-operating incomes are deducted from net profit. Increase in trade creditors and bills payable, and decrease in trade debtors, bills receivables and stocks are added to net profit, while increase in trade debtors, bills receivable and stocks and decrease in trade creditors and bills payable are deducted from net profit so as to arrive at cash from operations. While calculating this cash and bank balances are excluded.

To this various sources from which cash is raised (for example issue of capital and select sale of fixed assets etc.) are added and various appliations of cash (e.g., redemption of capital or debt, purchase of assets, paymentof dividends etc.) are deducted so that budgeted cash balance at the end is derived. This method is used generally for long-term cash forecasting.

3) Balance Sheet Method : According to this method, a budgeted balance sheet is prepared at the end with the projected balances of assets and liabilities for a period. The balancing figure will be the budgeted closing balance of cash for the period. The projected balances of various assets are calculated by adding the planned purchases of esscts to the opering balances and deducting planned

sale of assets. Likewise, the balances of various liabilities are projected by adding issue of capital and debt to the opening balances and deducting any planned repayment of debt and capital. Current assets are estimated based on anticipations regarding business operations, while current liabilities are estimated based on anticipations regarding purchases and payments for them.

10.6.12 Master Budget : The Master Budget is consolidated summary of various functional budgets. It is also known as comprehensive budget or summary budget or consolidated budgeted or finalised profit plan. It gives budgeted profit and loss account for the budgeted period and budgeted balance sheet at the end of the period.

Master Budget has been defined by Rowland and William H. Harr as “a summary of the budget schedules in capsule form made for the purpose of presenting, in one report, the highlights of the budget forecast.”

The CIMA, England defines it as “the summary budget incorporating its component functional budgets and which is finally approved, adopted and employed.”

Master budget is prepared by the budget committee by coordinating various functional budgets. When it is finally approved by the committee, it becomes the target for the company during the budget period.

Advantages of Master Budget : The following are the advantages of Master Budget :

1. This budget coordinates and integrates all functional budgets.
2. It gives a summary of functional budgets in a capsule form in one report.
3. It helps establishing accuracy of all functional budgets because the summarised information of all functional budgets should agree with the information given in the Master budget.
4. It gives a projected overall profitability position of the firm.
5. It provides information relating to forecast balance sheet in the master budget.

10.7 Fixed Budget and Flexible Budget

On the basis of capacity for which a budget is prepared, budgets can be classified into 1) Fixed budget and 2) Flexible budget.

10.7.1 Fixed Budget : A budget prepared for a single level of activity is called a fixed budget. The CIMA, London defined a fixed budget as “a budget which is designed to remain unchanged irrespective of the level of activity actually attained.” This budget, also known as rigid budget, is prepared for a single predetermined level of activity assuming no change in associated conditions. It does not provide for changes in expenditure arising out of change in the anticipated conditions and activity. Hence, a fixed budget will be useful only when the actual level of activity corresponds to the budgeted level of activity.

Thus, a fixed budget does not serve much purpose as a controlling measure. However, a fixed budget can be usefully employed for cost comparisons and control if actual level of activity is close to

the budgeted activity and conditions relating to production, sales, price, demand and competition remain more or less static.

10.7.2 Flexible Budget : A flexible budget is also known as dynamic budget, variable budget or sliding scale budget. It is designed to change in accordance with the level of activity actually attained.

The chartered Institute of Management Accountants, (CIMA) London defines flexible budget as “as budget which, by recognising the difference between fixed, semi-variable and variable cost is designed to changes as volume of output changes.” This budget provides for fluctuations in output, sales, number of employees and other variable factors so that budget for prevailing conditions can be compared with actual output, sales and costs.

Application of Flexible Budgets : Flexible budgeting is prescribed in the following conditions :

- i) When the level of business activity undergoes large variations during different periods due to seasonal and cyclical fluctuations.
- ii) Where the overall business situation is highly dynamic and fast changing.
- iii) Where it is difficult to forecast the demand because the business is a new one
- iv) Where an industry is subject to fast changes in fashions, designs, tastes and consumer preferences.
- v) Where product profile and technology are fast changing.
- vi) Where industry is continuously suffering from shortages of various production inputs such as materials, labour, plant capacity etc., which determine the level of activity.

Differences Between fixed Budget and Flexible Budget : The main differences between the two budgets are given below :

1. **Condition :** Fixed budget assumes static condition, whereas flexible budget is designed to change according to changed conditions.
2. **Flexibility :** Fixed budget is rigid and it does not change with change in actual level of activity. But flexible budget is so flexible that it can be automatically adjusted to the actual level of activity.
3. **Classification of costs :** Costs are not classified according to their variability in the case of fixed budget, whereas in the case of flexible budget, costs are classified according to their variability into fixed, semi-variable and variable costs.
4. **Comparison :** In case of fixed budget, meaningful comparison between actual and budgeted costs is not possible if these two differ. But realistic comparisons can be made in case of flexible budget because budgeted figures can be changed to suit the actual level of activity achieved.
5. **Budget :** Fixed budget is prepared for only one level of activity. Flexible budgets are prepared for different levels of activity.

6. **Budget equation** : There is no need for a budget equation in fixed budgets. But a budget equation is developed for each cost in flexible budgeting.
7. **Cost ascertainment** : In case of fixed budgets, it is not possible to ascertain costs under changing circumstances, where as costs can be easily ascertained at different levels of activity in flexible budgeting.
8. **Cost control** : Fixed budget has a limited use and is ineffective as a tool for cost control. But flexible budget can be used as an effective cost control tool.
9. **Fixation of prices** : In fixed budgets, if the budgeted and actual levels of activity are different, cost ascertainment and price fixation become very difficult. But flexible budget will be very useful in price fixation

Utility of Flexible Budget : A flexible budget is very useful in the following ways :

i) As this budget is flexible enough to be adjusted according to the changes in the level of activity, it is very useful for purposes of budgetary control.

ii) This budget helps in assessing the performance of departmental heads because their performance can be judged in relation to the level of activity attained by the organisation.

iii) Since a flexible budget is prepared for various levels of activity, cost ascertainment for these levels of activity can be possible.

iv) In price fixation and submission of tenders flexible budgets are very useful.

The following illustrations explain the preparation of a flexible budget.

Illustration 5

The budgeted expenses for production of 10,000 units in a factory are given below :

	Per Unit Rs.
Materials	70
Labour	25
Variable factory overheads	20
Fixed factory overheads (Rs. 1,00,000)	10
Variable expenses (Direct)	5
Selling expenses (10% fixed)	13
Distribution Expenses (20% fixed)	7
Administrative Expenses (Fixed : Rs 50,000)	5
Total cost of sales per unit :	155

You are required to prepare a flexible budget for the production 6000 units and 8000 units.

Solution :

FLEXIBLE BUDGET

Particulars	output 6000 units		output		8000 units
	per unit Rs.	Amount Rs.	Per unit Rs.	Amount Rs,	
Material	70=00	4,20,000	70=00	5,60,000	
Labour	25=00	1,50,000	25=00	2,40,000	
Direct Variable expenses	5=00	30,000	5=00	40,000	
Prime Cost	100 = 00	6,00,000	100 = 00	8,00,000	
Factory overheads :					
Variable overheads	20=00	1,20,000	20 = 00	1,60,000	
Fixed overheads	16=67	1,00,000	12=50	1,00,000	
Works Cost	136 = 67	8,20,000	132 = 50	10,60,000	
Administrative Expenses :					
Fixed expenses	8=33	50,000	6=25	50,000	
Cost of Production	145=00	8,70,000	138 = 75	11,10,000	
Selling Expenses	2=17	13,000	1=63	13,000	
Fixed : 10% of Rs. 1,30,000					
Variable :	11=70	70,200	11=70	93,600	
Distribution Expenses :					
Fixed : 20% of Rs 70,000	2=33	14,000	1=75	14,000	
Variable :	5=60	33,600	5=60	44,800	
Total cost of Sales	166 = 00	10,00,800	159 = 43	12,75,400	

W. Note 1. Calculation of selling expenses :

$$\begin{aligned} \text{Total selling expenses for 10,000 Units} &= \text{Rs. } 13 \times 10,000 \\ &= \text{Rs. } 1,30,000 \end{aligned}$$

Fixed selling expenses : 10% of the total = Rs 13,000

$$\begin{aligned} \text{Variable selling expenses per unit} &= \frac{1,30,000 - 13,000}{10,000} \\ &= 1,17,000 \div 10,000 \\ &= \text{Rs. } 11.70 \end{aligned}$$

W. Note 2 : Calculation of distribution expenses :

$$\text{Total for 10,000 units} = \text{Rs. } 7 \times 10,000 = \text{Rs. } 70,000$$

Fixed expenses = 20% of 70,000 = Rs. 14,000

$$\begin{aligned} \text{Variable distribution expenses per unit} &= \frac{56,000}{10,000} \\ &= \text{Rs. } 5.60 \end{aligned}$$

Illustration 6 :

Draw up a flexible budget for overhead expenses on the basis of the following data and determine the overhead rates at 70%, 80% and 90% plant capacity levels.

	At 80% capacity
	Rs.
Variable overheads :	
Indirect labour	12,000
Indirect material	4,000
Semi-variable overheads :	
Power (30% fixed, 70% variable)	20,000
Repairs & Maintenance (60% fixed, 40% variable)	2,000

Fixed overheads

Depreciation	11,000
Insurance	3,000
Salaries	10,000
Total overheads	62,000

Estimated direct labour hours 1,24,000 hours

Solution :

Flexible Budget

Particulars	70% capacity	80% capacity	90% capacity
	Rs.	Rs.	Rs.
1. Variable overheads			
Indirect labour	10,500	12,000	13,500
Indirect material	3,500	4,000	4,500
2. Semi-variable overheads :			
Power (W.N.1)	18,250	20,000	21,750
Repairs and maintenance (W.N.2)	1,900	2,000	2,100
3. Fixed overheads :			
Depreciation	11,000	11,000	11,000
Insurance	3,000	3,000	3,000
Salaries	10,000	10,000	10,000
Total overheads	58,150	62,000	65,850
Estimated direct labour hours	1,08,500	1,24,000	1,39,500
Overhead Rate per hour = $\frac{\text{Total Overheads}}{\text{Estimated direct labour hours}}$	0=54	0=50	0=47

Working Note 1 : Power : at 80% Rs. 20,000

Of this, fixed overheads is 30% of 20,000 = Rs 6000

Variable element = $14,000 \times \frac{1}{80} = \text{Rs. } 175$ for each percent

∴ At 70% = Rs. 6000 + Rs. 14000 $\times \frac{70}{80}$

= Rs. 6000 + 12,250

= Rs. 18,250

At 90% = $6000 + 14,000 \times \frac{90}{80}$

= 6000 + 15,750 = 21,750 Rs.

Working note 2 : Repairs & Maintenance.

At 80% : Rs. 2,000

Fixed element : 60% of Rs. 2000 = Rs. 12000

Variable element : 2000 - 1200 = Rs. 800

At 70% capacity : $\text{Rs. } 1200 + 800 \times \frac{70}{80}$
= 1200 + 700 = 1900 Rs.

At 90% capacity : $\text{Rs. } 1200 + 800 \times \frac{90}{80}$

= Rs. 1200 + 900

= Rs. 2100

10.8 Zero - Base Budgeting (ZBB)

The concept of zero base budgeting was first introduced in U.S. Army and was proposed for the first time in the business world by Peter Pyher in Texas Instruments Inc., a computer and Electronic manufacturer, in 1969. Mr. Jimmy carter, the former president of the U.S.A. introduced this technique in budgeting in the state of Georgia in 1970, when he was Governor of that state, since then ZBB has become increasingly popular in the U.S.A. and later in the rest of the world, as a tool integrating the managerial function of planning and control.

Conventional Budgeting Vs. ZBB : Conventional budgets are prepared mainly on the basis of past performance and actual costs. A conventional budget is developed on the basis of the concept of incrementalism. Under this approach past cost figures are taken as a base to start with and these figures will be increased to determine the budgeted targets for the coming budget period.

But the major drawback of conventional budgeting based on incremental approach is that this approach carries forward previous year's inefficiencies and extravagances because previous year's figures are taken as a base. Thus incremental approach does not promote operational efficiency.

On the other hand, Zero- base budgeting is not based on the incremental approach. Instead of taking previous year's figures, rather zero is taken as a base. Hence, called Zero-base budgeting. Starting from Zero or scratch, a budget is prepared on the basis of likely activities for the future period. Funds required for any activity should be obtained only after presenting a convincing case.

ZBB has been defined by its originator, Peter A Pyher as follows : "A planning and budgeting process which requires each manager to justify his entire budget request in detail from scratch (hence Zero base) and shifts the burden of proof to each manager to justify why he should spend any money at all. The approach requires that all activities be analysed in decision packages" which are evaluated by systematic analysis and ranked in order of importance."

Steps in ZBB : The important steps in ZBB are as follows :

1. Identification of decision units : This helps Justify each item of expenditure in the proposed budget.
2. Preparation of decision packages : These packages which are separate and identifiable activities are linked with corporate objectives.
3. Ranking of decision packages based on cost benefit analysis.
4. Allotment of funds based on the above, by following pyramid ranking system so that optimum results are ensured.

Advantages of ZBB : Zero - Base Budgeting has the following advantages :

1. Since it is not based on incremental approach, it does not carry past inefficiencies and mistakes into the future. Promotes operational efficiency because it requires managers to justify their activities or the funds requested.
2. It encourages generation of alternatives and most profitable alternative.
3. As ZBB requires managers to review their activities every time when a budget is developed, it makes managers, innovative and analytical
4. The management will be able to make an optimum allocation of scarce resources, as funds are allocated and used as a priority basis under ZBB
5. It encourages closer coordination and improved communication between managers of decision units and top management.

6. Greater participation and involvement of the personnel in the budgeting process creates a motivational impact.
7. It makes managers cost conscious and helps them in identifying priorities in the overall interest of the organisation.
8. ZBB is most suitable for service activities and marketing, administration and personnel functions and other areas where flexible budgeting is difficult.
9. ZBB facilitates more effective delegation of authority.
10. It forces managers to remain up-dated in terms of technologies, available options and opportunities.

Limitations of ZBB : However, this technique suffers from the following limitations :

1. Generation of decision packages and alternatives is time consuming, costly and requires a lot of paper work.
2. Ranking of decision packages is many times subjective and gives rise to conflicts.
3. Certain managers may resist new ideas and changes as they feel threatened by ZBB
4. ZBB lays emphasis on short-term benefits which may be detrimental to the long-term objectives of the organisation
5. Some activities such as research and development and general administration, which involve qualitative benefits, it is very difficult to quantify the benefits from these activities.
6. Effective ZBB requires a continuous flow of correct, up-dated and complete information relating to each decision package.

In spite of its defects, ZBB is adopted by several governments all over the world. Safeguards are developed against the above limitations, ZBB can be an effective tool of planning, co-ordination, control, motivation and efficiency improvement.

10.9 Advantages and Limitations of Budgetary Control

The main advantages of budgetary control are as follows :

1. It enables the management to conduct the business in the most efficient way as budgets are prepared to get the effective utilisation of resources and achieving the objectives in the most efficient way.
2. As the goals or targets are predetermined, all the managers try to achieve their respective goal or target, which in its turn, enhances their efficiency.
3. Budgetary control ensures that individual responsibilities are clearly defined and that the required authority commensurate with the responsibility delegated. Hence, buck passing may be prevented when the budgeted results are not achieved.

4. It makes the different levels of managers involved in budget preparation. Thus, it ensures team work.
5. Budgetary control makes "Management by exception possible because it helps in taking remedial measures only in respect of weak spots identified.
6. Effective utilisation of men, materials, machines and money is ensured because production is planned according to the availability of these resources.
7. It helps creating conditions for setting up a system of standard costing.
8. It promotes a sense of cost consciousness and in restricting expenditure to the minimum.
9. It helps performing the functions of planning, coordination and control in a better way.
10. Since budgetary control is a very useful and efficient technique of cost control, it enhances the standing and credit worthiness of the firm with the government, banks and financial institutions.
11. Since budgets provide a yardstick against which actual performance of departments and employees can be compared, budgets act as a measure of efficiency.
12. As current and future trends are studied while preparing a budget, it is very useful in reviewing current trends.

Limitations of Budgetary Control : In spite of the above advantages, budgetary control suffers from the following limitations.

- i) As budgets are prepared on the basis of estimates and forecasts relating to the future which is quite unpredictable, it may not be possible to achieve the budgeted targets.,
- ii) The modern economic and business world is fast hanging, which necessitates frequent revisions of budgets. This proves to be not only time consuming but also a costly affair.
- iii) Small organisations cannot afford the establishment of budgetary control technique, as it is very expensive to correlate and coordinate various budgets.
- iv) Budgets act as constraints on managerial initiative because managers try to achieve the budgeted targets and they are not expected to go beyond that.
- v) The success of budgetary control depends upon the team work which may be lacking in the organisation, because conflicts may arise among functional executives while sharing resources and responsibility.
- vi) Budgets are only tools in the hands of management but not a substitute for management
- vii) Employees generally like to avoid being evaluated and therefore oppose introduction of budgetary control.
- viii) The process of formulation of budgets is quite time consuming and requires additional expenditure of money. Such expenditure needs to be justified in terms of benefits from the budgetary process.

10.10 Summary

Budgetary control is a very useful cost control technique in the hands of management. It refers to controlling through budgets. It involves establishment of budgets for each function and section of the organisation, continuous comparison of actual performance with the budgets so as to know the variations, taking remedial action to achieve the desired objective and revision of budgets in the light of changed circumstances. The general objectives of budgetary control are planning, coordination and control.

Keeping in view the purpose served by the budgets, different types of budgets have been developed. They include current budgets and basic budgets, long-term budgets and short-term budgets, functional budgets and master budgets, and fixed budgets and flexible budgets.

Functional budgets relates to various functional activities of the business. These budgets include sales budget, production budget, various overhead budget, cash budget etc. The master budget is consolidated summary of various functional budgets. It gives budgeted profit and loss account for the budgeted period and budgeted balance sheet at the end of the period.

On the basis of capacity for which a budget is prepared budgets can be of two types fixed budget and flexible budget. A budget prepared for a single level of activity is called a fixed budget, while a budget which is designed to change as volume of output changes, is called a flexible budget. Flexible budget is very useful for purposes of budgetary control as this budget is flexible enough to be adjusted according to the changes in the level of activity.

Unlike conventional budgets, Zero-based budgeting is not based on the incremental approach. Every executive should prepare the budget starting from zero, forgetting the past, hence zero-based budgeting. It was first introduced in the USA and now it is increasingly used in other countries also.

Budgetary control as a tool of cost control, is very useful to the management in fixing the targets and taking measures to achieve them. Even though, this technique suffers from certain limitations, it becomes a very important cost control technique in the hands of management, if carefully used.

10.11 Key words :

Budget : A budget is a financial and quantitative statement prepared prior to a defined period of time of the policy to be pursued during that peirod.

Budgeting : The process of preparing various budgets is known as budgeting .

Budgetary Control : Budgetary control is the technique of controlling in general all the operations and concerning functions of the organisation

Budget committee : A committe constituted to monitor the budgetary control system in the organisation.

Budget manual : is a written document which specifies the objectives of the budgetary control, organisation for budgeting, rights, duties and responsibilities of all the officers involved in budgetary process, budget time table and other procedures regarding budgetary control.

Budget period : is a period for which a budget is prepared .

Key factor : A limiting factor refers to that resource which restricts or limits the level of activity, otherwise possible.

Functional budgets : are budgets prepared concerning major functions of the organisation such as sales, budget, production budget, materials budget, labour cost budget, factory overheads budget, office and administration overheads budget, selling and distribution overheads budget, etc.

Master Budget : is a consolidated summary of various budgets which is also known as a comprehensive budget which is finally approved, adopted and employed.

Fixed Budget : is also known as a rigid budget, which is prepared for a single level of activity.

Flexible budget : is also known as a variable dynamic sliding scale budget which is tailored to suit to the changing volume of output by recognising the difference among fixed, semivariable and variable costs.

Zero-base budgeting : A budgeting process which requires each Manager to justify entire budget request in detail from scratch i.e. zero.

10.12 Self - Assessment Questions / Exercises

1. what is budgetary control ? state the main objectives of budgetary control.
2. What is budgetary control ? Explain the pre-requisites for the adoption of a system of budgetary control.
3. What is a budget ? Explain different types of budgets
4. What is cash budget ? What are its advantages ? How is it prepared ?
5. What is a flexible budget ? Explain the differences between flexible budget and fixed budget. What are the advantages of flexible budget ?
6. Explain various advantages and limitations of budgetary control.
7. What is zero-based budgeting ? How is it prepared ? Explain advantages and limitations of zero based budgeting.
8. Gama Engineering company Ltd. manufactures two products x and y. An estimate of the number of units expected to be sold in the first seven months of 2003 is given below :

	Product X	Product Y
January	500	1400
February	600	1400

March	800	1200
April	1000	1000
May	1200	800
June	1200	800
July	1000	900

It is anticipated that there will be no work-in-progress at the end of any month and

b) Finished units equal to half the anticipated sales for the next month will be in stock at the end of each month (including December, 2002).

The budgeted production and production costs for the year ending 31st December, 2003 are as follows :

	Product X	Product Y
Production (Units)	11,000	12,000
Direct material per unit	Rs. 12	Rs. 19
Direct wages per unit	Rs. 5	Rs. 7
Other manufacturing expenses		
apportionable to each type of Product.	Rs. 33,000	Rs. 48,000

You are required to prepare :

- A production budget showing the number of units to be manufactured each month, and
- A summarised production cost budget for the 6 month period - January to June, 2003

(Ans Total production for 6-month period : X-5,550 units, Y - 6,350 units. Production cost budget: Total production cost product X - Rs. 1,11,000; y- Rs. 1,90,600)

9. ABC company has given the fore cast sales for January 2003 to July 2003 and actual sales for November and December, 2002 as under. With the other particulars given below, prepare a cash budget for the five months i.e., from January to May, 2003.

i) Sales :	Rs.
November 2002	1,60,000
December 2002	1,40,000
January 2003	1,60,000
February	2,00,000
March	1,60,000
April	2,00,000
May	1,80,000
June	2,40,000
July	2,00,000

ii) Sales : 20% cash and 80% credit payable in the third month (January Sales in March)

iii) Variable expenses : 5% on turnover, time lag half month

iv) Commission : 5% on credit sales payable in the third month.

v) Purchases : 60% of the sales of the third month, payment will be made in third month of purchases.

vi) Rent and other expenses : Rs. 6000 paid every month

vii) Other payments :

Purchase of fixed assets : March Rs. 1,00,000

Tax-in the month of April : Rs. 40,000

[Ans : Closing cash balance : Jan. Rs. 94,100, Feb. Rs. 1,05,500, March Rs. 48,100, April Rs. 65,100, May Rs. 99,200]

10) A department of company x attains sales of Rs. 6,00,000 at 80 percent of its normal capacity and its expenses are given below :

Administration costs :

Office Salaries Rs. : 90,000

General Expenses 2 percent of sales

Depreciation	Rs. 7,500
Rate and taxes	Rs. 8,750
Selling costs :	
Salaries	8 percent of sales
Travelling expenses	2 percent of sales
Sales office	1 percent of sales
General expenses	1 percent of sales
Distribution costs :	
Wages	Rs. 15,000
Rent	1 per cent of sales
Other expenses	4 percent of sales

Draw up a flexible budget for administration, selling and distribution costs operating at 90 percent, 100 percent, 110 percent of normal capacity

(Ans. Total budgeted cost : @ 80% - Rs. 2,35,250; at 90% - 2,49,500; at 100% - Rs. 2,63,750; and at 110% - Rs. 2,78,000)

10.13 Futher Readings

1. S.P. Jain & K.L. Narang - Advanced cost and Management Accounting.
2. Khanna, pandey
Ahuja and Arora - Practical costing
3. Nigam & Sharma - Advanced cost accounting.

Lesson - 11**STANDARD COSTING - VARIANCE ANALYSIS -
MATERIALS LABOUR AND OVERHEAD VARIANCES**

Objectives : of this unit are to explain

- K The meaning of standard cost and standard costing
- K The difference between standard costing and budgetary control techniques
- K Pre requisites for the establishment of standard costing system
to familiarise with you the following :
- K Computation of various variances and the causes of such variances
- K Advantages and limitations of standard costing.

Structure :

- 11.1 Introduction
- 11.2 Standard costing and Budgetary control
- 11.3 Preliminaries to the establishment of standard costs
- 11.4 Standard cost sheet
- 11.5 Variance analysis
- 11.6 Material Variances
- 11.7 Labour variances
- 11.8 Overhead variances
- 11.9 Causes of variances
- 11.10 Advantages of standard costing
- 11.11 Limitations of standard costing
- 11.12 Summary
- 11.13 Key words
- 11.14 Self-Assessment Questions / Exercises.
- 11.15 Further Readings

11.1 Introduction

The objective of cost accounting system is effective cost control. But historical costing is not an effective method of cost control because it does not provide yardsticks with which actual performance may be compared. The limitations and disadvantages of historical costing system have led to the development of standard costing system. From Management's point of view, "What a product should cost" is more important than "what it did cost". Managers constantly compare the historical or actual cost of their product with "what a product should cost. Reasons for deviations are rigorously analysed and responsibilities are promptly fixed, so that the performance will be improved in the future. Thus, "the should be cost" is a question of great concern to management for improvement of cost performance. A scientific answer to this problem is developed by use of standard costing. Standard costing is a managerial tool to determine efficiency and effectiveness of cost performance.

11.1.1. Standard cost and Standard costing : Standard cost is a predetermined cost which is determined in advance of production. When standard costs are used for the purpose of cost control, the technique is known as standard costing. The two terms standard cost and standard costing are defined as follows :

Standard Cost : Standard cost is the predetermined cost based on a technical estimate for materials, labour and overhead for a selected period of time and for a prescribed set of working conditions.

The Chartered Institute of Management Accountants, London defines Standard cost as follows :

"A predetermined calculation of how much costs should be under specified working conditions. It is built up from an assessment of the value of cost elements. Its main purposes are to provide bases for control through variance accounting for the valuation of stock and work-in-progress and in some cases, for fixing selling prices."

Standard Costing : According to the Chartered Institute of Management Accountants (CIMA), London, "Standard costing is a control technique which compares standard costs and revenues with actual results to obtain variances which are used to stimulate improved performance."

Thus, Standard costing is the preparation of standard costs and applying them to measure the variations from actual costs and analysing the causes of variations with a view to maintain maximum efficiency in production.

It is clear from the above definition that standard costing as a technique of cost control comprises the following :

- 1) Ascertainment of standard costs for each element of cost i.e., material, labour and overhead.
- 2) Measurement of actual costs.
- 3) Comparison of actual costs with the standard costs to find out the variances.
- 4) Analysis of variances for identifying reasons
- 5) Of variances to take appropriate action where necessary, so that maximum efficiency may be achieved.

Standard costing technique is complementary to the actual costing or historical costing system. Standard costs serve as yardsticks against which actual cost are compared to know the reasons of inefficiencies.

11.1.2. Standard cost and Estimated cost : Even though, both estimated costs and standard costs refer to the future they are different. They differ in the following ways :

i) Scientific determination : Standard costs are scientifically determined keeping in view certain factors and conditions of efficiency. But estimated costs are based on past data relating to product which is adjusted according to anticipated changes in future.

ii) Different aims : Standard cost aims at “What a cost should be”, while estimated cost aims at assessment of “what a cost will be.”

iii) Representation of Management’s view : Standard cost represents management’s view of efficient operation. But the idea of efficiency does not dominate determination of estimated cost.

iv) Estimated costs are used by the firms for fixing selling prices of products etc. They do not serve the purpose of cost control. On the other hand, standard costs may emphasis on cost control.

11.2 Standard Costing And budgetary control :

Standard costing and budgetary control are two different techniques. These techniques are complementary to each other. These are inter-related but not inter-dependent techniques. Both have certain common features. They have the common object of improving managerial control. Both techniques are based on the presumption that cost is controllable. In both the techniques, results of comparison are analysed and reported to management. In spite of these common features, these two are different techniques. They differ in the following ways :

1. Standard costing denotes a ‘unit idea’. It is about what a unit should cost. Budgetary control, on the other hand denotes a ‘total idea’. For example, we say that budgeted cost of material is Rs. 1000 or standard cost of material per unit is Rs. 2

2. Standard costs are based on technical estimates while budgets are based on past data adjusted to future needs.

3. Scope of the two techniques is different. Budgets are laid down for all functions of an organisation like production, purchase, selling and distribution, and research and development. But standard costing relates primarily to one function i.e., production. It mainly deals with manufacturing cost only.

4. In practice, budgets are taken to be the monetary ceiling that should not be exceeded. On the other hand, standards set up targets which are to be attained by actual performance.

5. Budget preparation considers both income and expenditure, whereas the use of standard costing is mainly confined to expenditure only.

6. Variances are revealed in total in budgetary control, whereas in standard costing variances are subjected to microscopic view with reference to causes and incidents.

Both Standard costing and budgetary control are complementary to each other. Both should be used simultaneously for maximum efficiency. These may prove to be more effective if they are used together.

11.3 Preliminaries to the Establishment of Standard costs :

Before a standard costing system is established in a firm, the management should follow the following preliminaries :

1. Establishment of cost centres,
2. Types of standards, and
3. Setting the standards.

11.3.1 Establishment of cost Centres : A cost centre is a location, person or item of equipment for which costs may be ascertained and used for the purpose of cost control. In standard costing, establishment of cost centres is necessary for fixing responsibilities for adverse variances.

11.3.2 Types of Standards : Based upon the period of operation, and tightness and looseness, standards have been classified into the following categories :

Based on period of operation :

- a) Current standards
- b) Basic standards
- c) Normal standards

Based on tightness and looseness :

- d) Ideal standards.
- e) Expected or attainable standards.

a) Current standards. These standards are related to current conditions and are established for use over a short period of time. They outline what cost should be under current conditions and call for periodical review and frequent revisions. There are two main advantages of the use of these standards: i) they provide definite goals for short periods which the employees can be expected to reach. Current standards are set at such a level that is high but attainable with reasonably diligent efforts, and ii) Use of Current standards is economical as they can be used in planning, budgeting and control processes.

b) Basic standards : These are standards which are established for use unaltered over a long period of time. These are also called with different names, like bogey standards, static standards and fixed standards. Basic standard established for some base year and is not changed for a long period of time. Since they are not adjusted to current market conditions, basic standards are not suitable from cost control point of view. However, the variances calculated on the basis of basic standards will help in studying the trends in manufacturing costs over a long period of time.

c) Normal standard : This standard is defined as the average standard which is expected that it can be attained over a future period of time, preferably covering one trade cycle, say five years. It is difficult to follow normal standards in practice as it is not possible to forecast performances with a reasonable degree of accuracy for a long period of time. These standards are not attainable if anticipated normal conditions do not prevail over a future period of time. Hence, these standards may not be a useful device for the purpose of cost control.

d) Ideal standards: These are the standards which can be attained under the most favourable conditions only. These standards provide no scrap, no idle time, no rest period and no break-down. These are based upon a very high degree of efficiency which are rather impossible to achieve. Hence, they are just theoretical standards.

e) Expected or Attainable standards : It is a compromise between extremes of ideal standards and normal standards. In establishing this type of standards, present conditions and circumstances prevailing within a particular industry are taken into consideration. Besides, due weightage is given to the expected changes in the present conditions and circumstances. Hence, these standards are considered to be more realistic than the ideal standards and are considered to be very useful for cost control purposes.

11.3.3 Setting the Standards : Determination of standards for various elements of cost requires skill, imagination and experience. For setting standards, routines and process of working conditions are thoroughly studied work studies and motion studies are conducted different tests are carried out to ensure that standards are realistic and are neither too high nor too low. This job of setting standards should be entrusted to Standard Committee which includes General Manager, Purchase Officer, Production Engineer, Production Manager, Sales Manager, Cost Accountant, and other functional heads. Of all the persons, the cost accountant plays a very significant role in setting the standards because he is the person who supplies the necessary cost figures and coordinates the activities of the committee so that standards set are as accurate as possible.

The success of standard costing depends upon the establishment of correct standards. Hence, every possible care should be taken in the establishment of standards. The standards should be established for each element of cost in the following ways :

1. Direct Material Cost Standards : The establishment of standard cost of material involves :

- i) Determination of standard quantity of materials
- ii) Determination of standard price of materials.

In ascertaining the standard quantity of materials, after consulting the past records, the engineering department should plan the standard specification of materials which contains the information per unit of production regarding material contents of product, standard composition of mix and quantity of normal wastage.

The standard prices of materials should be determined for the various types of materials required for the production. But it presents a lot of difficulties because prices are susceptible to wide range of

fluctuations. The cost accountant along with the purchase officer determine these standard prices. These are determined after carefully studying the market conditions and forecasting the trend of prices for a future period. Generally standard prices are based on current prices adjusted to expected changes in future. It must be kept in mind that the object of fixing standard prices of materials is to increase efficiency in the purchasing.

2. Direct Labour cost Standards : The determination of direct labour cost standards includes two aspects :

- i) Determination of Standard time, and
- ii) Determination of standard rate.

Determination of standard time : These are also referred to as labour efficiency or labour performance standards. Standard time is determined on the basis of the following :

- a) Time study, b) Motion study, c) Average of past performance, d) Test runs, and e) Work sampling.

Time and Motion study is performed by Industrial engineers to determine the standard hours required for an average worker to do a specified Job. For developing time standards, allowance is made for rest time, fatigue, tool setting, machine breakdown, normal idle time etc. Standard time can also be determined on the basis of the average of past performance, which is simple but not a scientific method. Another method of setting the standard time is by taking trial runs for new products. However, this method is not satisfactory as real conditions are not available in such runs.

Another method "work sampling" is used these days for developing time standards. Under this technique, performance of an activity is observed at random moments and data for a reasonably long period of time is collected and time required for an activity is determined. The defect of this technique is that it reflects "what it is" and it has to be adjusted to establish "what it ought to be".

Determination of Standard Rate : Standard wage rates should be established for every category of labour. The past data regarding labour rates may not be reliable basis, if the wage rates are subject to fluctuating demand and supply of the labour force. The expected changes in labour rates should be considered in the determination of standard rates. In the case of firms where wages rates are fixed by contracts, Law, wage Tribunals and wage Boards, establishment of standard rates of pay do not present any problem. Fixation of standard wage payment. If wages are paid according to time wages system, standard rate per hour or per day will be fixed. If piece rate system is followed, standard wages per piece will be fixed. Standard rates of pay are determined by the cost accountant taking help from the personnel department.

Once the standard time and standard rate are established, standard labour cost for an operation is obtained by multiplying standard hours by standard rate.

3. Overhead standards : As overheads can be segregated into fixed and variable, standard overhead rates should be determined for fixed as well as variable overheads. Standard overhead rates should also be fixed for function wise overheads namely, manufacturing, administrative and

selling and distribution, so that exact place of overhead variance may be located and corrective action may be taken. Standard overhead rate is determined keeping in view past experience, present conditions and future trends.

Fixation of standard overhead rate involves determination of standard overhead costs and estimation of standard level of production reduced to a common base such as units of production reduced to a common base such as units of production direct labour hours, machine hours etc. Finally standard overhead rate is determined by dividing standard overhead costs by standard level of production. The standard overhead rate is determined with the following formula :

$$1. \text{ Standard variable overhead rate} = \frac{\text{Standard Variable overheads for the budget period}}{\text{Budgeted production in units or budgeted hours for the budget period}}$$

$$2. \text{ Standard fixed overhead rate} = \frac{\text{Standard fixed overheads for the budget period}}{\text{Budgeted production in units or budgeted hours for the budget period}}$$

11.4 Standard Cost Sheet :

After the standards for various elements of cost have been set, these are recorded in a form, which is referred to as standard cost sheet or standard cost card. It contains quantity and price of each class of material used, grade of labour, labour rate and time and overhead rate for each product, the total standard cost and cost per unit.

The standard cost sheet is of great use in making quotations and finding art variances. The number and complexity of cost sheets or cards depend upon the size and characteristics of the business. A standard cost sheet or cost card should be maintained for each product showing total standard cost of output dividing into various elements of cost.

A specimen of standard cost card is given below :

ABC Ltd

Standard Cost Card.

No.....

Date of Setting standard

Product

Element of cost	Standard Quantity or Hours	Rate Rs.	Standard cost Rs.
1. Direct Material			
Material A	40 Units	2.000	80=00
Material B	20 units	3.00	60=00
	60 Units		140=00
Less : Normal loss @ 10%	6 Units	Scrap Value	12=00
	54 Units		128=00
2. Direct Labour			
	50 Hrs.	1.00	50.00
3. Overheads :			
Variable	20 Hrs	2.00	40 = 00
Fixed	15 Hrs	1.00	15=00
Total Cost			233=00
Profit @ 20%			46=60
Selling price			279=60

$$\text{Standard Cost per Unit} = \frac{\text{Total Cost}}{\text{Output}}$$

$$= \frac{\text{Rs. 233}}{54 \text{ units}} = \text{Rs. 4.31}$$

$$\begin{aligned} \text{Standard Selling price per unit} &= \text{Rs. 4.31} + 20\% \text{ of Rs. 4.31} \\ &= \text{Rs. 4.31} + .86 = \text{Rs. 5.17} \end{aligned}$$

11.5 Variance Analysis :

The comparison of actual performance with standard performance reveals the variances. An analysis of these variances is helpful in controlling the performance and achieving the profits that have been planned. A variance represents a deviation of the actual cost or profit or sales from the standard cost or profit or sales. If actual cost is less than the standard cost or actual profit is more than standard profit, it represents a favourable variance, which is an indicator of efficiency of the firm. If, on the other hand, actual cost is more than the standard cost or actual profit is less than the

standard profit, it represents an unfavourable or adverse variance which usually reflects the inefficiency of the firm.

The variances can be classified in another way as controllable and uncontrollable variances. If a variance is attributable to the inefficiency of a cost centre, i.e., individual or department, it is said to be controllable variance. This type of variances can be corrected or controllable by taking a suitable action. On the other hand, if variances arise due to some external reasons like increase in prices of materials, they are known as uncontrollable variances. These variances are uncontrollable because no particular individual can be held responsible for this.

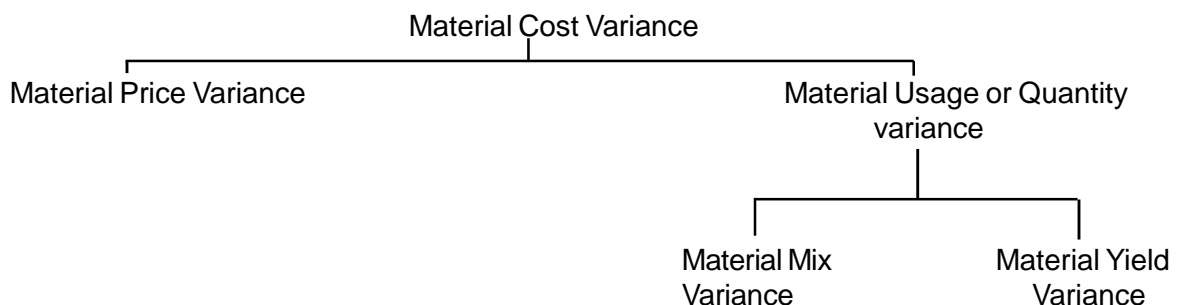
11.5.1 Classification of Variances : The variances can be classified on the basis of elements of cost and sales as below :

1. Direct Material Variances
2. Direct Labour Variances
3. Overhead variances
4. Sales Variances.

The first three types of variances are related to the cost while the fourth type is concerned with sales or profit. The various cost variances, their calculation and causes of such variances are explained in this lesson. "Cost variance" represents the difference between the costs actually incurred for production and the standard costs specified for the same. The cost variance is the sum total of Direct material, Direct labour and overhead variances.

11.6 Direct Material Variances

Direct material variances and its sub-divisions are summarised in the flow chart given below :



i) **Material Cost Variance :** It represents the difference between the standard cost of materials allowed for actual output achieved and the actual cost of materials used. It is computed as follows :

Material Cost Variance = Standard Cost of materials for actual output - Actual cost of materials used.

Here, standard cost of materials used means :

Standard Quantity for actual output x Standard price.

Actual cost of materials used = Actual Quantity of materials used x Actual price

(or) Material Cost Variance - Material Price Variance + Material Usage Variance

(or) Material Cost Variance = Material Price Variance + Material Mix variance + Material Yield Variance,

For Calculation of Material cost Variance, the following information is required :

1. Standard quantity of materials
2. Standard price per unit of materials
3. Actual quantity of materials used, and
4. Actual price per unit of materials.

ii) Material price variance : Material cost variance can be divided into material price variance and Material usage of Quantity variance.

Material price variance is that part of material cost variance which is due to the difference between actual price and standard price of materials. In other words, it represents the difference between the standard cost of materials for actual output and the actual cost of materials used. It can be calculated with the following formula :

Material Price Variance : (MPV) :

Actual quantity (Standard price per unit - Actual price per unit)

iii) Material usage / Quantity variance (MQV) : MQV is that part of the material cost variance which arises due to the difference between the standard quantity of materials allowed for actual output and actual quantity of materials used. It is calculated with the following formula :

MQV = Standard Price per unit (Standard Quantity for actual output - Actual Quantity)

Illustration - 1

The standard material required to manufacture one unit of product x is 10kg and the standard price per kg. of material is Rs. 5. However, the cost accounts revealed that 11,500 kg. of materials costing Rs. 55,200 were used for manufacturing 1000 units of product x. Calculate material variances.

Solution :

Standard price of material per kg. = Rs. 5

Standard quantity per unit of product x = 10 kg.

Standard quantity of materials for actual output of 1000 units of product x = 1000 x 10 kg

= 10,000 kg.

Actual usage of materials - 11,500 kg.

$$\text{Actual price per kg. of material} = \text{Rs. } \frac{55,200}{11,500} = \text{Rs. } 4.80$$

i) Material cost variance :

$$\begin{aligned} &= \text{Standard cost of materials} - \text{actual cost of materials} \\ &= (\text{Standard quantity} \times \text{Standard price}) - (\text{Actual quantity} \times \text{Actual price}) \\ &= (10,000 \text{ kg} \times \text{Rs } 5) - (11,500 \times \text{Rs. } 4.80) \\ &= \text{Rs. } 50,000 - \text{Rs. } 55,200 \\ &= \text{Rs. } 5,200 \text{ (Adverse)} \end{aligned}$$

Since actual cost of materials used is greater it is an adverse variance.

ii) Material price variance :

$$\begin{aligned} &= \text{Actual Quantity} (\text{Standard price per unit} - \text{Actual price per unit}) \\ &= 11,500 (\text{Rs } 5.00 - \text{Rs. } 4.80) \\ &= 11,500 \times 0.20 \\ &= 2300 \text{ (Favourable)} \end{aligned}$$

Since standard price is greater than the actual price, MPV is a favourable variance.

iii) Material usage variance :

$$\begin{aligned} &= \text{Standard price} (\text{Standard usage} - \text{Actual usage}) \\ &= \text{Rs. } 5 (10,000 - 11,500) \\ &= 5 \times (-1500) = \text{Rs. } 7,500 \text{ (Adverse)} \end{aligned}$$

Since actual quantity of materials used is greater than the standard quantity of materials it is an adverse variance.

Verification :

$$\begin{aligned} \text{Material cost variance} &= \text{MPV} + \text{MQV} \\ &= \text{Rs. } 2300 \text{ (Fav)} + \text{Rs } 7500 \text{ (Adv)} \\ &= \text{Rs } 5,200 \text{ (Adverse)} \end{aligned}$$

iv) Material Mix Variance (MMV)

Material usage or quantity variance can be further sub-divided into material mix variance and material yield variance.

Material Mix variance is that part of Material Quantity variance which arises due to the difference between standard composition and actual composition of mixing the different types of materials required for production. Short supply of a particular material is often the most common reason for material mix variance.

This variance is calculated as the difference between the standard cost of standard mix and standard cost of actual mix.

In case of material mix variance, there may be two situations :

- a) Actual weight of mix and the standard weight of mix do not differ, and
- b) Actual weight of mix differs from the standard weight of mix.

a) When actual weight of mix and the standard weight of mix do not differ. In such a situation Material mix variance is calculated with the following formula :

$$\begin{aligned} \text{MMV} &= \text{Standard cost of Standard mix} - \text{Standard cost of actual mix} \\ &= \text{Standard price per unit (Standard Quantity - Actual Quantity)} \end{aligned}$$

If the standard quantity is revised due to shortage of a particular type of material, the material mix variance is calculated as follows :

$$\text{MMV} = \text{Standard price per unit (Revised Standard Quantity - Actual Quantity)}$$

Illustration 2 :

From the following information, calculate the materials mix variance :

Standard	Actual
Material A 200 units @ Rs 12	160 units @ Rs. 13
Material B 100 units @ Rs 10	140 units @ Rs. 10

Due to shortage of material A, it was decided to reduce consumption of A by 15% and increase that the material B by 30%

Solution :

Standard mix is revised as below :

Material A : 200 Units - 15% of 200 = 170 Units

Material B : 100 Units + 30% of 100 = 130 units

Total 300 units

Here, the total weight of standard mix and the total weight of actual mix do not differ. So material mix variance is calculated as below :

Material Mix Variance :

Standard price per unit (Revised standard quantity - Actual Quantity)

Material A : Rs. 12 (170 - 160) = Rs. 120 (Fav)

Material B : Rs. 10 (130 - 140) = Rs. 100 (Adv)

Material Mix Variance : Rs. 20 (Fav)

b) When the total weight of actual mix differs from the total weight of standard mix :

In this case, material mix variance is calculated as below :

$$\left[\frac{\text{Total Weight of Actual Mix}}{\text{Total Weight of (Revised) Standard Mix}} \times \text{Standard cost of (Revised) Standard mix} \right] - \text{Standard cost of Actual mix}$$

This formula is necessary to adjust the total weight of standard mix to the total weight of actual mix which is more or less than the weight of standard mix.

Illustration 3 :

Calculate material variances from the following data.

Consumption for 100 units of product Standard Actual

	Standard	Actual
Material A	40 units @ Rs. 50 per unit	50 units @ Rs. 50 per unit
Material B	60 units @ Rs. 40 per unit	60 units @ Rs. 45 per unit

Solution :

a) Material cost variance = Standard cost of materials - Actual cost of materials

Material A : (Standard price x St. Qty) - (Actual price x Actual Qty)

$$= (\text{Rs. } 50 \times 40) - (\text{Rs. } 50 \times 50)$$

$$= \text{Rs } 2000 - 2500 = \text{Rs } 500 \text{ (Adv)}$$

$$\begin{aligned} \text{Material B} &= (\text{Rs. } 40 \times 60) - (\text{Rs. } 45 \times 60) \\ &= \text{Rs. } 2400 - 2700 = \text{Rs. } 300 \text{ (Adv)} \end{aligned}$$

$$\text{Material cost Variance} = \text{Rs } 800 \text{ (Adv)}$$

b) Material Price Variance :

$$\text{MPV} = \text{Actual Quantity (Standard price - Actual price)}$$

$$\text{Material A : } 50 (50 - 50) = \text{NIL}$$

$$\text{Material B : } 60 (40 - 45) = \text{Rs. } 300 \text{ Adverse}$$

$$\text{Material Price Variance Rs.300 Adverse}$$

c) Material Usage Variance :

$$\text{MUV} = \text{Standard Price (standard quantity - Actual Quantity)}$$

$$\text{Material A} = \text{Rs } 50. (40 - 50) = \text{Rs. } 500 \text{ Adverse}$$

$$\text{Material B} = \text{Rs. } 40 (60 - 60) = \text{Nil}$$

$$\text{Material usage variance : Rs. } 500 \text{ Adverse}$$

d) Material Mix Variance :

Since the total weight of actual mix differs from the total weight of standard mix, MMV is calculated as below :

$$\left[\frac{\text{Total weight of Actual mix}}{\text{Total weight of standard mix}} \times \text{standard cost of standard mix} \right] - \text{Standard cost of Actual mix}$$

Standard cost of Standard mix :

$$\text{Material A : Rs } 50 \times 40 = \text{Rs. } 2000$$

$$\text{Material B : Rs } 40 \times 60 = \text{Rs } 2400$$

$$\text{Rs } 4400$$

Standard cost of Actual mix : Standard price x Actual Quantity

$$\text{Material A : Rs } 50 \times 50 = \text{Rs. } 2500$$

$$\text{Material B : Rs } 40 \times 60 = \text{Rs } 2400$$

$$4900$$

$$\text{MMV} = \left[\frac{110}{100} \times 4400 \right] - 4900$$

$$= 4840 - 4900 = \text{Rs. } 60 \text{ Adverse.}$$

V) Material Yield Variance (Sub - Usage Variance) :

It is that part of the material usage variance which arises due to the difference between the standard yield specified and the actual yield obtained. This variance measures the abnormal loss or saving of materials. In process industries, where some percentage of loss is inevitable, this variance is particularly important. This is also known as scrap value.

Material Yield variance can be calculated in the following two situations as below :

a) When standard and actual mix do not differ

$$\text{MYV} = \text{Standard Rate (Actual Yield - Standard Yield)}$$

$$\text{Where, Standard Rate} = \frac{\text{Standard cost of Standard mix}}{\text{Net standard output}}$$

b) when actual mix and standard mix are different : In this case, the following modified formula is used for calculating yield variance :

$$\text{MYV} = \text{Standard Rate (Actual Yield - Revised standard Yield)}$$

$$\text{standard rate} = \frac{\text{Standard cost of standard mix}}{\text{Net standard output}}$$

Illustration 4 :

Calculate Material yield variance from the following data :

Material	Standard Mix	Actual Mix
A	200 units @ Rs. 12	160 units @ Rs. 13
B	100 units @ Rs. 10	140 units @ Rs. 10

Standard loss allowed is 10% of input. Actual output is 275 units.

Solution :

Since the standard mix and actual mix are not different in this case, Material yield variance is calculated with the following formula :

MYV = Standard Rate (Actual yield - Standard Yield)

Standard Mix		Actual Mix	
Material A : 200 units @ Rs12 = Rs. 2,400		160 Units @ RS. 13 = Rs. 2,080	
Material B : 100 units @ Rs 10 = Rs. 1,000		140 Units @ Rs. 10 = RS. 1,400	
300 units	Rs. 3,400	300 units	Rs. 3,480
Less : Loss 30 units	----	25 units	-----
Output 270 units	Rs. 3,400	275 Units	Rs. 3,480

$$\text{Standard Rate} = \frac{\text{Standard cost of Standard mix}}{\text{Net standard output}}$$

$$= \frac{\text{Rs. 3400}}{270} = \text{Rs. 12.59}$$

$$\begin{aligned} \text{Material Yield Variance} &= \text{Rs. 12.59 (275 - 270)} \\ &= \text{Rs. 12.59} \times 5 \\ &= \text{Rs. 62.95 (Favourable)} \end{aligned}$$

Illustration : 5

From the data given below calculate material variances :

Raw Material	Standard	Actual
A	40 Units @ Rs. 50 per unit	50 Units @ Rs. 50 per unit
B	60 Units @ Rs. 40 per unit	60 units @ Rs. 45 per unit

Solution :

a) Material cost variance :

MCV = Standard cost of standard materials - Actual cost of actual materials

$$\text{Material A} = (40 \text{ units} \times \text{Rs. } 50) - 50 \times \text{RS. } 50$$

$$= \text{Rs. } 2000 - \text{Rs } 2500 = \text{Rs. } 500 \text{ (A)}$$

$$\text{Material B} = (60 \text{ units} \times \text{Rs. } 40) - (60 \text{ units} \times \text{Rs. } 45)$$

$$= \text{Rs. } 2400 - 2700 = \text{Rs. } 300 \text{ (A)}$$

Material cost variance : 800 (A)

b) Material price variance :

$$\text{MPV} = \text{Actual quantity (St. price - Act. Price)}$$

$$\text{Mat. A} = 50 (\text{Rs. } 50 - \text{Rs. } 50) = \text{NIL}$$

$$\text{Mat. B} = 60 (\text{Rs. } 40 - \text{Rs. } 45) = \text{Rs. } 300 \text{ (A)}$$

c) Material usage variance :

$$\text{MUV} = \text{St. price (St. Qty - Act. Qty)}$$

$$\text{Mat. A} = \text{Rs. } 50 (40 - 50) = \text{Rs. } 500 \text{ (A)}$$

$$\text{Mat. B} = \text{Rs. } 40 (60 - 60) = \text{NIL}$$

$$\text{Material Usage variance} = \text{Rs. } 500 \text{ (A)}$$

d) Material Mix variance : Here total weight of standard mix and total weight of actual mix are different. So MMV is calculated as below :

$$\text{MMV} = (\text{Revised standard for actual quantity} - \text{Actual Quantity}) \times \text{Standard price}$$

$$\text{Revised standard quantity} = \text{Standard Quantity} \times \frac{\text{Total Actual Quantity}}{\text{Total Standard Quantity}}$$

$$\text{Material A} : 40 \text{ units} \times \frac{110}{100} = 44 \text{ units}$$

$$\text{Material B} : 60 \text{ units} \times \frac{110}{100} = 66 \text{ units}$$

∴ Material Mix Variance =

$$\text{Material A} : (44 - 50) \times \text{Rs. } 50 = \text{Rs. } 300 \text{ (A)}$$

$$\text{Material B} : (66 - 60) \times \text{Rs. } 40 = \text{Rs. } 240 \text{ (F)}$$

$$\text{Total Material Mix variance} : \text{Rs. } 60 \text{ (A)}$$

e) Material Yield Variance / Material Sub - Usage Variance : Here, yield is the same but total standard and actual inputs are different. So, material yield variance is calculated as below :

MYV = (Standard Quantity - Revised Standard Quantity) x Standard price

Material A : (40 - 44) x Rs 50 = Rs. 200 (A)

Material B : (60 - 66) x Rs 40 = Rs. 240 (A)

Total Material Yield variance Rs. 440 (A)

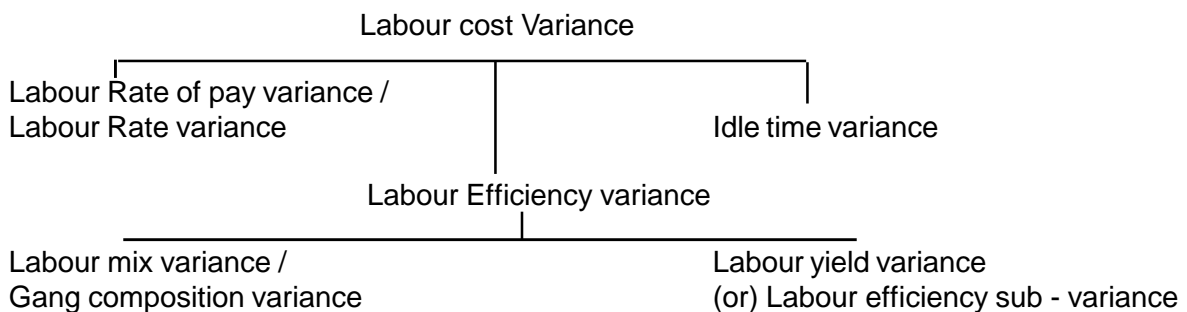
Verification :

Material cost variance = MPV + MUV
 = Rs. 300 (A) + Rs. 500 (A)
 = Rs. 800 (A)

Material Usage Variance = MMV + MYV
 = RS. 60 (A) + Rs. 440 (A)
 Rs. 500 (A)

11.7 Labour cost Variances

Labour cost variances arise when the standards fixed for labour wage rate and time allowed differ from the actuals. Labour variances can be analysed as follows :



(A) Labour Cost Variance (LCV) : This variance arises due to the difference between the standard cost of labour allowed for actual output achieved and the actual cost of labour employed. It is calculated as follows :

LCV = Standard cost of labour for actual output - Actual cost of labour

Labour Rate of pay Variance (LRV) : Labour cost variance can be sub-divided into labour rate variance and labour efficiency variance.

LRV is that part of labour cost variance which arises due to the difference between the standard wage rate and actual wage rate paid. It is calculated as follows :

$LRV = \text{Actual Time} (\text{Standard Rate} - \text{Actual Rate})$

From the above it is evident that LRV resembles Material price variance.

c) Labour Efficiency Variance (LEV) : LEV is that part of labour cost variance which arises due to the difference between standard labour time allowed for actual output achieved and actual labour time spent. It is calculated as follows :

$LEV = \text{Standard Rate} (\text{Standard time allowed for actual output} - \text{Actual time})$

Here, actual labour time means labour hours spent minus abnormal idle time hours.

This LEV resembles material usage variance.

D) Labour Idle Time Variance (LITV) : Idle time variance arises only when there is abnormal idle time. It shows the effect of abnormal causes affecting production like power failure, breakdown of machinery, shortage of materials etc. Abnormal idle time should be deducted from actual time spent while calculating labour efficiency variance, so that the real efficiency of the workers can be ascertained. Idle time variance is calculated as below :

$LITV = \text{Abnormal Idle Time} \times \text{Standard Rate}.$

Illustration 6 :

The standard time and standard rate for one unit of component A are given below :

Standard hours = 15

Standard rate Rs 4 per hour

The actual data and related information are as under :

Actual production	1000 units
Actual hours	15,300 hours
Actual rate	Rs. 3.90 per hour

Calculate i) Labour cost variance, ii) Labour rate variance and iii) Labour efficiency variance.

Solution :

i) Labour Cost Variance

$LCV = \text{Standard cost of labour allowed for actual output} - \text{Actual cost of labour}$

$= [15 \text{ hrs} \times 1000 \times \text{Rs } 4] - [15,300 \times \text{Rs. } 3.90]$

$= \text{Rs } 60,000 - 59,670 = \text{Rs. } 330 \text{ Favourable.}$

ii) Labour Rate Variance :

$$\begin{aligned}\text{LRV} &= \text{Actual hours (Standard Rate - Actual Rate)} \\ &= 15,300 (\text{Rs. } 4.00 - \text{Rs. } 3.90) \\ &= \text{Rs. } 1530 \text{ (F)}\end{aligned}$$

iii) Labour Efficiency Variance :

$$\begin{aligned}\text{LEV} &= \text{Standard Rate (Standard Hours - Actual Hours)} \\ &= \text{Rs. } 4 (15,000 - 15,300) \\ &= \text{Rs. } 1,200 \text{ (A)}\end{aligned}$$

Verification :

$$\begin{aligned}\text{LCV} &= \text{LRV} + \text{LEV} \\ &= \text{Rs } 1530 \text{ (F)} + 1200 \text{ (A)} \\ &= \text{Rs } 330 \text{ (F)}\end{aligned}$$

Illustration 7 :

Calculate Labour variances from the following information :

Gross direct wages = Rs. 3,000

Standard hours produced = 1,600

Standard rate per hour = Rs 1.50

Actual hours paid = 1500 (out of this, hours not worked due to abnormal causes are 50)

Solution :

a) Labour Cost Variance :

$$\begin{aligned}&\text{Standard hours for actual output} \times \text{Standard rate} - \text{Actual hours paid} \times \text{Actual Rate} \\ &= (1600 \times \text{Rs. } 1.50) - (1500 \times \text{Rs } 2.00) \\ &= \text{Rs. } 2400 - \text{Rs } 3,000 = \text{Rs } 600 \text{ (Adverse)}\end{aligned}$$

$$\text{Here, Actual rate} = \frac{\text{Rs. } 3000}{1500} = \text{Rs. } 2 \text{ perhour}$$

b) Labour Rate Variance

$$\begin{aligned} & \text{Actual hours (Standard Rate - Actual Rate)} \\ & = 1500 (1.50 - 2.00) = \text{Rs.750 (Adv)} \end{aligned}$$

c) Labour Efficiency Variance :

$$\begin{aligned} \text{LEV} &= \text{Standard Rate (Standard Hours - Actual Hours)} \\ &= \text{Rs. 1.50 (1600 Hrs - 1450 Hrs)} \\ &= \text{Rs. 1.50} \times 150 = \text{Rs. 225 (F)} \\ & \text{(Actual Hours = Actual hours paid - Idle time)} \end{aligned}$$

d) Labour Idle Time Variance :

$$\begin{aligned} & \text{Abnormal Idle time} \times \text{Standard Rate} \\ & = 50 \text{ Hours} \times \text{Rs. 1.50} = \text{Rs. 75 (A)} \end{aligned}$$

Check :

$$\begin{aligned} \text{LCV} &= \text{LRV} + \text{LEV} + \text{LITV} \\ &= \text{Rs 750 (A)} + \text{RS. 225 (F)} + \text{Rs. 75 (A)} \\ &= \text{Rs. 600 (A)} \end{aligned}$$

E) Labour Mix Variance : Labour Efficiency Variance can be further sub-divided into 1) Labour Mix Variance or Gang composition variance and 2) Labour yield variance or Labour efficiency sub - variance.

Labour mix variance arises only when two or more types of labour force are used in the production process. If only one type of labour force is used, there will be no labour mix variance. The labour mix variance is that part of labour efficiency variance which arises due to the difference between standard composition and actual composition of labour force. This variance resembles materials mix variance.

Its calculation is explained below under the following cases :

i) When total time of standard labour composition and total time of actual composition are equal.

$$\text{LMV} = \text{Standard cost of standard composition} - \text{Standard cost of actual composition}$$

ii) When total time of standard composition and total time of actual composition are different :

$$LMV = \left[\frac{\text{Total time actual composition}}{\text{Total time of standard composition}} \times \text{Standard cost of standard composition} \right]$$

- Standard cost of actual composition

iii) When standard composition of labour force is revised due to shortage of a particular type of labour :

In this case, "Standard cost of Revised standard composition" should be used in place of 'Standard cost of standard composition' in the above two cases.

Illustration 8 :

Calculate labour variances from the following data :

The budgeted labour force for producing product x is :

20 semi - skilled workers @75 paise per hour for 50 Hrs.

10 skilled workers @ Rs. 1.25 per hour for 50 Hrs

The actual labour force employed is :

22 semi-skilled workers @ 80 paise per hour for 50 Hrs

8 skilled workers @ Rs. 1.20 per hour for 50 Hrs.

Solution :

a) Labour cost variance :

Standard cost of labour - Actual cost of labour

Standard cost of labour :

Semi - skilled : 20 x 50 Hrs = 1000 Hrs @ 75 p	Rs. 750
Skilled : 10x 50 Hrs = 500 Hrs @ 1.25	Rs. 625
Total 1500 hrs	Rs. 1375

Actual cost of labour :

Semi - skilled : 22 x 50 Hrs = 1100 Hrs @ 80 p	Rs. 880
Skilled : 8x 50 Hrs = 400 Hrs @ 1.20	Rs. 480
Total 1500 Hrs	Rs. 1360

LCV = Rs 1375 - 1360 = Rs. 15 (F)

b) Labour Rate Variance :

$$\text{LRV} = \text{Actual time (Standard Rate - Actual Rate)}$$

$$\text{Semi - skilled : } 1100 (75\text{p} - 80\text{p}) = \text{Rs } 55 \text{ (A)}$$

$$\text{Skilled : } 400 (1.25 - 1.20) = \text{Rs. } 20 \text{ (F)}$$

$$\text{Total Labour Rate Variance } 35\text{(A)}$$

c) Labour Efficiency Variance :

$$\text{LEC} = \text{Standard Rate (Standard time - Actual time)}$$

$$\text{Semi - skilled : } 75\text{p} (1000 - 1100) = \text{Rs } 75 \text{ (A)}$$

$$\text{Skilled : } 1.25 (500 - 400) = \text{Rs. } 125 \text{ (F)}$$

$$\text{Total Labour Rate efficiency Variance Rs. } 50 \text{ (F)}$$

d) Labour Mix Variance: Since the total standard and actual hours are the same, LMV is calculated with the following formula :

$$\text{LMV} = \text{Standard cost of standard mix} - \text{Standard cost of actual mix}$$

$$\text{Semi - skilled : } (1000 \times 75\text{p}) - (1100 \times 75 \text{ p})$$

$$= \text{Rs } 750 - \text{Rs } 825 = \text{Rs } 75 \text{ (A)}$$

$$\text{Skilled : } (500 \times 1.25) - (400 \times 1.25)$$

$$= \text{Rs } 625 - 500 = \text{Rs. } 125 \text{ (F)}$$

$$\text{Total Labour Rate Variance Rs. } 50 \text{ (F)}$$

F. Labour Yield Variance : It is that part of the labour efficiency variance which arises due to the difference between the yield that should have been achieved with the actual time utilised and the yield actually achieved. This variance can be calculated as follows :

$\text{LYV} = \text{Standard Labour cost per unit (Actual yield in units - Standard yield expected from actual time used)}$

Illustration 9 :

Standard labour hours and rate for production of an article are furnished below :

	Hours	Rate Rs.	Total Rs.
Skilled workers	5	1.50 per hour	7-50
Semi - Skilled workers	4	0.75 per hour	3-00
Unskilled workers	8	0.50 per hour	4-00
			14-50

Actual Data :

	Hours	Rate per hour Rs	Total Rs
Skilled workers	450	2-00	900
Semi - Skilled workers	420	0-75	315
Unskilled workers	1000	0-45	450
			1665

No. of articles produced are 100. Calculate labour variances.

Solution :

a) Labour cost variance

LCV = [Standard Hours for actual production x Standard Rate] - [Actual Hours x Actual Rate]

Skilled workers : [100 x 5 Hrs x 1.50] - [450 x Rs. 2]

= Rs. 750 - 900 = Rs. 150 (A)

Semi - Skilled : [100 x 4 Hrs X 0.75] - [420 Hrs x .75]

= Rs. 300 - Rs. 315 = RS. 15 (A)

Unskilled : [100 x 8 x 0.50] - [1000 x 0.45] = Rs. 50 (A)

Total labour cost variance RS. 215 (A)

b) Labour Rate Variance :

LRV = Actual Hours (Standard Rate - Actual Rate)

Skilled : 450 (1-50 - 2-00) = Rs 225 (A)

Semi Skilled : 420 (0-75 - 0-75) = NIL

Unskilled : 1000 (0-50 - 0-45) = Rs 50 (F)

Total Labour Rate Variance : Rs. 175 (A)

c) Labour Efficiency Variance

LEV = Standard Rate (Standard Hours for actual output - Actual Hours)

Skilled : Rs. 1.50 (500 - 450) = Rs. 75 (F)

Semi - Skilled : Rs. 0.75 (400 - 420) = Rs. 15 (A)

Unskilled : Rs. 0.50 (800 - 1000) = Rs. 100 (A)

Total labour Efficiency Variance : Rs. 40 (A)

d) Labour Mix Variance : Here, total standard hours (500 + 800 + 400 = 1700 Hrs) are different from total actual hours worked (450 + 420 + 1000 = 1870) Hence, the following formula is used to calculate the Labour Mix Variance.

LMV =

$$\left[\frac{\text{Total Actual Hours}}{\text{Total Standard Hours}} \times \text{Standard cost of standard labour} \right] - \text{Standard cost of actual labour}$$

$$= \left[\frac{1870}{1700} \times (500 \times 1.50 + 400 \times 0.75 + 800 \times 0.50) \right] - [450 \times 1.50 + 420 \times 0.75 + 1000 \times 0.50]$$

$$= \left[\frac{1870}{1700} \times 1450 \right] - \text{Rs } 1490$$

$$= \text{Rs. } 1595 - \text{Rs. } 1490 = \text{Rs. } 105 \text{ (F)}$$

e) Labour Yield Variance

LYV = Standard cost per unit (Actual yield - Standard Yield for actual hours)

Standard Labour cost per unit = Rs. 7.50 + Rs. 3.00 + Rs 4 = 00

= Rs. 14.50

Standard Yield for actual time

$$\begin{aligned}
 &= \text{Actual Yield} \times \frac{\text{Total actual hours}}{\text{Total standard hours}} \\
 &= 100 \times \frac{1870}{1700} \\
 &= 110
 \end{aligned}$$

$$\therefore \text{LYV} = \text{Rs. } 14.50 (100 - 110) = \text{Rs. } 145 \text{ (A)}$$

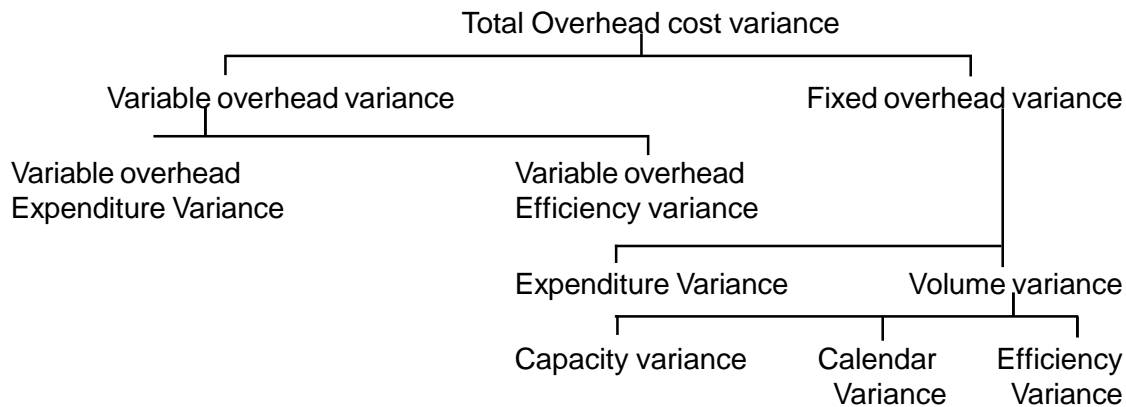
Verification :

$$\text{LCV} = \text{LRV} + \text{LEV} = \text{Rs. } 175 \text{ (A)} + 40 \text{ (A)} = \text{Rs. } 215 \text{ (A)}$$

$$\text{LEV} = \text{LMV} + \text{LYV} = \text{Rs. } 105 \text{ (F)} + \text{Rs. } 145 \text{ (A)} = \text{Rs. } 40 \text{ (A)}$$

11.8 Overhead Variances

Overhead cost variance arises when there is a difference between absorbed overhead and actual overheads incurred. In other words under or over absorption of overheads results in overhead cost Variance. These variances can be analysed and presented in the following way.



A. Total Overhead Cost Variance : This variance arises due to the difference between total overheads absorbed to production and actual overheads incurred. This is calculated with the following formula :

Formula 1 : When overhead rate per unit is given :

$$[\text{Actual output} \times \text{Standard overhead rate per unit}] - [\text{Actual overhead cost}]$$

Formula 2 : When overhead rate per hour is given :

$$[\text{Standard hours for actual output} \times \text{Standard overhead rate per hour}] - [\text{Actual overhead cost}]$$

This total variance can be classified into two : 1) Variable overhead cost variance and 2) Fixed overhead cost variance.

B. Variable overhead Cost variance : It is the difference between the standard variable overhead cost allowed for actual output and the actual variable overhead cost. It is calculated with the following formula :

(Actual output x Standard variable overhead rate) - Actual variable overheads

(or) [Standard hours for actual output x Standard variable overhead rate per hour] - Actual Variable overheads

Variable overhead variance can be further subdivided into two as expenditure variance and efficiency variance.

1. Variable Overhead Expenditure Variance : It resemble labour rate variance and is calculated in the same way as below :

Actual hours (Standard variable overhead rate per hour - Actual variable overhead rate per hour)

(or) Actual hours x Standard variable overhead rate per hour - Actual variable overheads.

2. Variable overhead Efficiency variance

This variance resembles labour efficiency variance and is calculated in the same way as below:

VOEV = Standard variable overhead rate per hour (Standard hours for actual production - Actual hours)

Illustration 10 : From the following data, calculate variable overhead variances :

	Budgeted	Actual
Variable Overheads	Rs. 2,50,000	Rs. 2,60,000
Output in Units	25,000	20,000
Working hours	1,25,000	1,10,000

Solution :

$$\text{Standard variable overhead rate per hour} = \frac{\text{Rs. 2,50,000}}{1,25,000} = \text{Rs. 2}$$

$$\text{Standard variable overhead rate per unit} = \frac{\text{Rs. 2,50,000}}{25,000} = \text{Rs. 10}$$

$$\text{Time allowed per unit of output} = \frac{1,25,000}{25,000} = 5 \text{ Hours}$$

1. Total Variable overhead variance
 - = (Actual output x Standard rate per unit) - Actual variable overheads
 - = 20,000 x Rs. 10 - Rs. 2,60,000
 - = Rs. 2,00,000 - 2,60,000
 - = Rs. 60,000 (Adverse)

2. Variable Overhead expenditure Variance
 - = (Actual hours x Standard rate per hour) - Actual variable overheads
 - = (1,10,000 x Rs. 2) - 2,60,000
 - = RS. 2,20,000 - 2,60,000
 - = Rs. 40,000 (Adverse)

3. Variable overhead Efficiency Variance
 - = Standard rate per hour (Standard time for actual output - Actual hours)
 - = Rs. 2 (20,000 x 5 Hrs - 1,10,000)
 - = Rs. 2 (1,00,000 - 1,10,000)
 - = Rs. 20,000 (Adverse)

C) Fixed Overhead Variance : It is that part of the total overhead cost variance which arises due to the difference between the standard fixed overhead allowed for actual output and the actual fixed overhead cost incurred. It is calculated in the following manner.

$$\text{Actual output x Standard fixed overhead rate per unit} - \text{Actual overheads}$$

$$\text{or Standard hours allowed for actual output x Standard fixed overhead rate per hour} - \text{Actual fixed Over heads}$$

This variance is further analysed into : 1) Expenditure Variance and 2) Volume variance.

1. Expenditure Variance : It is that part of the fixed overhead variance which arises due to the difference between budgeted fixed overheads and actual fixed overheads. It is calculated with the following formula :

$$\text{Expenditure Variance} = \text{Budgeted fixed overheads} - \text{Actual fixed overheads.}$$

$$\text{(or) = (Budgeted hours x Standard fixed overhead rate per hour)}$$

$$- \text{Actual fixed overheads.}$$

2. Volume variance : It is that part of the fixed overhead variance which arises due to the difference between the standard fixed overhead cost allowed for actual output and the budgeted fixed overheads for a period. It shows the over or under absorption of fixed overheads which is a result of more or less actual output than the budgeted output. It is calculated as below :

$$\text{Volume variance} = \text{Actual output} \times \text{Standard rate} - \text{Budgeted fixed overheads}$$

$$\text{(or) Standard rate (Actual output - Budgeted output)}$$

$$\text{(or) Volume Variance} = \text{Standard rate per hour (Standard hours for actual output - Actual Hours)}$$

Volume variance can be further sub-divided into Capacity, Calendar and Efficiency variances.

i) Capacity variance : It arises due to working at higher or lower capacity than the budgeted capacity. It is expressed as follows :

$$\text{Capacity Variance} = \text{Standard rate per unit (Revised budgeted units - Budgeted units)}$$

$$\text{(or) Capacity Variance} = \text{Standard rate per hour (Revised budgeted hours - Budgeted hours)}$$

ii) Calendar Variance : This variance arises when the actual working days are more or less than the budgeted working days. It is calculated as below :

Calendar Variance = Increase or decrease in output due to more or less working days at the rate of budgeted capacity x Standard rate per unit.

iii) Efficiency Variance : It is that part of the Volume variance which is due to the difference between the budgeted efficiency of production and the actual efficiency achieved. It is calculated as below :

$$\text{Standard Rate per unit (Actual production - Standard production)}$$

$$\text{(or) Standard Rate per hour (Standard hours produced - Actual Hours)}$$

Here, standard production or standard hours produced means budgeted production or hours adjusted to increase or decrease in production due to Capacity or Calendar Variance.

For example, if budgeted production is 10,000 units and if there is a 5% increase in capacity and the factory works for 27 days instead of 25 days, the revised budgeted units will be calculated for the purpose of Efficiency variance as below :

$$\text{Revised budgeted units} = \text{Budgeted production} \times \frac{105}{100} \times \frac{27}{25}$$

$$= 11,340 \text{ Units.}$$

Illustration 10 : Calculate Fixed overhead variances from the following data :

	Budgeted	Actual
Output	15,000 units	16,000 units
No. of working days	25	27
Fixed overheads	Rs. 30,000	RS. 30,500

There was an increase of 5% in capacity.

Solution :

$$\begin{aligned} \text{Standard Fixed Overhead Rate per unit} &= \frac{\text{Standard Overhead}}{\text{Standard Output}} \\ &= \frac{\text{Rs. 30,000}}{15,000} = \text{Rs. 2} \end{aligned}$$

i) Fixed overhead cost variance :

$$\begin{aligned} &= \text{Actual output} \times \text{Standard Rate per unit} - \text{Actual Fixed overheads} \\ &= (16,000 \text{ units} \times \text{RS } 2) - \text{Rs. } 30,500 \\ &= \text{RS } 32,000 - 30,500 = \text{Rs. } 1,500 \text{ (Fav)} \end{aligned}$$

2) Expenditure Variance :

$$\begin{aligned} &= \text{Budgeted fixed overheads} - \text{Actual Fixed overheads} \\ &= \text{Rs. } 30,000 - \text{Rs } 30,500 = \text{Rs. } 500 \text{ (Adverse)} \end{aligned}$$

3) Volume Variance :

$$\begin{aligned} &= (\text{Actual output} \times \text{Standard rate per unit}) - \text{Budgeted Fixed overheads} \\ &= (16,000 \times \text{Rs. } 2) - 30,000 \\ &= \text{RS. } 32,000 - 30,000 = \text{Rs. } 2000 \text{ (Fav)} \end{aligned}$$

4) Capacity Variance

$$= \text{Standard Rate} (\text{Revised Budgeted Units} - \text{Budgeted units})$$

Budgeted units for 25 days = 15,000 units

$$\begin{aligned} \therefore \text{Budgeted units for 27 days} &= 15,000 \times \frac{27}{25} \\ &= 16,200 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Revised budgeted units after 5\% increase in capacity} &= 16,200 + 16,200 \times \frac{5}{100} \\ &= 16,200 + 810 \\ &= 17,010 \text{ units} \end{aligned}$$

$$\begin{aligned} \therefore \text{Capacity Variance} &= \text{Rs. } 2 (17,010 - 16,200) \\ &= \text{Rs. } 1620 \text{ (Fav)} \end{aligned}$$

5) Calendar Variance :

$$\begin{aligned} &= \text{Standard Rate per unit} \times \text{Increase or decrease in production due to more or less working days} \\ &= \text{Rs. } 2 \times 15,000 \times \frac{2}{25} \\ &= \text{Rs. } 2 \times 1200 = \text{Rs. } 2400 \text{ (Fav)} \end{aligned}$$

6) Efficiency Variance :

$$= \text{Standard Rate (Actual production - Standard production)}$$

Here, Standard Production is :

Budgeted production : 15,000 units

Increase due to increased capacity : 810 Units

Increase due to 2 more working days : 1,200 units

17,010 units

$$\begin{aligned} \therefore \text{Efficiency Variance} &= \text{Rs. } 2(16,000 - 17,010) \\ &= \text{Rs. } 2 \times (-1010) \text{ units} \\ &= \text{Rs. } 2,020 \text{ (unfav)} \end{aligned}$$

11.8.1 Two Variance and Three variance Methods : Overhead variance analysis can also be analysed by two variance and three variance methods. If overhead variances are analysed by expenditure and volume, it is called Two - Variance method. If the volume variance is further analysed to know the reasons of change in output, it is called Three - Variance method.

Thus, two - Variance method covers Expenditure variance and Volume variance. Three-Variance method covers Expenditure variance, Volume variance, Capacity variance, Calendar variance and Efficiency variance.

11.9 Causes of Variances

The measurement of variances by itself will not serve any purpose unless an attempt is made for the identification of their causes and correction of these causes. For this a prompt reporting of various variances and their causes should be made to the management so that remedial measures may be taken in time. The possible causes of various variances are explained below.

1. Material price variance : The possible causes are :

- i) Changes in market price
- ii) Inefficient buying
- iii) Emergency Purchases
- iv) Loss of discount
- v) Failure to take advantage of seasonal purchases

2. Materials usage Variance :

- i) Poor quality of material
- ii) Careless handling
- iii) Poor quality of material
- iv) Wrong mixture of materials
- v) Improperly set standards
- vi) Pilferage of material.

3. Rate of pay variance :

- i) Defective grading of employees
- ii) General rise in wages
- iii) Higher wages for emergency operations.

4. Labour efficiency variance :

- i) Poor working conditions

- ii) Poor supervision of workers
 - iii) Use of sub-standard materials
5. Idle time variance :
- i) Shortage of materials
 - ii) Break-down of machinery
 - iii) Power failure
 - iv) Time lost in getting instructions
6. Overhead Expenditure Variance :
- i) Improper use of available facilities
 - ii) Rise in general Price level
 - iii) Changes in methods of production
 - iv) Lack of effective control.
7. Volume Variance :
- i) Power failures
 - ii) Shortage of materials
 - iii) Lack of orders
 - iv) Ineffective supervision
 - v) Poor efficiency of machinery
 - vi) Poor efficiency of workers
 - vii) More or less working days.

11.10 Advantages of Standard Costing

Standard costing is an important cost control technique for managerial decisions. It is useful in number of ways. It's main advantages are explained below.

1. It provides yardsticks for comparison of actual performance. Thus, it helps in exercising cost control.
2. Variance analysis assists to single out inefficiency and locate persons responsible for unfavourable variances.

3. Only distinct deviations are reported to management. Thus, it helps the application of principle of "Management by exception".
4. The use of standard costing leads to optimum and effective utilisation of men, materials and other resources.
5. Standard costs are predetermined costs and hence they are very useful in planning and budgeting.
6. It provides a valuable guidance to the management in the formulation of price and production policies.
7. Standard costing creates an atmosphere of cost consciousness which increases efficiency and productivity all round.
8. It makes the work of valuation of inventory easier because the inventory is valued at predetermined costs.
9. Delegation of authority will be effective because top executives can safely delegate responsibility by telling the persons concerned about the standard performance expected of them.
10. Standard costing leads to simplification of procedures and standardisation of products.

11.11 Limitations of Standard Costing

Standard costing is a very important managerial tool for cost control. However, it should be used taking the following limitations into consideration.

1. Establishment of standards may demand a lot of skill imagination and experience, which may be a costly affair and small organisations may not afford.
2. Standards should correspond to current conditions for best results. But current conditions change very rapidly. This necessitates a frequent revision of standards which is a very costly affair.
3. This technique may not be very effective in the industries which deal with non-standardised products and jobs.
4. It is very difficult to establish standard costs of material labour and overhead. If inaccurate standards are set, they may do more harm than any benefit as they provide wrong yardsticks.
5. Segregation of variances into controllable and uncontrollable elements is necessary for fixing responsibilities. But this segregation is a very difficult task which restricts the application of standard costing.

11.12 Summary

The limitations and disadvantages of historical costing system have led to the development of standard costing system. Standard costing is the preparation of standard costs and applying them to measure the variations from actual costs and analysing the causes of variations with a view to maintain maximum efficiency in production. Thus, standard costing as a technique of cost control, it comprises:

1) the ascertainment of standard costs for each element of cost, 2) measurement of actual costs, 3) comparison of actual costs with standard costs to find out the variances, and 4) analysis of variances for identifying the causes to take appropriate action so that maximum efficiency may be achieved.

Standard costing and budgetary control are two different techniques which are complementary to each other. These two are inter-related but not inter-dependent techniques.

There are different types of standards. They are current standards, Basic standards, Normal standards, Ideal standards and expected or attainable standards.

The success of standard costing depends upon the establishment of correct standards. Hence, every possible care should be taken in the establishment of standards.

An important aspect of standard costing is variance analysis. The comparison of actual performance with standard performance reveals the variances. An analysis of these variances for the purpose of identifying the causes for the same is known as variance analysis. Variances are classified as favourable and unfavourable variances, and controllable and uncontrollable variances. On the basis of elements of cost and sales, variances can be classified as 1) Direct Material Variances, 2) Direct labour variances, 3) Overhead variances, and 4) Sales variances. Again, all these variances can be classified into various sub-variances.

The measurement of variances alone will not serve any purpose unless an attempt is made for the identification of their causes and correction of these causes. For this a prompt reporting of various variances and their causes should be made to the management, so that remedial measures may be taken in time.

Standard costing is an important cost control technique for managerial decisions. It is useful in a number of ways. However, it suffers from various limitations which should be taken into consideration while making use of this technique.

11.13 Key words

1. Standard cost : The predetermined cost based on a technical estimate for materials, labour and overheads for a certain period of time and for a prescribed set of conditions.
2. Standard costing : A technique which involves the preparation of standard costs and applying them to measure the variations from actual costs and analysing the causes of variations with a view to maintain maximum efficiency in production.
3. Variance : The difference between the standard and the actual.
4. Standard cost sheet : A sheet which shows the total standard cost and cost per unit of a specified unit or production.

11.14 Self - Assessment Questions and Exercises

1. Define standard cost and standard costing, Explain advantages and limitations of standard costing.?
2. What are the basic differences between standard costing and budgetary control ?

3. What is standard costing ? Explain the preliminaries to the establishment of standard costs. ?
4. What is variance analysis ? Explain different types of variances.
5. Explain the possible causes of various variances.
6. The standard material cost for 100 kg. of chemical x is made-up of :
 Chemical A : 30 kgs. @ Rs. 4 per kg.
 Chemical B : 40 kgs. @ Rs. 5 per kg.
 Chemical C : 80 kgs. @ RS. 6 per kg.

In a batch, 500 kgs. of chemical x were produced from a mix of :

Chemical A : 140 kgs at a cost of Rs. 588
 Chemical B : 220 kgs at a cost of Rs. 1,056
 Chemical C : 440 kgs at a cost of Rs. 2,860

Calculate the material variances for 100 kg. of chemical x.

[Ans. Material cost variance Rs 100-80 (A), Material price Variance Rs. 40-80 (A), Mat. usage variance Rs. 60 (A), Material Mix variance Rs. 7 (A), Mat. Yield variance Rs. 53 (A)]

7. The budgeted labour force for producing 1000 units of product x is :

	Total Standard Hours	Total Standard cost Rs.
30. Men @ 40p. per hour for 50 hours	1,500	600 - 00
20 women @ 30p. per hour for 30 hours	600	180 - 00
10 Boys @ 20p. per hour for 20 hours	200	40 - 00
	2,300	820 - 00

The actual data and related work force for an actual production of 1000 units of x :

	Total Actual Hours	Total Actual Cost Rs.
25 men @ 45p. per hour for 50 hrs	1,250	562.50
30 women @ 30p. per hour for 30 hrs	900	270.00
10 Boys @ 20p. per hour for 15 hrs	150	30.00
	2,300	862.50

Calculate Labour variances : (LCV = Rs. 42.50 (A) ; Lab Rate variance = Rs. 62.50 (A); Labour Efficiency variance = Rs. 20 (F) ; Labour Mix variance = Rs 20 (F); Labour efficiency sub-variance = NIL]

8. Calculate overhead variances from the following data :

	Budget	Actual
No. of working days	20	22
Manhours per day	8,000	8,400
Output per manhour in units	1.0	0.9
Overhead cost (Rs)	1,60,000	1,68,000

9. You the following data :

	Budget	Actual
Output (units)	30,000	32,500
Hours	30,000	33,000
Fixed overheads Rs.	45,000	50,000
Variable overheads Rs.	60,000	68,000
Working days	25	26

Calculate overhead variances

[(Ans. Overhead cost variance : Rs 1,680 (A) Expenditure variance : RS. 8,000 (A) ; Volume variance Rs. 6,320 (F) Efficiency variance : Rs. 18,480 (A), Capacity variance : Rs. 8,800 (F), Calendar Variance : Rs. 16,000 (F)]

11.15 Further Readings

1. S.P Jain & K.L. Narang - Advanced cost and Management Accounting
2. Nigam & Sharma - Advanced cost Accounting
3. Khanna, Pandey, Ahuja and Arora - Practical costing.
4. Arora M.N. - Cost and Management Accounting

Lesson - 12**VALUE ANALYSIS****Objectives :**

of this Unit are to explain the concepts of cost control and cost Reduction to familiarise with you the concept and porcine of value analysis

Structure :

- 12.1 Cost Reduction and Cost Control
- 12.2 Significance of Cost Reduction
- 12.3 Techniques of cost Reduction
- 12.4 Introduction to Value Analysis
- 12.5 Phases of VA Exercise
- 12.6 Value Analysis concept
- 12.7 What is Value Analysis
- 12.8 Meaning of value and other value concepts
- 12.9 Another view point
- 12.10 Organising for Value Analysis
- 12.11 Steps in Value Analysis
- 12.12 Interdependence among : Value, Function / Cost
- 12.13 Techniques of Value Analysis
- 12.14 Merits of Value Analysis
- 12.15 Key words
- 12.16 Self-Assessment Questions / Exercises.
- 12.17 Further Readings

12.1 Cost Reduction and Cost Control :

Both cost reduction and cost control are tools of increasing profitability But the two differ in terms of their procedures and approach. The differences between them are given below :

1. **Nature** : Cost reduction is a corrective function and it may operate along with a cost control programme. On the other hand, cost control is preventive function as costs are optimised before they are incurred.

2. **Emphasis** : Cost control lays emphasis on present and past behaviour of costs. The stress in cost reduction is on present and future cost.
3. **Standards** : Cost control involves setting cost standards, analysing variances from the standards and taking corrective actions. Cost control attempts to keep-actual costs in line with established cost standards. Cost reduction challenges these standards forthwith. It tries to reduce costs on a continuous basis. In a cost control programme, standards act as to gets but cost reduction questions the standards itself.
4. **Application** : Cost reduction can be applied to each and every area of busines. It has universal application and does not depend on standards. But cost control is limited to area where standards can be set. It has limited application to items for which standards exist.
5. **Aim** : Cost control seeks to achieve lowest possible cost under given conditions. On the other hand, Cost reduction recognises that no condition is permanent. It calls for change in conditions if they result in lower cost.
6. **Content** : Cost control represents efforts involved in attaining targets or standards. Cost reduction symbolises achievement in reduction costs.
7. **Continuity** : Cost reduction programme can be finished. Cost control, on the other hand, is an ongoing or never-ending process. Cost control, as generally precised, takes the dynamic approach to many of the factors affecting costs which planned cost reduction demands. For example under cost control, the tendency is to accept standard once they are fixed and leave them unchallenged over a period. In cost reduction, on the other hand, standards must be constantly challenged for improvement. There is no phase of business which is exempt from cost reduction. Products processes, procedures and personnel are subject to continuous scrutiny to see where and how they can be reduced in cost.

Cost reduction involves cutting downcosts whereas cost control involves maintaining costs in accordance with established standards. Thus, cost reductional is not the same as cost control. The two are different from each other.

12.2 Significance of Cost Reduction :

Cost reduction has immense significance in business as it exercises marked influence on the future of a business enterprise. A business firm may increase profits by a) Increasing the selling price of its products, or (b) increasing the volume of sales, or by (c) reducing the cost of operation. In the highly competitive world, no individual firm can raise prices or sales volume to significant extent. Therefore, the only practical way to raise profits is to minimise costs.

Cost reduction improves the competitiveness of an enterprise. Lower costs make for lower prices and higher demand / sales. For instance, television enjoyed limited demand / Sales in the begining with reduction in cost and prices, its demand has increased tremendously.

Areas of Cost Reduction : Cost reduction is a continuous process embracing all the divisions and functions of an enterprise. However, the critical areas of its application are as follows :

1. **Product Design** : In product design, the goal of cost reduction programme is to obtain maximum use-value for the product at the minimum cost, without spoiling its sales appeal. Economics achieved in product design are felt throughout the life cycle of the product. Therefore, product design is the foremost area of cost reduction. Cost reduction in product design can be obtained through reduction in cost of materials, standardisation of product, etc.
2. **Materials** : Cost reduction in materials consists of bulk buying at competitive prices, economy in materials handling costs, reduction in materials usage, increasing material yield, inventory control, etc.
3. **Labour** : As reduction in labour costs can be achieved through better machine loading, reduction in batch frequency, work simplification, training and motivation of workers, better working facilities, etc.
4. **Production** : In the area of production, cost reduction requires efficient production planning, effective work scheduling, progressing inventory management, optimum utilisation of physical facilities and time, etc.
5. **Organisation** : Proper division of work, accurate definition of each function, proper assignment of jobs, effective communication channels, proper delegation and decentralisation of authority, effective co-operation and coordination can yield significant cost savings in this area. However, it is very difficult to quantify cost in organisation.

12.3 Techniques of Cost Reduction :

The main techniques used for cost reduction are as follows :

1. Cost Accounting and Analysis
2. Ratio Analysis
3. Break-even Analysis.
4. Method study
5. Market research
6. Job analysis & Merit rating
7. Production Planning & Control
8. Operations & Methods Study
9. Quality Control
10. Rationalisation
11. Use of better technology

12. Mechanisation & automation
13. Standardisation
14. Value Analysis

12.4 Introduction to Value Analysis :

Value analysis is a technique of cost reduction. It involves study of cost in relation to product design. Before making or buying a product material equipment a study of its value (function) is made. The purpose is to reduce the cost of the prescribed function without sacrificing the required standard of performance. First the required function is determined and then the best way to perform it at a lower cost is found. Value analysis is a supplementary device in addition to the conventional cost reduction methods described above.

Value analysis is a systematic application of established technique to identify the functions of a product or component and to provide the desired functions at the lowest total cost. It is a creative approach to deleminating unnecessary costs which add neither to quality not to the appearance of the product. Value analysis is a rational and structured process consisting of a) functional analysis is to define the reason for the existence of product or its components, (b) Creativity analysis for generating new and better alternatives, and (c) measurement for evaluating the value of present and future concepts.

Value analysis is closely related to value engineering, though the two are not identical. Value analysis refers to the work done in this regard by purchasing department whereas work which engineers do in this area is called value engineering. Value analysis requires close co-operation between purchase, engineering, production and costing departments and also that of the vendor's expertise. It is a team job requiring lot of discussion and deliberations. Any new idea is fully investigated to analyse its feasibilities. The product is considered from all angles and all possible alternatives are explored.

The main questions asked under value analysis include :

1. Is the cost vis-a-vis the usefulness of the product reasonable ?
2. Can lower cost design work as well ?
3. Can another less costly item fill the need ?
4. Will less expensive material do the job ?
5. Does the function contribute value ?
6. Are features reasonable ?
7. Can scrap be reduced by changing the design or material ?
8. Is there an alternative product/process design which is less expensive ?

Some examples of saving through value analysis are as follows :

- a) Use of new and cheaper materials in place of traditional materials.
- b) Discarding tailored products where standard components can do the job.
- c) Dispensing product features not required by customers, e.g., doing away with headphone in a radio set.

Value analysis seeks to develop the cost favourable product design, process design, material usage, material loss, scrap content, etc.

12.5 Phases of Value Analysis Exercise :

The main phases of a value analysis exercise are as follows :

1. **Origination phase** : In the first phase a value analysis study team is constituted. The project is selected and defined. The team examines in detail the product and its components to understand thoroughly their nature.
2. **Information phase** : After Familiarisation, a functional analysis is carried out to determine the functions and uses of the product and its components, the cost and importance of each function are identified. A value index is calculated on the basis of cost benefit ratio for each function. A list is prepared in which the items functions are arranged in decreasing order of value.
3. **Innovation phase** : This is the creative phase concerned with the generation of new alternatives to replace or removing the existing ones.
4. **Evaluation phase** : Each and every alternative is analysed and the most promising alternatives are selected. These alternatives are further examined for economic and technical feasibility. The alternatives finally selected must be capable of performing the desired functions satisfactorily. These must meet the standards of accuracy, reliability safety, maintenance and repairs, environmental effect, etc.
5. **Choice phase** : In this phase, a report is prepared. This report contains a summary of the study, conclusions and specific proposals. The decision makers choose the alternative. Programmes and action plans are then developed to implement the chosen alternative.
6. **Implementation phase** : The chosen alternative is put into use with the help of programmes and action plans developed in advance.
7. **Review phase** : The progress of value analysis changes is continually monitored and followed up in order to provide assistance, to clarify any misconceptions and to ensure that the desired results are achieved.

12.6 Value Analysis Concept :

Value analysis is one of the newer scientific aids to managerial decision making. It comprises a group of techniques aimed at the systematic identification of unnecessary cost in a product or service

and efficiently eliminating them without impairing its quality and efficiency. It can also be defined as a systematic analysis and evaluation of techniques and functions in the various areas of a concern with a view to exploring channels of performance improvement so that the value attached to a particular product or service may be improved. It endeavours to achieve the maximum possible value for a given cost by a continuous process of planned action and aims at cost reduction from the point of view of value. Although initially the group of techniques, aimed at the systematic identification of unnecessary costs and exploring channels of performance improvement, was used mostly in the engineering field which gave it the name of value engineering, it is now used in the various areas of a concern such as marketing, purchasing, financing etc. Keeping in view the wide application of this technique, value analysis is now used instead of value engineering.

Value analysis involves a creative approach for finding out unnecessary costs. Such costs are those costs which though incurred on a product or service, are unnecessary and do not improve its quality or efficiency, give it a better appearance, prolong its life, nor provide any additional satisfaction to the customer. By eliminating these costs, the cost of the product or service can be reduced, and the sales and the resulting profit proportionately increased.

Value analysis is an effective tool for cost reduction. Cost reduction may be achieved by economising expenditure and increasing productivity whereas value analysis probes into the economic attributes of value, In value analysis it is possible to improve performance, increase the value of a product and thus reduce costs by a continuous process of planned action. Value analysis lays emphasis on searching out new ideas while cost reduction is usually confined to already known facts. Hence, value analysis is not a substitution for accomplishment of greater results leading to the elimination of unnecessary costs and value improvement of a product or service.

Value analysis is some times taken as value engineering. There is no doubt that value engineering is an important aspect of value analysis and is concerned with production technology product designing, fabrication and quality control. Broadly speaking value engineering is mainly concerned with production while value analysis goes upto the marketing stage for the systematic identification of unnecessary costs and efficiently eliminating them. The scope of value analysis thus is broad and extends to all operations of an organization where cost is incurred

12.7 What is Value Analysis :

A value analysis (or value engineering as it is some times called) is a systematic analysis and evolution of the techniques and functions in the various spheres of an organisation with a view to exploring channels of performance improvement, so that the value in the particular product or service can be bettered. It enables the maximum possible value to be achieved for a given cost.

The concept of value analysis calls for a complete rethinking on all aspects of an industrial and commercial activity. This concept goes beyond perfecting an existing production pattern. Existing practices of materials usage, processes employed, machines used, types of operations, types of packaging, marketing methods, etc, are reviewed with a completely unbiased mind and an entirely commonsense approach in order to ensure maximisation of the return on investment. Thus, starting from raw material specification upto final delivery of finished goods to customer nothing is considered as a matter of facts in so far as its suitability for the job in question is concerned. If alternative product mix, materials, labour operations, machinery or methods are available which can result an better

economies of production, sales, and distribution, then such alternatives are accepted irrespective of the extent of change from present practice that may be necessary to implement the alternative proposals, in the value analysis therefore, after following points should be considered :

1. The feasibility of the alternative.
2. The investment, if any, required for the alternative.
3. All cost necessary to implement the change and get the changed production or distribution envisage.
4. Inter-related costs or costs resulting indirectly out of a decision to change like costs of items rendered obsolete, cost of training, payment of retrenchment benefits, etc.
5. Integrated costs resulting from a decision to change including both direct costs and indirect costs resulting out of the change.
6. The benefits out of the change like the increased revenue and reduction in costs.
7. Over all financial yield i.e. the additional income less additional expenses
8. Percentage return of the net yield over investment.
9. Period over which the expected additional yield is expected to be maintained.

After considering all the points as above if the change proposed has a net financial advantage quite significant in relation to investment, then the change is adopted.

12.8 Meaning of value and other value concepts

Value has already been mentioned several times, but what does it really mean ? For instance what value would someone, dying of thirst, place on a glass of water, Having quenched his thirst, what value would he place on a second quenched his glass ? Without quantifying the answer, it is probably appreciably lower in the second case. The operant condition here is the satisfaction of a need. In a different context, why should someone want to own a Rolls Royce or some other up-market commodity. In this case value is related to prestige and pride of possession, technical excellence and reliability. Value, therefore, can be examined in three ways, i.e., by the degree to which a product :

1. Satisfies a need.
2. Conforms to a performance specification.
3. Satisfies aesthetic considerations and pride of ownership.

It is possible to achieve these constituent elements of value simultaneously in a product, but the essence of a value analysis exercise is to do so without increasing cost.

Let us expand the three elements of value. Need will be satisfied only if products are available for consumption where and when customers require them. The use function demands that raw materials

and components are consistent with specifications, such that after processing the product will measure up to the required degree of reliability and performance. The esteem function requires high standards of appearance and styling inherent in the design.

Expenses are incurred in research and development, whether or not a new product project reaches fruition. During manufacture, value is added to the product with each successive operation but, again, this cannot be achieved without incurring cost. At what point, therefore, in this continue should value analysis (VA) be applied? The answer is that VA can be applied at any stage in the life of a product but the benefits diminish as the development progresses. Design changes may require the use of different materials, processes, machine tools and equipment and once investment has been made in terms of capital goods and work in progress the cost of modification escalates. In other words, the law of diminishing return applies. Value analysis investigations should therefore be conducted as early as possible in the life of a product, when major change does not incur excessive cost.

Different Value Concepts : The term, value is used in a broader sense and it has different meanings for different persons. For example, for a designer, value means quality of the product designed and efficiency of the product produced for a salesman, it would be the price of the product at which it can be sold in the market, and for the management, value would be the return on capital employed. An industrial product may have the following types.

i) Use value : There are certain characteristics of a product which make it useful for certain purposes. For example a book of cost accountancy if written for ICWA-Inter students has a value provided it serves the purpose of such category of students. It measures the quality of performance of a product. Use value may be primary use value, secondary use value and auxiliary use value. Primary use value indicates the attributes of a Product which are essential for its performance as engine, steering wheel and axle in a motor car without which car cannot run. Secondary use value refers to such devices as bonnet or the mudguard or the windscreen without which motor car can be driven but these are necessary for the protection of engine and other parts. Auxiliary use value is essential for better control and operation as speed meter, electron horn etc. in motor car.

ii) Esteem value : Certain properties of a product do not increase its utility or performance but they make it estimable which would induce customers to purchase the product. For example, a watch with gold cover has esteem value. A rich customer may prefer a watch with gold cover although a watch with a steel cover may serve the same purpose of keeping time.

Some product may have both use as well as esteem value and yet both may be important. For example, a fountain pen with a gold plated body will have both use and esteem value as it will not only look better but will also last longer.

iii) Cost value : This value is measured in terms of cost involved, in case of a manufacturing concern it refers to the cost of production of the product produced and if some part of the product is purchased from outside, it means cost of purchase of the part.

iv) Exchange Value : Certain characteristics of a product facilitate its exchange for something else and what we get is the exchange value of that product it is equivalent to its sale value. All these values play an important part in our personal lives, but in value analysis we are mainly concerned with use value and to some extent to the esteem value. All other values should be subordinated to use

value in varying degrees. Value of a product manufactured for sale is the least amount spent in manufacturing it to create appropriate use and esteem values. Thus, value analysis seeks to provide the different values required in a product or service at the least cost without impairing its quality, efficiency and attractiveness.

12.9 Another View point :

The originator of the concept of value analysis, Miles, of the General Electric Company of America, is reported to have said that, on average one quoted of manufacturing cost is unnecessary. The extra cost continues because of patterns and habits of thought, personal limitations, difficulties in promptly disseminating ideas and because today's thinking is based on yesterday's knowledge.

Value analysis differs from other cost reduction techniques, e.g. work study and price analysis, in that the major area for concern is the product itself or more specifically, the inherent design and constituent materials. Very often the terms value analysis and value engineering are used synonymously but, although performing the same function, there is infact an appreciable difference in direction between the two terms. Value analysis examines the elements of cost and performance of an existing product, whereas value engineering investigation is carried out at the design and development stages prior to introduction. However, as the similarities for outweigh the differences we will assume that the titles are interchangeable. The techniques can therefore be defined as : a systematic of a product such that quantity, reliability and safety are, proved, with no increase in cost.

Survey have shown that, in manufacturing, 50% to 60% of sales revenue can be taken by the cost of purchased material and components. This is a significant proportion of total cost, and any reductions will have an appreciable impact on profitability.

12.10 Organising for Value Analysis :

Unfortunately this one of those areas, like quality control, research and development, and purchasing where it is difficult to find the best 'home' for it within the company structure. One could argue that since cost is a major constituent of any investigation then value analysis should be part of the finance function or, since cost is a minor constituent of any investigation then value analysis should be part of the finance function or, since the product itself is being examined, it could be powerfully argued that value analysis should come under the aegis of the design department. Again, as the functions of the product will come under close scrutiny one could put forward the case that value analysis should lie within the role of the technical department.

Each organization must ofcourse choose for itself, although probably the optimum solution would be none of the above but rather to set up an investigation team having direct access to, and with responsibilities to, the company executive. In this way parochial attitudes are minimized and a more company oriented approach to the problem can be pursued.

The VA Team : The team should consist of a small core of people with a full time commitment, to the value analysis programme but with functional authority to co-opt senior representatives from other relevant disciplines into the investigation. In this way, inertia, present in large amorphous, groups, is minimized and the momentum of the operation can be maintained. The structure of such a team is shown in figure (value analysis team). Their duties would include :

1. Deciding the areas for investigation
2. Data gathering.
3. Examining and evaluating the data.
4. Recommending and reporting alternatives.

The choice of team leader the value engineer is very important since at any time may be called upon to act as peacemaker, devils advocate, diplomat or expert. For example, since the design of a product is the subject of the investigation, comments and criticism and value judgements are consecutive and not subjective. At all times it must be remembered that it is the product which is under review and not personalities, the duties of the technical estimator and process planner centre around the examination of drawings specifications and processes, bearing in mind the costs and usage of materials, such that structured discussions can take place then the full team meets.

12.11 Steps in Value Analysis :

The stages in a value analysis programmes are as follows :

1. Assemble together all relevant information
2. Critically examine the assembled data
3. Evaluate the data.
4. Recommend alternatives.
5. Submit Report.

Information : In this stage, as much information as possible should be gathered about the product, with regard to :

1. Raw materials used.
2. Cost and source of raw material
3. Design specifications.
4. Parts obtained from suppliers.
5. Parts made in house
6. Function of parts.
7. Required quality standards.
8. Quality control procedures.

9. Actual or forecast sales volume.
10. Machine tools used.
11. Operating costs.
12. Special requirements, e.g. safety, chemical analysis and engineering test.

The success of the whole operation may depend on the quality and comprehensiveness of the above data

Examinations :

In this phase of the investigation, all of the information previously gathered is subjected to vigorous questioning and examination. This is generally referred to as the brainstorming or speculative stage, and it is important that these discussions should be totally uninhibited. It is probably now that the calibre of the value engineer is put to the greatest test. What is required is a free flow of ideas, even though some may be regarded as nonsensical to most members of the group. Although with subsequent evaluation, this may prove to be the case, it could equally be true that a seemingly ridiculous suggestion may contain the embryo of an idea which can be taken up and expanded by another person into something worthwhile.

The object is to develop alternative methods of achieving the same function, and it may be helpful to prepare a questionnaire in order to keep the discussion on a structured, if uninhibited, course, normally each significant component or sub assembly of the product is analysed separately, and constructively criticized, discussions being centred around the following area.

1. What is the function of the component ? These are generally defined as either basic or secondary and are described using just a verb and a noun for example, in an ordinary household water tap, the jumper assembly performs a basic function in that it controls the flow. This does not mean, however, that all the other parts of a household tap, which perform secondary functions, are unnecessary.
2. What processes are used in production ? Would it be possible and / or advantageous to eliminate, separate or combine some operations ?
3. What materials and parts are being used ? Are they standard ? Can cheaper materials be used as a safe alternative ?
4. What are the design specifications ? Is the present finish necessary ? Are the present limits and tolerances correct ? If we ease up on limits will we produce less rejects and will the product still meet the performance specification ?
5. What is the labour requirement of the present system ? Would it be an advantage to mechanize or automate the process ?

Cost, although discussed, does not form a significant part of the examination at this stage, the objective being the crossfertilization of ideas.

Evaluation : It is only now, when all the information has been gathered together and a speculative examination has been carried out, that the ideas are evaluated in terms of practicality, economics, acceptability and safety. The more abstract ideas should now be tested to determine whether or not they are of any practical value. The alternatives which incur high costs are automatically eliminated, and this also applies to suggestions which would be unacceptable for technical constitutional safety reasons.

It often happens, ofcourse, that objections are expressed for no valid reason, and these are termed road blocks. Again, the skill and diplomacy of the value engineers put to the test if these are to be successfully overcome. The list of road blocks is endless but here are a few of the more common examples :

1. It would take too long to pay off.
2. It needs sleeping on.
3. It has never been done before.
4. We tried that years ago.
5. It won't work in a large / small / our company.
6. It needs further investigation.
7. I'm thinking about it.
8. It's not my responsibility.
9. We're not ready for that yet.
10. Why do we have to change it anyway.
11. So what's new, we've been doing that for 20 years.
12. Another company tried that years ago and they couldn't get it to work.

Recommendation : During the course of discussion, the initial list of alternatives will be reduced to a smaller total, each of which will have advantages and disadvantages. The next step therefore is to decide which of these offers the greatest value in terms of function, esteem and cost. There are several methods one can use to help decision - making but one of the more structured systems involves the preparation of a selection matrix. Using this technique, relevant criteria are selected and weighted in relation to their importance, and then assessed according to their ability to meet the required goal. It is essential to decide the criteria and relative weights before carrying out any comparability study in order that an objective discussion of the relative merits of alternative designs can be maintained. For example, if we decide to use a ten point scale to determine the importance of the criteria, then cost of materials and quality of performance may be regarded as essential, and will therefore carry the greatest weight, i.e. ten. Other factors can be similarly assessed. Also, the ability of the criterion to meet the required goal can be graded using, for example, a five point system. Excellent 5. Verygood 4. Good 3. Fair 2. Poor 1.

The cell value for each criterion in each alternative design is obtained by multiplying the weight by the assessment, e.g., alternative 1 was deemed to be very good in its ability to meet the requirements of minimising material cost and therefore scored $10 \times 4 = 40$ points.

It is important to compare the alternatives factor by across the matrix rather than conducting a complete assessment of each alternative individually.

When all the cell values have been evaluated, the points are added up and if there is a clear 'winner' then this will go forward as the recommended solution. However, where no clear favourite emerges, e.g. alternative 2 and 3 scored very closely, further discussion and modification may be necessary.

Criteria	Alternatives			
	1	2	3	4
Cost of Materials	10 x 4 40	10 x 3 30	10 x 5 50	10 x 5 50
Cost of Manufacture	8 x 2 16	8 x 5 40	8 x 4 32	8 x 3 24
Quantity of Performance	10 x 5 50	10 x 5 50	10 x 4 40	10 x 3 30
Quantity of Appearance	6 x 4 24	6 x 4 24	6 x 3 18	6 x 4 24
Ease of Manufacture	7 x 3 21	7 x 5 35	7 x 5 35	7 x 3 21
Ease of Assembly	5 x 4 20	5 x 4 20	5 x 4 20	5 x 4 20
Ease of Maintenance	5 x 5 25	5 x 4 20	5 x 5 25	5 x 5 25
Level of Safety	6 x 3 18	6 x 3 18	6 x 4 24	6 x 5 30
Total Score	214	237	244	224

Figures : Evaluation / Selection Matrix

The Report : When the team have reached agreement on their choice of one alternative their conclusions and recommendations are formalised in a report which is then submitted to the company executive for a approval. Also included in the document is a summary, the following figure (cost / savings summary) of the financial implications of the projects, which should contain details of present and projected costs and savings, based on actual or forecast data.

Following discussions based on a study of the report, the company executive will decide whether to go into manufacture or not. The function of the VA team has been to provide detailed and substantive information to assist the board to make the correct decision.

Savings per unit

Labour

Materials

Projected sales per annum

∴ Saving per annum D

Expenses :

Additional Figs, fixtures, Equipment

Cost of redundant Materials

Cost of Redundant Equipment

Cost of Redundant Machines

Redundancy payments to staff

Capital Expenditure

∴ Total Expenses to D

Net cost savings per annum to D

12.12 Interdependence Among Value Function And Costs :

The relationship can be expressed as follows :

$$\text{Value} = \frac{\text{Function}}{\text{Cost}}$$

Higher the ratio, higher is the value and lower the ratio, lower is the value.

Value can be improved i) by improving function, cost remaining constant, or ii) by improving cost function, function remain constant iii) by improving function and reduction cost.

Example (i) : Cast iron components when purchased from a particular sole supplier and machined, who need certain cracks during machine operations. The percentage of such rejections was 5% and considered normal but when alternative source of supply as tapped at the price the rejections were reduced to 2%. Thus it improved the function without increasing the cost.

Example (ii) : In manufacturing a machine tool, two small parts when rivetted together before assembly of a product, frequently broke off during operation. In order to improve the function the two parts were redesigned and machined into one combined operation in order to eliminate the necessity of rivetting. This lowered the cost of operation also.

Example (iii) : A spare part made of cast iron was being use in a machine. Its cost of manufacturing increased. Experiments were carried out with plastic rubber material to manufacture the spare part which served the purpose equally well. Besides improving the function, it reduced the cost substantially.

12.13 Techniques of Value Analysis :

Lawrence D. Miles of the General Electric company who is known as the father of Value Analysis has developed a number of techniques after considerable work in this field. The skillful application of these techniques is helpful in the identification of unnecessary costs and exploring channels of performance improvement. These techniques are as follows :

1. Work in Specifics : Very often people at the top in an organization are likely to say, "This is the only method to make this item. We have tried other methods but failed". The best way of tackling such a situation is to be very specific and not to make a vague statement. People at the top will be influenced by the specific proposal and it is possible that the right manufacturing process may be developed after careful examination. Hence, avoid generalities because they serve only to prevent changes and protect the status obtain all available cost : Information about all available costs should be obtained. It is possible that specific method may lightly increase cost in one department but may lead to substantial reduction in costs into other departments, resulting in an overall reduction of cost. Value analysis is mainly concerned with comparing costs. Therefore, relevant costs for each function as may be required for the analysis should be developed as accurately as possible.
3. Seek information from the most authentic Source : Information on any aspect of cost, methods of manufacture, finishing, packing etc. should be obtained from the most reliable source. To get the correct information a questionnaire should be developed. While collecting information, the particular questions that the value analysis to ask are :
 - i) What is the precise function of the product ? How important is this function ?
 - ii) What is the cost of the product ? Is the cost proportionate with its utility ?
 - iii) Does the design of the product contribute to value ? Is it nor possible to eliminate a part or a component without reducing its use value or esteem value ? Will a change in the design in the product lead to lower cost ?
 - iv) Are all the features of the product essential ?
 - v) Is any better substitute available ?

- vi) Is it possible to reduce cost of material ?
 - vii) Are all the labour operations necessary ?
 - viii) Is standardisation and simplification of products possible ?
 - ix) Is it possible that a number of products use common standard parts ?
 - x) Can a standard item be substituted for a non-standard item ?
4. Evaluate function by comparison : After identifying the function of an item, the natural questions to ask are “How do other concerns perform the same function ? What is their cost ? will the value of the function be reduced by eliminating unnecessary cost “. This probe will lead to a number of alternatives which can be examined to see if any of them is likely to result in a cheaper but reliable alternative.
 5. Discuss with specialists and take advantage of their expertise knowledge : Now a days, technology is advancing so rapidly that it is almost not possible for engineers and others working in an organisation to keep abreast of the latest developments. It, therefore, pays to be in touch with a specialist suitable for the specific problem and get his specialised knowledge. Without such expertise knowledge status will be continued and opportunity of improving value and reducing cost will be lost.
 6. Use real creativity : Value analysis involves a creative approach for finding out unnecessary costs. The human mind is capable of developing new ideas which lead to cost reduction and performance improvement. Creative thinking can be helpful in cost reduction by simplifying the existing part or item to do the same function.
 7. Consult your suppliers for new ideas : As your suppliers are dealing with many others who are in the same line of business, their ideas and suggestions will be of great help to you.
 8. Use standard parts whenever possible : Standard parts are interchangeable and cheaper than specially make parts because standard parts are generally made by mass production methods leading to reduced costs. Specially made (non-standard) parts should be used only when it is unavoidable to do so.
 9. Refine ideas till only acceptable alternative remains.
 10. Identify and overcome all road-blocks : Road blocks are the difficulties created by one’s colleagues and others who resist change and feel secure in the existing ways. The resistance to change to new methods and techniques is principally from ignorance and it can be overcome with patience, tact and carefully explaining the proposed method or technique to the individual concerned who is opposed to change.
 11. Get the maximum cooperation from your colleagues in other departments with whom you have to deal. The value analyst should be polite and friendly with every one that may get the fullest cooperation.
 12. The value analyst should always ask him this question, “would he spent his money in this way?” such an approach will be helpful in thinking of alternatives that are less costly.

12.14 Merits of Value Analysis :

The following are the main advantages of Value Analysis :

1. It is a powerful tool for cost reduction because its basic objective is the identification of unnecessary costs in a product or service and efficiently eliminating them without impairing its quality and efficiency.
2. It is a scientific tool for increasing the productivity of a concern because it aims at exploring various alternatives for efficient use of all types of resources in employment and making available goods and services of the kind and quality most wanted by customers at lower and lower costs. In this way, the manufacture of most suitable production is facilitated because value and esteem value to customers.
3. It helps to keep management abreast of the latest technology and other developments because value analysis aims at examining new methods and techniques of doing things with a view to reducing the cost and increasing the value of the items.
4. It ensures the fullest possible use of resources because it aims at eliminating all unnecessary costs.
5. It induces the creative ability of the staff because it involves a creative approach for finding out unnecessary costs. Creativity develops new ideas which, in turn, make available the least expensive alternative to do the same function.
6. It creates proper atmosphere for increased efficiency because it aims at a continuing search for improvement in efficiency.
7. It is helpful in any drive for import substitution because it explores new methods and techniques of manufacturing indigenous goods which may serve the same purpose which imported goods serve. Thus, it is helpful in saving precious foreign exchange.
8. It can be applied at all stages from the initial design stage of an item right up to the final stages of its packing and despatch because it aims at identifying unnecessary costs at all levels with a view to eliminating them systematically.
9. Customers needs are best served with the help of value analysis because it aims at production of the most suitable products.
10. Value analysis helps in the implementation of the marketing concept because it lays emphasis on the constant linking of production function with the marketing function.
11. Management effectiveness can be measured with the help of value analysis because any saving in cost is treated as increased efficiency.

12.13 Key words

Value Analysis : is a cost reduction technique employed to identify and analyse the functions of a product and to provide the desired functions at the lowest cost.

Relationship among Value Function and Costs : $\text{Value} = \frac{\text{Function}}{\text{Cost}}$

Value Analysis Team : Team should consist of small core of people with a full-time commitment to the value analysis programme with full functional authority to co-opt senior representatives from other relevant disciplines for the investigation in the decided areas of concern for value analysis.

12.16 Self - Assessment Questions and Exercises

1. What do you mean by value analysis technique ? Enumerate its advantages.
2. What do you understand by value analysis in cost reduction programme ? What is the normal questionnaire used in conducting value Analysis ?
3. "Value engineering is more effective than any other cost reduction techniques like work study, automation etc." Discuss.
4. What is value ? What is value analysis ? Discuss how value analysis programme can be applied in a manufacturing organisation to bring down the cost of the product.

12.17 Further Readings

1. Prasad, N.K. - Principles and practice of cost Accounting.

Lesson - 13**LIFE CYCLE COSTING ANALYSIS (LCCA) AND
LEARNING CURVE ANALYSIS (LCA)****Objectives :**

Of this unit are to explain and familiarise with you :

- K Concept and meaning of life cycle costing
- K Advantages of life cycle costing
- K Technique of learning curve analysis
- K Applications and limitations of learning curve analysis

Structure :

- 13.1 Life cycle costing - Concept and meaning**
- 13.2 Life cycle budgeting and life cycle costing**
- 13.3 Advantages of life cycle costing**
- 13.4 Learning Curve Analysis**
- 13.5 Summary**
- 13.6 Key words**
- 13.7 Self-Assessment Questions / Exercises.**
- 13.8 Further Readings**

13.1 Life cycle costing - Concept and Meaning

Life cycle costing accumulates actual cost attributable to a product throughout the life cycle span of that product. For understanding life cycle costing, it is necessary to understand product life cycle. The product life cycle starts from the time of initial research and development to the time, at which sales and support to customers are with drawn. This life cycle time may vary from product to product. For example, for motor vehicles, this time span may range from five to ten years. For some pharmaceutical products, this time span may be three to five years and for computer products it may be seven years. For fashion products it may be less than one year.

Life cycle costing tracks and accumulates the actual cost attributable to each product from its initial research and development to its final resourcing and support in the market place.

Thus, it attempts accumulation and consideration of costs for activities that occur over the entire life cycle of a product or project from inception to abandonment by the customer. It focusses on total costs (capital cost as well as revenue cost) over the product's life which includes design and

development, acquisition, operation, maintenance and servicing. Service costs include marketing, distribution, administration and after - sales service costs.

The terms “Cradle-to-grave costing” and “Womb to tomb costing” are the different terms which are used in the context of life cycle costing to convey the sense of fully capturing all costs associated with the product during its life span. Life cycle costing is achieved through a combination of management, financial, engineering and other disciplines.

13.2 Life Cycle Budgeting And Life Cycle Costing :

Life cycle costing tracks and accumulates the actual costs attributable to each product from start to finish whereas under life cycle budgeting managers estimate the revenues and costs attributable to each product from its initial Research and Development to its final customer servicing and support in the market place. Thus, life cycle costing refers to actuals while life cycle budgeting refers to budgeted figures or estimates.

Life cycle budgeted costs provide important information for pricing decisions. For some products, the development period is relatively long and many costs are incurred prior to manufacturing. To be profitable, a firm must generate revenues to cover costs in all the business functions. A product life cycle budget highlights the importance of setting prices and budgeting revenues to recover costs in all the value - chain business fluctuations rather than costs in only some of the functions such as production. The life cycle budget also indicates the costs to be incurred over the life of the product.

13.2.1 Developing life cycle Reports : Another related aspect is developing the life-cycle reports for products. Generally, most accounting systems emphasize reporting on a calendar basis monthly, quarterly and annually. As against this, product life cycle reporting does not have this calendar-based focus. Developing life cycle reports for each product requires tracking costs and revenues on a product, by-product basis over several calendar periods. For example, the Research and Development costs included in a product life - cycle cost report are often incurred in different calendar years. When R&D costs are tracked over the entire life cycle, the total magnitude of these costs for each individual product can be computed and analysed.

There are atleast three important benefits offered by a product life - cycle reporting format :

- a) The full set of revenues and costs associated with each product becomes visible.
- b) Differences among products in the percentage of their total costs incurred at early stages in the life cycle are highlighted.
- c) The inter relationships among business function cost categories are highlighted.

13.3 Advantages of Life Cycle Costing

Following are the advantages of life cycle costing:

1. Important information required for pricing decisions can be provided by life cycle costing. This is essential in the present day circumstances because for some products, development period is relatively long and many costs are incurred prior to and after manufacturing.

2. It helps immensely the manager to develop insight and plan. Hence is possible to generate revenue from the product which can cover costs relating to all six business functions, i.e., research and development, product design, manufacturing, marketing, distribution and customer service.
3. The perspective of manager is broadened because he keeps the complete life cycle relating to the product. He does not have a calendar based focus, but considers whole life span of the product.
4. Full costs associated with each product becomes relatively more visible under life cycle costing as against traditional costing where manufacturing costs only are highly visible.
5. Life cycle costing highlights inter - relationships across cost categories. Many companies, who cut research and development costs, experienced major increase in customer service related costs in subsequent years. The products of these companies also failed to meet promised quality performance level. A life cycle revenue and costs statement highlights the errors which are hidden in cost statements having calendar based focus.
6. It is immensely useful in capital budgeting decision. It considers both capital costs and revenue costs relating to the product / project over its life span.

13.4 Learning curve Analysis :

Learning is the process by which an individual acquires skill, knowledge and ability. When a new product or process is started, the performance of worker is not at its best and learning phenomenon takes place. As the task or operation is repeated and the worker gains experience, the performance of the worker improves, time taken per unit declines and thus his productivity increases. This increase in productivity of workers is due to learning effect. Cost predictions especially those relating to direct labour cost must allow for the effect of learning process.

Learning curve analysis is a mathematical technique. It is very much used to accurately and graphically predict cost considering the learning effect.

13.4.1 Learning Curve : A Learning curve is a function that shows how labour hours per unit decline as units of production increase and workers learn and become better at what they do. Managers use learning curves to predict how labour hours or labour costs will change as more units are produced.

Experience curve, improvement curve and progress curve are other terms which are synonymously used. Learning curve is essentially a measure of the experience gained in production of an article by an organisation.

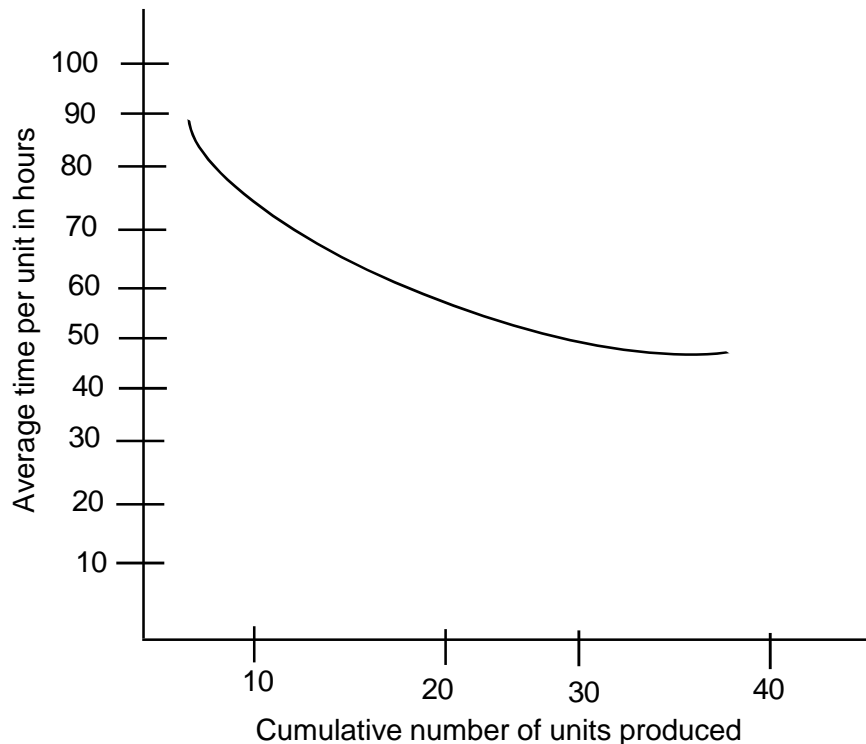
Learning curve analysis was first introduced by T.P. Wright of Curtiss-Wright, Buffalo, U.S.A. engaged in production of aircrafts. As the quantity produced of a given item doubles, the cost of that item decreases at a fixed rate. This phenomenon is the basic premise on which the theory of learning curve has been formulated.

Now, the managers are extending the learning curve theory to include other cost areas in the value - chain, such as marketing, distribution and customer service. The term "Experience curve" describes this broader application of the learning curve.

The table below illustrates the expected results of the 90% Learning Curve which means every time when production is doubled, the average labour cost will fall to 90% of the previous cost.

Batch No.	Cumulative quantity of Production	Average time per unit (2 hours)	Cumulative time taken (2 hours)
1	1	100	100
2	2	90	180
3	4	81	324
4	8	72.9	583.2
5	16	65.6	1049.6
6.	32	59.1	1891.2

The effect of learning can be presented clearly in the form of a diagram which is known as the learning curve, as below :



13.4.2 Learning Curve Ratio : The learning curve ratio shows the effect on time taken whenever production doubles. This helps in predicting the labour cost in advance. This ratio can be calculated with the help of the following formula.

$$\text{Learning Curve Ratio} = \frac{\text{Average labour cost for first } 2N \text{ units}}{\text{Average labour cost for first } N \text{ units}}$$

If the average labour cost for first 500 units of a product is Rs. 100 and for the first 1000 units is Rs. 80, then the learning curve ratio will be determined as follows :

$$\text{LCR} = \frac{\text{Rs. } 80}{\text{Rs. } 100} = .8 \text{ or } 80\%$$

The LCR of 80% means that every time production is doubled, the average labour cost declines to 80% of the previous cost.

13.4.3 Learning Curve Equation : The following mathematical formula is applied to predict the average labour cost for a given production level.

$$Y = ax^c$$

where = Cumulative number of units produced

Y = Average labour cost per unit at x units

a = Average labour cost per unit of the first lot

c = Learning coefficient

$$c = \frac{\text{Log of Learning ratio}}{\text{Log of 2}}$$

Illustration - 1

If the learning curve ratio is 80%, the labour cost to produce the first unit is Rs. 10, find out the average labour cost per unit for the first 10 units.

Solution :

$$Y = ax^c$$

Learning ratio = 80%

Average labour cost per unit for first lot = a = Rs. 10

Cumulative number of units produced = x = 10 units

$$\text{Learning coefficient} = c = \frac{\text{Log of learning ratio}}{\text{Log of 2}}$$

$$= \frac{\text{Log } 0.8}{\text{Log } 2} = - .322$$

$$Y = ax^c$$

$$= 10 (10)^{-.322}$$

$$= \text{Rs. } 4.76$$

The average labour cost per unit of the first 10 units = Rs. 4.76

$$\text{Total labour cost for first 10 units} = \text{Rs. } 4.76 \times 10$$

$$= \text{Rs. } 47.60$$

Illustration 2

The usual learning curve model is

$$Y = ax^c$$

Where,

Y = Average time per unit for x units

a = Average time for the first unit

x = Cumulative no. of units

c = Learning Coefficient

Given a = 10 hours and learning ratio = 80% You are required to calculate :

i) The average time for 20 units

ii) The total time for 30 units

iii) The time for units 31 to 40

$$\text{Given that} \quad \text{Log } 2 = 0.301$$

$$\text{Log } 3 = 0.4771$$

$$\text{Log } 4 = 0.6021$$

$$\text{Antilog of } 0.5811 = 3.812$$

$$\text{Antilog of } 0.5244 = 3.345$$

Antilog of 0.4841 = 3.049

Solution :

i) Average time for 20 units

$$y = ax^c$$

$$= 10 \times (20)^{-0.322}$$

$$= \log 10 - 0.322 \log 20$$

$$= 1 - 0.322 (1.301)$$

$$= 1 - 0.4189$$

$$= 0.5811$$

Here, C = Learning Coefficient

$$= \frac{\log 0.8}{\log 2}$$

$$= -0.322.$$

Antilog of 0.5811 = 3.812

Average time for 20 units = 3.812 hours per unit

ii) The total time for 30 units :

$$\begin{aligned} \text{Total time} &= ax^c \times 30 \text{ units} \\ &= (10 \times 30^{-0.322}) \times 30 \\ &= (\log 10 - 0.322 \log 30) \times 30 \\ &= (1 - 0.322 (1.4771)) \times 30 \\ &= (1 - 0.4756) \times 30 \\ &= (0.5244) \times 30 \end{aligned}$$

Antilog of 0.5244 = 3.345

∴ Total time = 3.345 × 30

= 100.35 hours

iii) The time for units 31 to 40

$$\begin{aligned} \text{Total time for 40 units} &= (10 \times 40^{-0.322}) \times 40 \\ &= (\log 10 - 0.322 \log 40) \times 40 \\ &= (1 - (0.322 \times 1.6021)) \times 40 \\ &= (1 - 0.5159) \times 40 \end{aligned}$$

$$= (0.4841) \times 40$$

$$\text{Antilog of } 0.4841 = 3.049$$

$$\begin{aligned} \text{Total time for 40 units} &= 3.049 \times 40 \\ &= 121.96 \text{ hours} \end{aligned}$$

$$\text{Total time for 30 units} = 100.35 \text{ hours}$$

$$\begin{aligned} \text{Time for units 31-40} &= 121.96 - 100.35 \\ &= 21.61 \text{ hours} \end{aligned}$$

13.4.4 Factors Affecting Learning Curve : The combined effect of the following factors affect the learning curve :

- i) Production methods. The machine oriented production methods have a very relatively low rate of learning when compared to the labour oriented production methods.
- ii) Labour turnover. The learning curve tends to be low, if the labour turnover is very high. This is because the new workers will take more time in learning the production procedures.
- iii) Modifications in the production procedures. The frequent changes in the production procedures affect the learning process of the workers.
- iv) Changes in product design. The changes frequently made in the product quality, shape and size also restrict the pace of learning curve.
- v) Strikes, lockouts and shutdowns create obstacles in the learning progress which in turn affects the learning curve.

13.4.5 Advantages of Learning curve : Knowledge of learning curve can be useful both in planning and control. Standard cost for new operations should be revised frequently to reflect the anticipated learning pattern. The main advantages of the learning curve are summarised as follows :

- a) It helps in predicting labour cost
- b) The various sources for cost reduction allowed by improved learning are suggested by learning curve.
- c) It helps in predicting labour requirements
- d) It provides a yardstick to evaluate the effectiveness of training programmes.
- e) It assists in planning and controlling the inventories of materials, work-in-progress and finished stock as learning leads to higher production.

13.4.6 Limitations of Learning Curve : The usefulness of the learning curve is restricted by the following limitations :

- i) The learning curve is useful for the new operations only where machines do not constitute a major part of the production process.
- ii) The learning curve assumes no interruptions during production process. Any interruption in production affects seriously the learning curve.
- iii) This technique completely ignores such factors as improvement in production facilities arrangements, equipment and morale of the employees that influence the shape of the learning curve.
- iv) The learning curve cannot be generalised because there are different learning ratios for different situations.

13.5 Summary

Life cycle costing tracks and accumulates the actual cost attributable to each product from its initial research and development to its final resourcing and support in the market place. It focusses on total costs (capital cost as well as revenue cost) over the products life. Under life cycle budgeting, managers estimate the revenues and costs attributable to each product from its initial stage to its final customer servicing and support in the market place. Life cycle budgeted costs provide important information for pricing decisions. Life cycle costing is immensely useful to the manager in several ways. Full costs associated with each product becomes relatively more visible under life cycle costing as against traditional costing where only manufacturing costs are highly visible.

Learning is the process by which an individual acquires skill, knowledge and ability. As the task or operation is repeated and the worker gains experience, his productivity increases. This increase is due to the learning effect. Learning curve analysis is a mathematical technique which is used to accurately and graphically predict cost considering the learning effect. This technique which was first used in the manufacturing, is now extended to cover other cost areas such as marketing, distribution and customer service.

13.6 Key Words

Life cycle costing : It tracks and accumulates the actual cost attributable to each product from its initial research and development to its final resourcing and support in the market place.

Life cycle budgeting : It refers to estimating the revenues and costs attributable to each product from its initial research and development to its final customer servicing in the market place.

Learning curve : It is a function that shows how labour hours per unit decline as units of production increase and workers learn and become better at what they do.

Learning curve Ratio : It shows the effect on time taken whenever production doubles. This helps in predicting the labour cost in advance.

13.7 Self - Examining Questions

1. What is life cycle costing ? Discuss its advantages.
2. What do you understand by Learning curve ? Explain the factors affecting Learning curve.
3. Explain Learning Curve Ratio and Learning Curve Equation. What are the advantages and limitations of Learning curve ?

13.8 Further Readings

- | | | |
|-------------------------|---|---|
| C.T. Horngren | : | Cost Accounting - A Managerial Emphasis |
| S.P. Jain & K.L. Narang | : | Advanced Cost Accounting |

Lesson - 14**COST RECORDS - THE COST LEDGER - COST CONTROL ACCOUNTS****Objectives :**

- of this unit are to explain and familiarise with you
- K How the cost records are maintained
 - K The meaning and advantages of a cost ledger
 - K Different ledgers maintained
 - K Meaning and advantages of control accounts.
 - K Different control accounts maintained in a cost ledger.

Structure :

- 14.1 Introduction**
- 14.2 Cost Ledger - Types of Cost Accounting Ledgers**
- 14.3 Control Accounts**
- 14.4 Important Control Accounts in cost ledger**
- 14.5 Journal Entries in cost ledger**
- 14.6 Summary**
- 14.7 Key words**
- 14.8 Self-Assessment Questions / Exercises.**
- 14.9 Futher Readings**

14.1 Introduction

The accounting system installed in a particular concern depends upon the requirements of the business and the information required. Since cost accounts and financial accounts are kept for different purposes, the patterns of collecting information are different. However, the basis of passing Journal entries is the double entry system both in cost accounts and financial accounts.

There are basically two systems of maintaining cost accounts : 1) Non - integral or cost control accounting, and 2) Integral or Integrated accounting. While non- integral accounting refers to the system where cost and financial transactions are recorded separately, Integral or Integrated accounting refers to the system where both cost and financial transactions are recorded in one set of books. The non-integral system necessitates reconciliation between cost and financial accounts. But, no such reconciliation is required for integrated accounting.

Non - Integral Accounting : This is also referred to as cost ledger accounting system. While cost accountant is responsible for recording cost ledgers, financial accountant is responsible for financial ledgers. Since separate books are maintained for financial and cost accounting purposes, there are a number of items which appear in cost books but not in financial books, and vice versa, for example, under or over absorption of overheads, notional costs, expenses of pure financial nature, different amounts for depreciation or valuation of stock etc. As a result, profit or loss as per financial books may differ from that as shown by cost books requiring periodic reconciliation between the two sets of accounts.

14.2 Ledgers in costing Department :

There are four important ledgers in cost accounts. They are :

i) Cost Ledger

ii) Stores Ledger

iii) Work-in-progress ledger

iv) Finished goods Ledger.

- i) Cost Ledger : This is the principal ledger of cost accounts. It contains all impersonal accounts. This ledger is similar to general ledger in financial accounts. It contains subsidiary ledgers such as, stores ledger, work-in-progress ledger and finished goods ledger. It is made self - balancing by maintaining therein a control account for each of the other ledgers.
- ii) Stores Ledger : It contains all stores accounts. A separate account is opened for each item of stores.
- iii) Work-in-Progress Ledger : This ledger keeps records of each type of jobs undertaken and costs incurred for them. Each job, unit or a process is assigned a number. All materials costs, wages and overheads for each job in progress are posted to the respective job account in this ledger
- iv) Finished goods or Stock Ledger : This ledger contains accounts of all finished goods or completed jobs. A separate account is opened for each job or each type of completed product.

Thus, cost ledger is the principal book of accounts. It contains all impersonal accounts. In small firms, it is the only ledger maintained. But in large firms, where accounts are numerous, subsidiary ledgers such as stores ledger, work-in-progress ledger, Finished goods ledger etc. may have to be maintained. If subsidiary ledgers are maintained, the cost ledger should be made self-balancing by using control accounts. These control accounts should be opened in cost ledger for each of the other subsidiary ledgers.

14.2.1 Advantages of Cost Ledger. : The following advantages can be had by maintaining a cost ledger :

1. Cost ledger summarises all detailed information regarding costs in subsidiary ledgers so that it is helpful to the management in policy formulation

2. It provides the basis for analysis of cost and preparation of accounts for each cost centre, for cost ascertainment and control.
3. It facilitates proper control over materials labour and overheads.
4. It facilitates proper valuation of closing stocks of materials, work-in-progress and finished goods without delay.
5. Cost ledger provides all the necessary data for setting standards and ascertaining variances.

14.3 Control Accounts

In big organisations, where there are numerous transactions to be handled, instead of such transactions being posted in general ledger, they are recorded in subsidiary ledgers. At the end of the period, these transactions, which are kept in detail in one or more accounts of the subsidiary ledgers are posted in totals to the Control accounts.

Control accounts are the total accounts maintained in the cost ledger. Each total account represents a subsidiary ledger in which individual accounts are maintained. The very purpose of control accounts is exercising control over the three subsidiary ledgers and also complete double entry in cost accounts.

For example, a stores ledger control account represents the stores ledger in which individual stock accounts are maintained. Individual debits and credits are abstracted, totalled and taken to control account in cost ledger. The total balance in control account and aggregate of individual balances in subsidiary ledger accounts should agree at any time.

14.3.1 Advantages of Control Accounts : Control accounts are advantageous in the following ways:

- i) These accounts provide a summary of a large number of accounts.
- ii) These accounts facilitate preparation of final accounts and reconciliation of cost and financial accounts.
- iii) They provide information regarding total position i.e., the value of incomplete jobs, completed jobs or output and material in hand.

14.4 Important Control Accounts in Cost Ledger

The following are the important Control accounts in Cost ledger :

1. General Ledger Control or Adjustment Accountant or cost or financial ledger control Accountant). This account links cost books with financial books. All items of income and expenditure which have been extracted from financial accounts are posted into this account. In the same way all transfers from cost books to financial books, and vice - versa, are also passed through this account. No entry should be made from financial accounts direct to cost books without passing through this account. In the same way no entry should be made from cost books direct to

financial books without passing through this account. This account makes the cost ledger self-balancing by completing double entry. The balance on this account represents the total of all the balances of the impersonal accounts.

2. Stores Ledger Control Account : This account represents a summary record of the value of materials and stores received, issued and balance in hand. The total materials received in stores are debited to this account and materials issued from stores and materials returned to suppliers are credited to this account. The balance of this account should agree with the aggregate of balances of individual accounts in the stores ledger. Materials purchased for specific jobs or processes are debited to work-in-progress control account and not to the stores ledger control account.
3. Work-in-Progress Ledger Control Account : This account shows the total value of work-in-progress at any time. This account is debited with opening balance of work-in-progress, direct materials direct labour, direct expenses and production overheads recovered and credited with the cost of production of completed output or jobs. The balance of this account represents the value of incomplete output or jobs in hand. Material requisition notes, bills of materials, wages abstract, overhead summary etc are the sources of cost data for this account.
4. Wages control Account : This account deals with transactions relating to wages. All productive wages and salaries are debited to this account and wages absorbed by the output are credited. Direct wages are transferred to work-in-progress account and indirect wages are transferred to respective overhead accounts. Postings are made in this account from wages analysis sheet.
5. Finished Goods Ledger Control Account : This account gives the total value of finished goods in stock and shows in total the result of all the entries maintained in all individual accounts in the stock ledger. This account is debited with the opening balance of finished goods, the cost of finished goods from work-in-progress control account and the amount of administration overheads recovered at this point. Cost of sales is credited to this account and the balance represents the value of goods unsold in the stock.
6. Production (or Factory or works or Manufacturing) Overhead Account : This account deals with all types of factory overheads. It is debited with indirect materials cost, indirect wages and indirect expenses and is credited with the amount of overheads recovered from the output which is transferred to work-in-progress account. The balance in the account represents under or over absorbed overhead and is transferred to costing profit and loss account.
7. Administration Overhead Account : All office and administrative expenses are debited to this account and all recovered administrative overheads are credited to the account. The balance of the account which represents under or over recovery of overheads is transferred to costing profit and loss account.
8. Selling and Distribution Overhead Account : This account is debited with all selling and distribution overheads and credited with overheads recovered from goods sold. The balance in the account which represents under or over recovery is transferred to costing profit and loss account.
9. Cost of Sales Account : The cost of goods sold and selling and distribution overhead recovered are debited to this account and the account is closed by transfer to sales account.

10. Sales Account : This account is debited with the cost of sales and credited by the amount of sales. The difference being profit or loss will be transferred to costing profit and loss account.
11. Costing Profit and Loss Account. All under or over - absorbed overheads, abnormal losses or gains and profit or loss transferred from sales account are recorded in this account. The closing balance of this account represents net profit or loss and is transferred to general Ledger Adjustment account.
12. Overheads Suspense Accounts : When factory overheads are not considered in the valuation of closing stock of semi-finished goods, such overheads are debited to works Overhead Suspense Account and credited to works overhead Account. In the beginning of the next year, this entry is reversed so as to close works overhead suspense Account.

In the same way, when administrative overheads are not considered in the valuation of closing stock of finished goods, these overheads chargeable to the stock of finished goods are debited to the administrative Overhead Suspense Account and is credited to administrative overhead account. In the beginning of the next year, this entry is reversed.

14.5 Journal Entries in Cost Ledger :

All the transactions relating to materials, labour and overheads are recorded in cost books in the form of Journal entries. They are explained as follows :

14.5.1 Journal Entries Relating to Materials :

Transactions	Entry
1. Cash or credit purchase of materials for stock	Stores ledger control A/c Dr. To General ledger Adjustment A/c
2. Cash or credit purchase of materials for specified jobs	Work-in-progress control A/c Dr. To General Ledger Adjustment A/c
3. Materials Issued :	
a) Direct Materials	Work-in-progress control A/c Dr. To stores ledger control a/c
b) Indirect Materials	Factory overhead control a/c Dr. To stores ledger Control a/c
c) Returned to suppliers	General ledger Adjustment a/c Dr. To stores ledger control a/c
4. Materials returned from jobs to stores	Stores ledger control a/c Dr. To work-in-progress control a/c
5. Materials transferred from one job to another	Transferee job a/c Dr. To transferor job a/c

Illustration - 1

The following transactions are related to the month of October in XYZ Ltd. Enter them in the cost books.

1. Credit purchase of materials Rs. 3,000
2. Cash purchase of materials Rs. 2,000
3. Credit purchases for special job Rs. 1,000
4. Materials returned to suppliers Rs. 500
5. Direct materials issued to jobs Rs. 3,000
6. Indirect materials issued to jobs Rs. 1,000
7. Materials returned from jobs to store Rs. 500
8. Material transferred from job no. 10 to job no. 15 Rs. 200

Solution :

Journal Entries in Cost Books

	Rs.	Rs.
1. Stores ledger control A/c Dr. To General ledger Adjustment A/c (being credit purchases)	3,000	3,000
2. Stores ledger control A/c Dr. To General ledger Adjustment A/c (Being cash purchases)	2,000	2,000
3. Work-in-progress ledger control A/c Dr. To General ledger Adjustment A/c (Being the purchase for a special job)	1,000	1,000
4. General ledger Adjustment A/c Dr. To stores ledger control A/c (Being returns to suppliers)	500	500
5. Work-in-progress ledger control A/C Dr. To stores ledger control A/c (Being Direct materials issued to jobs)	3,000	3,000
6. Factory overhead control A/c Dr. To stores ledger control A/c (Being the issue of indirect materials)	1,000	1,000

7. Stores ledger control A/c Dr. To wip ledger control A/c (Being the materials returned to stores)	500	500
8. Job No. 15 A/c Dr. To job no. 10 A/c (Being the transfer of materials from job no. 10 to job no. 15)	200	200

14.5.2 Journal Entries Relating to Labour and Direct Expenses :

Transactions	Entry
1. Total Salary and wages paid (Direct)	Wages Control A/c Dr. To General ledger Adjustment a/c
2. Wages Charged to production as per wages abstract.	Work-in-progress control A/c Dr. To Wages control a/c
3. Allocation of indirect labour cost	Works overhead control a/c Dr. To wages control a/c
4. Direct Expenses :	Work-in-progress control a/c Dr. To General ledger adjustment a/c

Illustration 14.2

The following details are found in the wages analysis Book :

Direct labour	Rs.6,000
Indirect factory labour	Rs.2,900
Salaries to administrative staff	Rs.1,300
Salaries to selling & Distribution staff	Rs.800
	Rs. 11,000
Direct Expenses	Rs. 3,000

Pass journal entries in costing books.

Solution :

Journal Entries in Cost Books

	Rs.	Rs.
1. Wages control A/c Dr. To general ledger Adjustment A/c (Being the amount of gross wages brought into the costing books)	11,000	11,000
2. Work-in-progress ledger control A/c Dr. To wages control A/c (Being direct wages transferred to individual job accounts)	6,000	6,000
3. Factory overhead control a/c Dr. Administration overhead control a/c Dr. Selling & Distribution overhead control a/c Dr. To wages control A/c (Being indirect wages transferred)	2,900 1,300 800	5,000
4. Work-in-progress ledger control a/c Dr. To General ledger Adjustment A/c (Being direct expenses brought into cost books)		

14.5.3 Journal Entries Relating to Overheads :

Transactions	Entry
1. Overheads incurred and accrued	Respective overhead control A/C Dr. To General ledger Adjustment A/c
2. Overheads recovered	Work-in-progress control a/c Dr. (for works overheads) Finished goods ledger control a/c Dr. (for Administration overheads) Cost of Sales A/c Dr. (For Selling & Distribution overheads) To Respective overhead control a/c
3. Under absorption of overheads	Costing profit & loss a/c Dr. To Respective overhead control a/c
4. Over absorption of overheads	Respective overhead control a/c Dr. To costing profit & loss a/c

Illustration 14.3

From the following information regarding overheads of a firm pass journal entries in the costing books :

a) Overheads incurred :

	Oustanding Expenses	Cash Expenses
i) Factory overheads	Rs. 2,400	Rs. 440
ii) Administration Overheads	Rs. 1,500	Rs. 200
iii) Selling & Distribution overheads	Rs. 2,500	Rs. 500

b) Absorption of overheads is as under :

- i) Factory overheads Rs. 2800
- ii) Administration overheads Rs. 2,000
- iii) Selling & Distribution overheads 2,900

Solution :

Journal Entries in cost Books

		Rs.	Rs.
1. Factory overheads control a/c	Dr.	2,400	
Administration overheads control a/c	Dr.	1,500	
Selling & Distribution overheads control a/c	Dr.	2,500	
To General Ledger Adjustment A/c		6,400	
(Being the actual overheads)			
2. Factory overheads control a/c	Dr.	440	
Administration overheads control a/c	Dr.	200	
Selling & Distribution overheads control a/c	Dr.	500	
To general ledger Adjustment a/c		1,140	
(Being overheads incurred in cash)			
3. Work-in-progress ledger control a/c	Dr.	2,800	
To factory overheads control a/c			2,800
(Being factory overheads absorbed to production)			

- Costing profit & loss A/c Dr.
 To stores ledger control A/c
- b) Abnormal idle time
- Costing profit & loss A/c Dr.
 To wages control A/c
3. For Finished stock produced :
- Finished goods ledger control A/c Dr.
 To work-in-progress ledger control A/c
4. For cost of goods sold :
- Cost of sales A/c Dr.
 To finished goods ledger control A/c
5. For sales :
- General ledger Adjustment A/c Dr.
 To cost of sales A/c
6. Profit on sale :
- Cost of sales A/c Dr.
 To costing profit & loss A/c
7. Loss on sale :
- Costing profit & loss A/c Dr.
 To cost of sales A/c
8. Transfer net profit as per costing profit & loss A/c :
- Costing profit & loss A/c Dr.
 To general ledger Adjustment A/c
9. Transfer of net loss as per costing profit & loss A/c :
- General ledger Adjustment A/c Dr.
 To costing profit & Loss A/c

Illustration 14.4

From the following information relating to a business, pass necessary entries in cost - journal and prepare control accounts :

Purchases Rs. 45,000

Carriage inward Rs. 3,000

Direct labour Rs. 42,000

Indirect labour Rs. 18,000

Stores issued Rs 43,000

Factory overheads Rs. 41,000

Materials used in repairs Rs. 2,800

Cost of finished output Rs. 1,46,800

Solution :

Journal Entries

		Rs.	Rs.
Stores ledger control A/c	Dr.	45,000	
To General ledger Adjustment A/c			45,000
(Being materials purchased)			
Stores ledger control A/c	Dr.	3,000	
To General Ledger Adjustment A/c			3,000
(Carriage inwards changed to cost of materials)			
Wages control A/c	Dr.	42,000	
To General ledger Adjustment A/c			42,000
(Being wages incurred)			
Works Overhead control A/c	Dr.	18,000	
To General Ledger Adjustment A/c			18,000
(Being indirect labour cost incurred)			

Work-in-progress ledger control A/c To stores ledger control A/c (Being materials issued to production)	Dr.	43,000	43,000
Works overhead control A/c To General ledger Adjustment A/c (Being factory overheads incurred)	Dr.	41,000	41,000
works overhead control A/c To stores ledger control A/c (Materials used for repairs charged to overheads account)	Dr.	2,800	2,800
Work-in-progress ledger control A/c To wages control A/c (wages charged to work-in-progress)	Dr.	42,000	42,000
Work-in-progress ledger control A/c To works overhead control A/c (Factory overheads charged to production)	Dr.	61,800	61,800
Finished goods ledger control A/c To Work-in-Progress ledger control A/c (Transfer of cost of production to finished goods ledger)	Dr.	1,46,800	1,46,800

Ledger Accounts
General Ledger Adjustment A/c

Dr.		Cr.	
Particulars	Rs.	Particulars	Rs.
To Balance C/d	1,49,000	By stores ledger control a/c	45,000
		By stores ledger control a/c	3,000
		By wages control a/c	42,000
		By works overhead control a/c	18,000
		By works overhead control a/c	41,000
	1,49,000		1,49,000

Dr. Stores Ledger Control A/c Cr.

	Rs.		
To General Ledger Adjustment a/c	45,000	By work-in-progress ledger control a/c	43,000
To General ledger Adjustment a/c	3,000	By works overhead control a/c	2,000
		By Balance c/d	2,200
	48,000		48,000

Dr. Wages Control A/c Cr.

To General ledger Adjustment a/c	42,000	By work-in-progress ledger control a/c	42,000
	42,000		42,000

Dr. Works Overhead Control a/c Cr.

	Rs.		Rs.
To General ledger Adjustment a/c	18,000	By WIP ledger control a/c	61,800
To General ledger Adjustment a/c	41,000		
To Stores ledger control a/c	2,800		
	61,800		61,800

Work-in-progress Ledger Control a/c

To Stores ledger control a/c	43,000	By finished goods ledger control a/c	1,46,800
To wages control a/c	42,000		
To works overhead control a/c	61,800		
	1,46,800		1,46,800

Finished Goods Ledger Control a/c

To WIP ledger control a/c	1,46,800	By Balance c/d	1,46,800
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Illustration 14.5

The following balances appeared in the books of ABC company Ltd. on 1st January 2001

	Rs.	Rs.
General ledger Adjustment A/c		15,200
Stores ledger control account	8,750	
Work-in-progress control account	4,280	
Finished Goods ledger control a/c	2,170	
	<u>15,200</u>	15,200

On 31st December, 2001 the following information were supplied :

Purchases for stores	60,640	
Purchases for special jobs	1,950	
Direct wages	38,627	
Indirect factory wages	9,543	
Administration salaries	6,731	
Selling & Distribution salaries	<u>4,252</u>	59,153
Production expenses		10,432
Administrative expenses		9,546
Selling & Distribution expenses		6,430
Stores issued to production		56,501
Stores issued to maintenance account		2,586
Returns to suppliers		312
Production overheads absorbed by production		23,410
Administration overheads absorbed		15,150
Selling overheads recovered on sales		9,515
Production finished during the year		1,18,517

Finished goods sold at cost	1,33,382
Sales	1,55,000

You are required to prepare the control accounts in cost ledger and a Trial Balance for the year 2001.

Solution :

ABC company Ltd

Cost Ledger

General ledger Adjustment A/c

Dr.	Rs.		Cr.
To stores ledger control account	312	By Balance b/d	15,200
To sales a/c	1,55,000	By stores ledger control a/c (purchases)	60,640
To Balance c/d	18,697	By WIP ledger control a/c (Special purchases)	1,950
		By wages control a/c	59,153
		By Production overheads control a/c	10,432
		By Administration overheads control a/c	9,546
		By selling & Distribution overheads control a/c	6,430
		By costing profit & loss Account	10,658
	<u>1,74,009</u>		<u>1,74,009</u>

Dr.	Stores Ledger Control A/c		Cr.
	Rs.		Rs.
To Balance b/d	8,750	By WIP ledger control a/c	56,501
To General ledger adjustment a/c	60,640	By production overheads control a/c	2,586
		By General ledger Adjustment A/c	312

		By Balance c/d	9,991
	69,390		69,390

Dr. Wages Control A/c Cr.

To General ledger adjustment a/c	59,153	By WIP ledger control a/c	38,627
		By production overheads control a/c	9,543
		By Administration overheads control a/c	6,731
		By Selling & Distribution overheads control a/c	4,252
	59,153		59,153

Dr. Production Overhead Control A/c Cr.

To General ledger Adjustment a/c	10,432	By WIP control a/c	23,410
To Stores ledger control a/c	2,586		
To wages control a/c	9,543		
To costing profit & loss a/c	849		
	23,410		23,410

Dr. Work-in-progress Ledger Control a/c Cr.

To Balance b/d	4,280	By Finished goods ledger control a/c	1,18,517
To general ledger Adjustment a/c	1,950	By Balance C/d	6,251
To stores ledger control a/c	56,501		
To wages control a/c	38,627		
To Production overheads control a/c	23,410		
	1,24,768		1,24,768

Dr. Administration Overheads Control a/c Cr.

	Rs.		Rs.
To General ledger Adjustment a/c	9,546	By Finished goods ledger control a/c	15,150

To wages control a/c	6,731	By costing profit & loss a/c	1,127
	16,277		16,277
Dr. Finished Goods Ledger Control a/c		Cr.	
To Balance b/d	2,170	By cost of sales a/c	1,33,382
To WIP control a/c	1,18,517	By Balance c/d	2,455
To Administration overheads control a/c	15,150		
	1,35,837		1,35,837
Dr. Selling and Distribution Overheads control A/c		Cr.	
To General ledger Adjustment a/c	6,430	By cost of Sales a/c	9,515
To wages control a/c	4,252	By costing profit & loss a/c	1,167
	10,682		10,682
Dr. Cost of Sales A/c		Cr.	
To Finished goods ledger control a/c	1,33,382	By Sales a/c	1,42,892
To selling & Distribution overheads control a/c	9,515		
	1,42,897		1,42,897
Dr. Sales Account		Cr.	
To cost of Sales a/c	1,42,897	By General ledger Adjustment a/c	1,55,000
To costing profit & loss a/c	12,103		
	1,55,000		1,55,000
Dr. Costing profit and loss a/c for the year ended 31-12-2001		Cr.	
	Rs.		Rs.
To Administration overheads control a/c (under recovery)	1,127	By Sales a/c	12,103

To selling & Distribution overheads control a/c (Under recovery)	1,167	By production overheads control a/c (over Recovery)	849
To General ledger Adjustment a/c (Net profit)	10,658		
	12,952		12,952
Dr. Trial Balance as af 31st Dec. 2001 Cr.			
	Dr.	Cr.	
Stores ledger control a/c	9,991		
Work-in-progress ledger control a/c	6,251		
Finished goods ledger control a/c	2,455		
General ledger Adjustment a/c		18,697	
	18,697	18,697	

14.6 Summary

Since cost accounts and financial accounts are maintained for different purposes, the patterns of collecting information are different. However, the double entry system is followed in both the systems of accounting. There are basically two systems of maintaining cost accounts, non-integral accounting and integral accounting. Cost and financial transactions are kept separately under non-integral accounting, while they are recorded in one set of books under integral accounting. There are four important ledgers maintained in cost accounts under non-integral accounting, namely, cost ledger, stores ledger, work-in-progress ledger and finished goods ledger. In small organisations only cost ledger is maintained. But in large firms the other three ledgers are also maintained. Besides these, control accounts are also maintained. Control accounts are the total accounts maintained in the cost ledger, each representing a subsidiary ledger. The very purpose of control accounts is to exercise control over the three subsidiary ledgers and also complete double entry in cost accounts.

14.7 Key words

1. Non-integral accounting : A system of accounting where cost and financial transactions are kept separately

2. Integral or integrated Accounting : It refers to the system where both cost and financial transactions are recorded in the same set of books

3. Cost Ledger : This is the principal ledger of cost accounts. It contains all impersonal accounts.

4. Control Accounts : These are the total accounts maintained in the cost ledger. Each control account represents a subsidiary ledger in which individual accounts are maintained.

14.8 Self Examining Questions / Exercises :

1. Explain non-integral system of accounting and various ledgers to be maintained under this system ?
2. What is 'Cost Ledger' ? What are its advantages ?
3. What are Control Accounts ? Describe their advantages ?
4. What are Control Accounts ? Explain various control accounts maintained in cost control accounting.
5. "Control accounts are summary accounts" Discuss.
6. Following are the balances in the cost ledger of ABC Ltd on January 1, 2001

	Rs.
Stores Ledger Control Account	7,000
Work-in-progress ledger control Account	12,000
Finished goods ledger control Account	2,000
General ledger Adjustment Account	21,800
The following information is provided for the year 2001	
Purchase of materials	40,000
Direct factory wages	60,000
Manufacturing expenses	34,600
Selling and Distribution expenses	5,400
Materials issued to production	37,200
Manufacturing expenses recovered	34,440
Selling and distribution expenses recovered	5,320
Sales	1,50,000
Stock of finished goods at 31-12-2001	4,700
Work-in-progress at 31-12-2001	14,700

You are required to pass the necessary entries and to prepare various accounts in the cost ledger, including costing profit and loss account for the year 2001, Also extract a Trial Balance.

Ans. (Stores Ledger Control A/c Rs. 9,800 ; Finished goods ledger control A/c 1,29,740 ; Finished goods transferred to cost of sales A/c Rs. 1,27,040 ; Cost of sales transferred to sales A/c Rs. 1,32,360; Profit Rs. 17,400 ; General ledger Adjustment A/c Rs. 29,200)

7. The following balances appear in a company's cost ledger at the beginning of the month :

	Rs.	Rs.
Stores ledger control A/c	30,000	
Production overheads control A/c		12,000
Work-in-progress ledger control A/c	37,000	
Finished stock ledger control A/c	39,000	
Financial ledger control A/c		
(General ledger Adjustment A/c)		94,000
	1,06,000	1,06,000

During the month the following transactions took place :

Raw materials purchased	Rs. 75,000
Materials issued to production	Rs. 71,400
Materials returned to suppliers	Rs. 1,500
Factory wages	Rs. 69,000
Indirect labour	Rs. 37,000
Manufacturing overheads	Rs. 48,000
Manufacturing overheads charged to production	Rs. 73,000
Cost of Sales	Rs, 2,10,000
Sales returns at cost	Rs. 5,000
Finished products at cost	Rs. 2,27,000

Pass necessary Journal entries. Also prepare control accounts and trial balance at the end of the month.

Ans. (Stores ledger control A/c Rs. 32,100; Work-in-progress ledger control A/c Rs. 23,400 ; Finished stock ledger control A/c Rs. 61,000 ; Financial ledger control A/c (or General Adjustment Control A/c) Rs. 1,16,500)

14.9 Further Readings

1. C.T. Horngren : Cost Accounting - A Managerial Emphasis
2. S.P. Jain & K.L. Narang : Cost and Management Accounting
3. Khanna, Pandey & others : Problems on costing

Lesson - 15**COST REPORTS****Objectives :**

- K of this Unit are to explain the concept and need of reporting to Management
- K to familiarise with you the process of report writing and specimens of reports.

Structure :

- 15.1 Management Reporting System**
- 15.2 Essentials of a good system**
- 15.3 Meaning and Definition**
- 15.4 Objectives of Reporting**
- 15.5 Modes of Reporting**
- 15.6 Essentials of Good Reporting**
- 15.7 Kinds / Types of Classification of Reports**
- 15.8 Reporting System**
- 15.9 General Principles of Good Reporting System**
- 15.10 Process of Report Writing**
- 15.11 Managerial needs and Reporting**
- 15.12 Information to be presented**
- 15.13 Frequency of Reporting**
- 15.14 Specimens of Reports**
- 15.15 Key words**
- 15.16 Self-Assessment Questions / Exercises.**
- 15.17 Further Readings**

15.1 Management Reporting System :

A 'Management reporting system' can be defined as "an organised method of providing each manager with all the data and only those data which he needs for these decisions, when he needs them and in a form which aids his understanding and stimulates his action". 'The organisation can design such a system only after it has established its goals, broad policies and the basic organisation structure.

The term information means 'data processed or evaluated for a specific purpose'. It is indicative of the fact that the data is in a form which has reduced, if not removed, uncertainty regarding a particular event or situation. Thus, it has acquired the necessary significance to be of some definite use.

15.2 Essentials of Good System :

The following are the essentials of a good management reporting or information system.

- a) Proper design : MIS system should be properly designed keeping in view the information requirements of different levels of management. It should be managed by professionally trained personnel. Moreover, the system should be designed after ascertaining the views of its users and should have support from the top management.
- b) Evaluation of each manager's area of responsibility : This system should flow yield information required for the evaluation of each manager's area of responsibility in relation to the goals of the organisation.
- c) Proper flow of information : There should be a proper flow of information. It should flow from the right level of authority where the decisions are to be made. Moreover, complete and consistent information should flow in a systematic manner.
- d) Proper form : In order to facilitate decision-making, the information at the proper time, and form.
- e) Proper time : The system should ensure furnishing of the information at proper time, i.e., neither too late, nor too early.
- f) Cost benefit analysis : There should be a constant evaluation of the cost incurred in collecting and supplying the information and the benefit derived therefrom.
- g) Flexibility : The system should be capable of being adjusted accordingly to the requirements of the user.

Management reporting system has now become a specialised function. Large concerns these days have a separate Management Information Division. This division may be headed by the Accountant himself or the Management / cost accountant or Information Manager, depending on the size of the business. However, who so ever may head this division, he must know not only what information each level of management requires but also regarding the techniques to be employed for collecting, storing processing and finally communicating the required information to the proper management levels.

15.3 Meaning and Definition of Report :

The word 'Report' is derived from the latin word 'portare' which means 'to carry'. So 'Report' is a document which carries the information. The word Report consists of two parts viz, RE + PORT. The meaning of the word RE is 'again' or 'back' and PORT means 'to carry', combining these two words it means to carry the information again. It must be clear that reports are always written for any event which has already occurred. So report is a written document which carries the information again.

Dictionary meaning of the word report is 'to convey' or to transmit as having been said. In fact, a report is a communication from someone who has the information to someone who wants to use the information. Report is always planned for use.

According to G.R. Terry, Report is "a written statement based on a collection of facts, events and opinions and usually expresses a summarised and interpretative value to this information. It may deal with past accomplishments, present conditions or probable future developments". They talk about report as a written communication prepared on the basis of collected information related to present, past or future.

In the words of Johnson and Savage, "A good business report is a communication that contains factual information, organised and presented in clear, correct and coherent language".

In simple words, report can be defined as "a form of statement which presents and examines facts relating to an event, problem progress of action, state of business affairs etc. and for the purpose of conveying information reporting findings, putting forward ideas and making recommendations as the basis of action". So report is an impartial presentation of facts. These facts may arise out of available factual data or through enquiry, investigation, survey, interview, experiments or research. A mere expression of opinion without supporting factual data is not a report.

15.4 Objects / Ends Of Reports :

The reports are prepared and written to serve the following purposes :

- a) **Means of communication :** Reports are means of upward communication. It is a communication from someone who has the information to someone who needs that information for carrying out functions or management. Reports provide information to executives, government agencies, shareholders, creditors, customers or general public.
- b) **Serve as record :** Reports provide valuable records for future reference. Reports record facts and results of investigations. The facts can be of great importance in future.
- c) **Legal requirements :** Reports are also written and submitted to fulfil legal requirements. For instance, Annual Report of company's Accounts is necessary to be furnished to shareholders under Companies Act, 1956. Similarly, audit report of accounts must be accompanied by the income-tax return under Income Tax act. 1961.
- d) **To develop public relations :** Reports of general progress of business and utilisation of national resources to public helps in increasing the goodwill and developing public relations.
- e) **Basis to measure performance :** Routine reports about the work performance of employees help the management to measure performance in view of the objects. The reports on performance shall become the basis for promotions and incentives.
- f) **Control purposes :** Reports are the basis of any control process. It is on the basis of reports, actions are initiated and instructions are given to improve the performance.

15.5 Modes of Reporting :

Reports may be presented in a number of ways. The method of reporting may depend upon the nature of information to be conveyed, the volume of data or information to be given or the media available for communications. Following methods of reporting may be used :

1) Written Reporting : A number of written reports may be sent to different levels of management. These reports may be :

a. Formal Financial statements : These statements may deal with any or some of the following.

a.1. Actual figures against the budgeted ones.

a.2. Comparative accounting statements giving information at different periods of time.

b. Tabulated Information : The tabulated statistics which include analysis according to products, time, territories etc. A particular type of information, for example sales, may be tabulated at as per different periods, products, areas etc.

c) Accounting ratios : Accounting ratios may be presented as a part of formal financial statements. The ratios are useful in appropriate analysis of financial statements. The ratios may be current ratios, efficiency ratios, long-term solvency ratios, profitability ratios, etc.

2) Graphic Reporting : The reports may be presented as a part of formal financial statements.

The reports may be presented in the form of charts, diagrams and pictures. These reports have the advantage of quick grasp of trends of information presented. A look at the chart or diagram may enable the reader to have an idea about the information.

3) Oral Reporting : Oral reporting may be in the following forms :

a. Group meetings

b. Conversation with individuals

Oral reporting is helpful only to limited extent. It cannot form a part of important managerial decision - making. For that purpose the reports must be in writing so that these may be referred in future discussions too.

A combination of written, graphic and oral reporting may be useful for the concern.

15.6 Good / Essentials, of Reporting :

A report is a vehicle carrying information to those who need it. A report is prepared by putting in labour by the executives. The usefulness of the report will depend upon its quality and the way in which it has been communicated. A report should be prepared in a way it serves and purpose and presented at a time when it is needed. Good reporting is thus essential for effective communication. A good report should have the following requisites :

1. Good form and content : The following points to be taken into account while preparing a report:

- a) The report should be given a proper title, headings, sub-headings and paragraph division. The title will explain the purpose for which the report has been prepared the title also enables to point out the persons who need the report. A production report may be titled as 'Production report for the month of April 1992'. The title explains the purpose and period of preparing the report.
- b. If statistical figures are to be given in the report then only significant figures and totals should be made a part of it and other detailed figures should be given in appendix.
- c. The reports should contain facts and not opinions. The opinion may come, if essential, as a sequel to certain facts and not other wise.
- d. The report must contain the date of its preparation and date of submission.
- e. If the report is prepared in response to a request or letter then it should bear reference number of such request or letter.
- f. The contents of a report must serve the purpose for which it has been prepared. Separate reports be prepared for different subjects. Various aspects of the subject should be properly conveyed.
- g. The contents of the report should be in a logical sequence.

2. Simplicity : The report should be presented in a simple, unambiguous and clear language. The language should be non-technical. If the report is loaded with technical terminology it will reduce its utility because the reader may be unfamiliar with that language. The reader should be able to understand the report without any difficulty. The report should be able to readable. The figures should be rounded so as to make them easily understandable. If possible, charts, diagrams or graphs should be used for presenting information.

3. Promptness : Promptness in submitting a report is an essential element of a good report. The reports should be sent at the earliest. These are required for studying the progress and performance of various departments. A considerable delay in the occurrence of an event and reporting of the same will defeat the purpose of reporting. Information delayed is information denied. The quick supply of reports will enable the management to take corrective measures at the earliest.

The reports are to be based on information, the promptness in reporting will depend on quick collections of facts and figures. Following steps may help in quick reporting.

- a. A proper record-keeping system should be introduced into the organisation to meet various informational needs.
- b. To avoid clerical errors, mechanised accounting should be used.
- c. The accounting work should be centralised to avoid bottlenecks in collecting information.

4. Relevancy : The reports should be presented only to the persons who need them. They

should be marked to relevant officials. Sometimes reports are sent to various departments in a routine way then it will involve unnecessary expenditure and the reports will not remain secret. The persons or departments to whom the report is to be sent must be clear to the sender. People do not give much attention to reports coming in a routine way. So, this type of practice involves unavoidable expenditure and reduces the importance of reports.

5. Consistency : There should be a consistency in the preparation of reports. The comparability of reports will be possible only if they are consistent. For consistency, the reports should be prepared from the same type of information and statistical data. This will be possible if a same accounting principles and concepts are used for collecting, classifying, tabulating and presenting of information, consistency in reporting enhances their utility.

6. Accuracy : The reports should be reasonably accurate. Statistical reports may sometimes be approximated to make them easily understandable. The production of figures accurate upto paise may be difficult to be remembered, their reasonable approximation may make them readable and understandable. The degree of accuracy depends upon the nature of information and the purpose of its collection. The approximation should not done upto the level where the information loses its form and utility. So accuracy should be used to enhance the use of reports.

7. Controllability : The reports should be addressed to appropriate persons in respective responsibility centres. The reports should give details of variables, which are related to that centre. This will help in taking corrective measures at appropriate levels. The variables which are not controllable at a particular responsibility centre may also be mentioned separately in the report.

8. Cost of consideration : The cost of preparing and presenting the report should be considered. This cost should not be more than the advantage derived from such reports. The cost should be reasonable so that reporting may be used by all types of concerns. The cost-benefit analysis will help in deciding about the adoption of reporting system.

9. Comparability : The reporting system is meant to help management in taking correct decision and improving the operational efficiency of the organisation. This objective will better be achieved if reports give comparative information.

The comparative information can be in relation to previous periods, current standards, or budgets. This information helps in finding out deviation or variances. Where performance is below standards or expectations such variances can be highlighted in the reports. The 'management by exception' is possible when exceptional information will be supplied to the management. The comparative reporting will at once help the reader to reach at conclusion about the performance of the responsibility centre mentioned in the reporting.

10. Frequency of reports : Along with promptness the frequency of reporting is also significant. The reports should be sent regularly when they are required. The timing of reporting will depend upon the nature of information and its purpose. Some reports may be sent daily, some weekly, some monthly and so on.

Frequency of reports means that these should be sent when required. Their reports are prepared at approximate times and sent to appropriate persons as per their requirements.

15.7 Kinds / Types : Classification of Reports :

The reports may be classified into the following categories :

1. According to Object and Purpose
 - a. External reports
 - b. Internal reports
2. According to Nature
 - a. Enterprise reports.
 - b. Control reports
 - c. Investigate reports
3. According to Period
 - a. Routine reports
 - b. Special reports
4. According to Functions
 - a. Operating reports
 - b. Financial reports

1. According to object or purpose : Classification of reporting according to object or purpose may be discussed as under :

a. External reports : The reports meant for persons outside the business are known as external reports. Outsiders interested in company reports may be shareholders, creditors, or bankers. Though the company may not be answerable to outsiders but still some reports are meant for outside public. The company publishes Income statement and Balance sheet at the end of every financial year and these statements are filed with the Registrar of companies and stock exchanges. Final statements of accounts are expected to confirm to certain basic details. In India, companies act has made it compulsory to disclose some minimum information in final accounts.

b. Internal reports : Internal reports refer to those reports which are meant for different levels of management. Internal reports are not public documents and they are not expected to confirm to any standards. These reports are prepared by keeping in view the needs of disposal for scanning them. These reports may be meant for top level, middle level and lower level of management. The reports meant for different levels of management have been discussed. The frequency of these reports vary in accordance with the purpose they serve. Some of the internal reports that are commonly used are period report about profit or loss and financial position, statement of cash flow and changes in working capital, report about cost of production, production trends and utilisation of capacity, labour turnover reports, material utilisation reports, periodic reports on sales, credit collection period and selling and distribution expenses, report on stock position etc.,

2. Classification according to nature : According to nature, reports are divided into three categories:

a. Enterprise reports : These reports are prepared for the concern as a whole. These reports serve as a channel of communication with outsiders. Enterprise reports may concern all activities of the enterprise or may be related to different activities. Enterprise reports may include Balance sheet, Income statement, Income tax returns, Employment reports, Chairman's reports, etc. These reports

contain standardised information and are beneficial to outsiders. The interpretation of financial statements can also be undertaken from these reports. The reports are important from financial analysis point of view.

b. Control reports : Control reports deal with two aspects. One aspect related to the personal performance and the second aspect deals with the economic performance. The first type of reports are reported to judge the performance of managers and heads of responsibility concerns with that performance should have been under the prevailing circumstances. The reasons for deviations in performance are also identified. The second type of reports show how well the responsibility centre has fared as an economic entity. Such analysis is made practically. This type of analysis requires the full cost accounting rather than responsibility accounting. Control reports should consider the following:

- b.1 Control reports should be related to personal responsibility
- b.2 They should compare actual performance with the standards.
- b.3 They should highlight significant information.
- b.4. These should be sent at a proper time as to enable taking corrective measures.

c. Investigative reports : These reports are linked with control reports. In case some serious problem arises then the causes of this situation are studied and analysed. Investigative reports are based on the outcome of special solution studies. These reports are intermittent and are prepared only when a situation arises. They are prepared according to the nature of every situation. They are helpful to the management in analysing the causes of some problems.

3. Classification according to period : According to period reports may be classified into two :

a. Routine reports : These reports are prepared about day-to-day working of the concern. They are periodically sent to various levels of management. These reports may differ according to the nature of information details to be reported. So far as the timing is concerned they may be sent daily, weekly, monthly, or quarterly.

Routine reports may relate to sales information, production figures, capital expenditure, purchases of raw materials, market trends, labour situation etc.

There is a tendency to ignore reports by all recipients because of their routine nature. Important information in the report should be highlighted or presented in a different way or may be written in a different ink.

b. Special reports : The management may confront some difficulties and routine reports may not give sufficient information to tackle these situations. Under such circumstances, special reports are called for. Special reports are required for special purposes only.

These reports are prepared according to the need of the situation. Available accounting information may not be sufficient, so data may have to be specially collected. There may be need to put extra staff for compiling these reports it may also involve co-ordination of different departments and different

levels of management. According to J. Batty's special reports should be divided into sections, each conveying the following main purposes :

- b.1. Reasons of the report
- b.2 Investigation made the
- b.3 Finding a conclusion and recommendations.

Special type of reports may deal with the following topics ;

- i. Information about market analysis and methods of distribution of competitors.
- ii. Technological changes in the industry.
- iii. Problems about the purchase of raw materials etc.,
- iv. Reports of about the change in methods of production and their implications.
- v. Trade association matters.
- vi. Report by the secretary on company matters.
- vii. Political development at home and abroad having impact on business.

4. Classification of reports according to function : According to function the reports may be divided into two categories.

a. Operating reports : These reports provided information about operations of the concern. The operating reports may consist of the following :

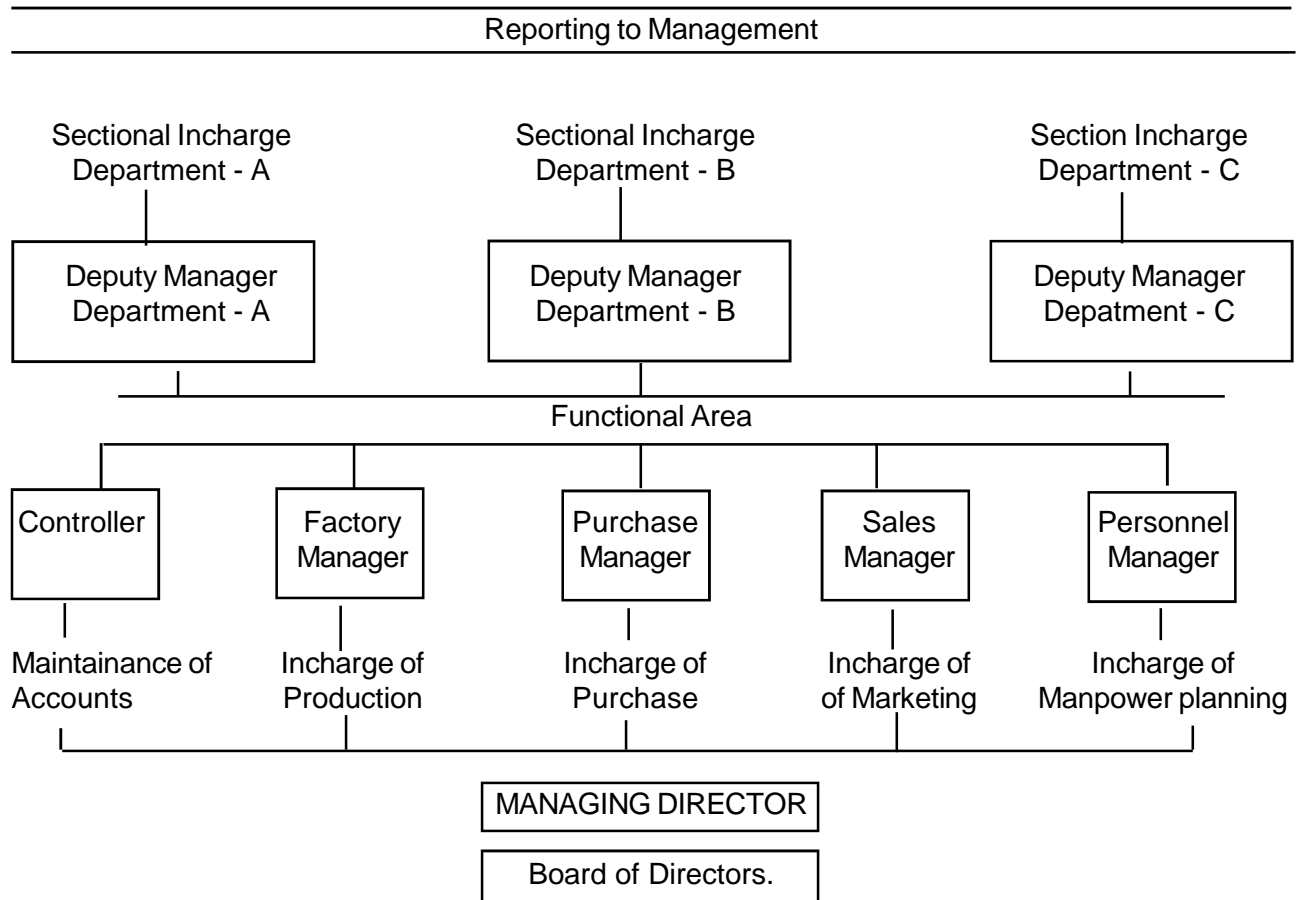
a.1 Control reports : These reports are used for managerial control. They are intended to spot deviations from budgeted performance without loss of time so that corrective action can be taken. Control reports are also used to assess the performance of individuals.

a.2 Information reports : These reports are prepared to provide useful information which will enable planning and policy formation for future. Information reports can take the form of trend reports and analytical reports. Trend reports provide information in comparative form over a period of time. Graphic representations can be effectively used in trend reports. As opposed to trend reports, analytical reports provide information in a classified manner about composition of certain results so that one can identify specific factors in the overall total ;

b. Financial reports : These reports provide information about the financial position on the concern on specific dates or movement of finances during a specific period. The balance sheet provides information about the financial position on a particular date. On the hand, cash flow statement provides data about the movement of cash during a particular period. These reports can be either static or dynamic. Balance sheet and other subsidiary reports are examples of static reports : Cash flow, fundflow statements and other reports showing financial position as compared to the budgeted are examples of dynamic reports.

15.8 Reporting System :

The reporting system involves all levels of management. The report originates from junior levels of management and goes upto top level management, consisting of Board of Directors. The reporting system of a large scale organisation is shown in the chart given below :



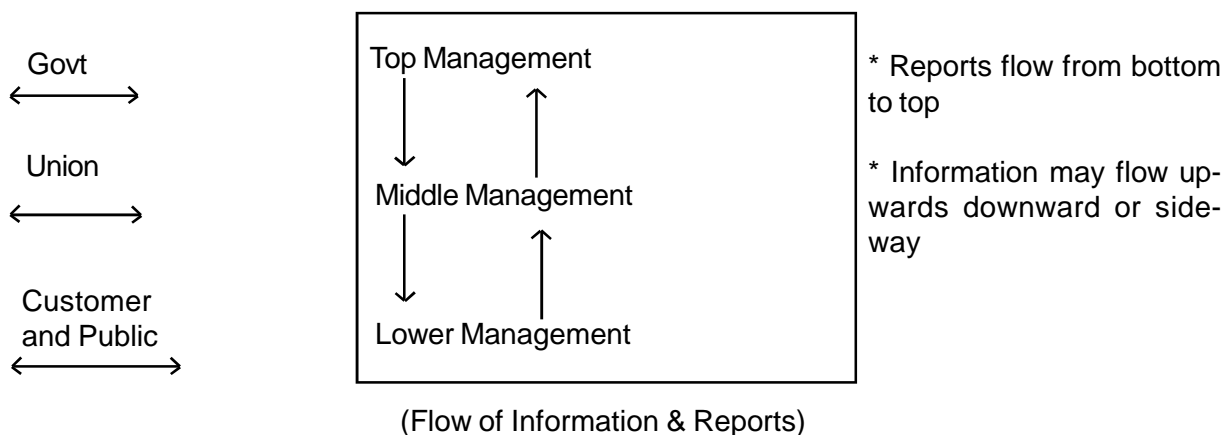
The sectional incharge of every section regularly reports the progress of his section to his superior. In this diagram functional managers have deputy managers who control departmental sections. The combined reports of different sections reach the departmental manager, called functional manager. Different functional managers submit the progress of their departments to the managing director. The brief summarises of departmental reports are submitted to the Board of Directors for reviewing policies and making strategy for the future. An effective reporting system will enable the top management to remain in constant touch with the progress of different departments.

15.9 General Principles of A good Reporting system :

A good reporting system is helpful to the management in planning and controlling. Every level of management needs information relating to its activities centre so that effective planning may be undertaken and current activities may be controlled and necessary corrective measures may also be taken in time if needed. Some general principles are followed for making the reporting system effective. These principles are discussed as follows :

1. Proper flow of Information : A good reporting system should have a proper flow of information. The information should be sent in the right form and at a proper time so that it helps in planning and co-ordination. The frequency of reports will depend upon the nature of report, the types of data required for preparing the information and cost involved in preparing such reports. The flow of reports should be such that it does not cause delay. In taking decision the reports should flow at regular intervals so that informational needs of different managerial levels are met at a proper time.

Flow of information is a continuous activity and affects all levels of the organisation. Information may flow upward, downward or sideways within an organisation. Orders, instructions, plans etc. may flow from top to bottom, Reports grievances, suggestions etc. may flow from bottom to top. Notification, letters, settlements, complaints may flow from outside, Information also flows sideways from one manager to another at the same level through meetings, discussions etc.



2. Proper timing : Since reports are used as controlling device so they should be presented at the earliest or immediately after the happenings of an event. The time required for preparation of reports should be reduced to the minimum for routine reports the period should be known and strictly adhered to. It will be a waste of time and effort to prepare information which is too late to be of any use. The absence of information when needed will either mean wrong decisions or deferment of decisions on matters which may be urgent in nature.

3. Accurate Information : The information should be as accurate as possible. If the information supplied is inaccurate it may result in making wrong decisions. However, the degree of accuracy may differ in different reports. Some times, part information may be supplied as a guide for future policy making, so the degree of accuracy may be less. The supply of exact figures may involve a problem of understanding. Approximate figures are more understandable than accurate figures given upto paise. Accuracy should also not involve excessive cost of preparation nor it should be achieved at the sacrifice of promptness figures at a proper time than delayed information prepared accurately.

4. Basic of comparison : The information supplied through reports will be more useful when it is supplied in comparison with past figures, standards set or objectives laid down. The comparison of information with past or budgeted figures will enable the reader to find out trends of variations. The decision taking authority will be able to make use of comparative figures while taking a decision. Corrective measures can also be initiated to improve on the past performance. The management accountant can make the reports more useful by giving his own interpretations to the information.

5. Reports should be clear and simple : The purpose of preparing reports is to help management in planning. Co-ordination and controlling. This purpose can be achieved only when the reports are easily understood by the readers. The information should be presented in a clear manner by avoiding extraneous data. Only relevant important information should become the part of a report. If supporting information cannot be avoided then it should either be given in appendix or separate chart should be attached for it.

The method of presenting information should be such that it attracts the eye, and enables the reader to form an opinion about the information. The graphic presentation of information will enable the reader to find out the trends and also to determine deviations more quickly than in other methods. The arrangement of presentation should be brief, clear and complete. Simplicity is a good guide for reports preparation.

6. Cost : The benefits derived from reporting system must be commensurate with the cost involved in it. Though it is not possible to assess the benefits of this system in monetary terms, there should be an endeavour to make the system as economical as possible.

7. Evaluation of Responsibility : The reporting system should enable the evaluation of managerial responsibility. The targets are fixed for various functional departmental heads. The record of actual performance is monitored along with the standard as enable management to assess the performance of different individuals. So, management reporting should be in a way that it helps in evaluating the work assigned to various persons.

General principles of Good Reporting System

1. Proper Flow of Information
2. Proper Timing
3. Accurate Information
4. Basis of comparison
5. Reports should be clear & simple
6. Cost
7. Evaluation of Responsibility

15.10 Process of Report Writing :

The process of writing and designing report consists of three stages. These stages are:

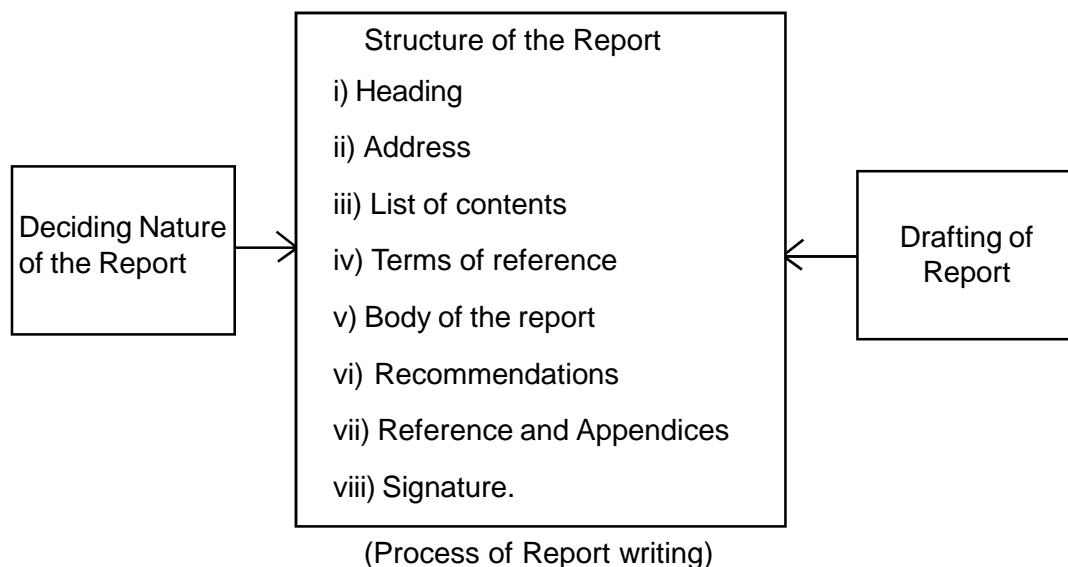
1. Deciding the nature and purpose of the report.
2. Structure of the report.
3. Drafting of a report.

These stages are explained as follows :

1. Deciding the nature and purpose of the report : The stage one is to know the type of reports. Whether the report is statutory or non-statutory. Its type shall determine the nature and shape of the report. It is also very essential to know the purpose or object of the report. The purpose shall determine the other two stages.

2. Planning structure of the Report : There is no one way to design the structure of the report but following part are common in any report.

- i) **Heading :** A short, clear, meaningful and attractive heading or title is necessary for a report. Title or heading should indicate the subject - matter of the report.
- ii) **Address:** Every report is written for some one. So it is essential to write the name of reader or readers. Report must be addressed to some person or body of persons.
- iii) **Contents :** It is a list of chapters of the report. The contents of the report are listed in a serial order along with page numbers on which such contents are to be found. Contents should be arranged logically.
- iv) **Terms of Reference or Introduction :** It gives the reason for writing a report. Brief description of the problem is stated. The object and scope of investigation are also given in this part.
- v) **Body of the Report :** This part is most important and lengthy. The writer presents here the facts and data collected by him. Use of tables, graphs, diagrams can be made here or in appendices. The object and scope of investigation are also given in this part.
- vi) **Recommendations :** This part is the summary of the report and consists of conclusions and recommendations. The conclusions are made on the bases of the facts and collected data. Recommendations or suggestions are given on the basic of conclusions.
- vii) **Reference and appendices :** It is customary to mention, list of references and bibliography indicating the sources from where the writer has taken material for writing the report.



Appendices contain diagrams, statistical tables, specimen forms etc.

viii) Signature : Every report should be signed by the person responsible for its preparation. Any report submittee should be signed by the chairman. It is advisable to mention date on the report.

3. Drafting Report : Drafting a report is an important stage in report writing. The stage includes following considerations :

i) Collection of data and its analysis : First step in drafting is collecting information, facts and data necessary for the purpose of the report. Data can be collected from secondary or primary sources. Data is collected, data has to be classified, tabulated, edited and analysed. The collected data has to be arranged logically and conclusions are drawn.

ii) Format of a report : The format of a report which has already been explained. It is concerned with the layout of the report and arrangement of the data. It can be standardised for the purpose. Following is a specimen of a report form. If report is in a letter form then it has salutation and a complimentary close. If report is in memorandum form, both salutation and complimentary close may be dispensed with.

iii) Writing of report (guiding principles) : Report writing is an art which can be developed by practising report writing and by studying the reports of other writers. Reports are written for others so the needs and style preferred by the reader should be kept in mind while writing a report. The general principles of a good reporting system which have been explained earlier will help in writing the report.

iv) Presentation of Report : General layout of a report should be pleasing to the eye. Report may be typewritten, printed or hand written depending on the number of copies required. Sufficient space and margin should be kept on the left hand side. Reports should be written on one side of the paper with double spacing. Pages, paras and sections should be numbered. Use of diagrams, illustrations charts, tables may be made and these should be numbered. If report is voluminous or is liable to constant handling it should be in bound form.

15.11 Managerial needs and Reporting :

There are generally three levels of management and their informational needs are different. Same type of information and in the same form and content may not be needed at all the managerial levels.

The three levels of management are :

- a) Top level Management
- b) Middle level Management
- c) Lower level Management

The information to be presented and the method of reporting should meet the specific requirement of various levels of management. The guiding principles for reporting to different levels of management are as follows :

1. The lower the levels of management the more detailed will be the reports and higher the level of management the shorter or summarised will be the reports. The lower level management consisting of foremen, section incharges, supervisors, etc. need more detailed reports because they are concerned with actual execution of work. On the other hand top management (i.e. Board of Directors) has limited time on needs summarised reports. Some times only exceptional matters are reported to this level.

2. The frequency of reports is also connected with the level of management. The lower the level of management the higher the frequency of reporting. The middle and lower levels of management need the reports more frequently because they deal with day to day operations of the business. The top level management will ask for the reports when some decision is to be taken or some policy has to be decided.

3. The number of reports to be sent is also concerned with the levels of management. The top level management will get maximum number of reports. The top management is to get reports about every activity in the business while lower level management is concerned with a particular department or section so it will get information about this area only. The Board of Directors will receive a Large number of reports because it controls every function in the organization.

a) Reports for Top Level Management : Top level management consists of Board of Directors. Top level management is concerned with policy planning and co-ordinating activities. The goals are set for the organisation and policies are devised to achieve these goals. The work of executing policies is left to the top level management :

- i) Periodic report about profit and loss account and balance sheet.
- ii) Statements of funds flow and cash flow at regular intervals.
- iii) Reports of production trends and utilisation of capacity
- iv) Reports about cost of production.
- v) Periodic reports on sales credit collection period and selling and distribution expenses.
- vi) A statement on development and research expenditure.

B) Reports for Middle Level Management : The Middle Level Management is assigned the work for executing various policies. The objects or goals are set by top management. The requisite authority is delegated to the middle level management so that organisational goals may be achieved. The reports submitted to middle level management are detailed so that a corrective view of performance of different departments is also undertaken by middle management. The reports submitted to middle management may be classified as follows :

i) Production Manager

1. Actual production figures along with budgeted production figures for that period. These reports are generally daily weekly or fortnightly.

2. The figures about the availability and utilisation of workers. Figures about normal and abnormal idle time are also reported.
3. Capacity utilisation reports.
4. Material usage reports
5. Machine and labour utilisation reports
6. Absenteeism and labour turnover reports
7. Scrap report
8. Machine hours Lost Report
9. Stock position report
10. Analysis of Budgeted cost of production and actual cost of production

ii) Sales Manager :

1. Reports on actual and budgeted sales. These reports are submitted areawise and product wise.
2. Weekly reports on orders booked, orders executed and orders still to be executed.
3. Reports on credit collection and on bad debts, etc.
4. Reports on stock position
5. Analysis of selling and distribution expenses, product as well as area wise.
6. Market survey reports.
7. Reports on customer's complaints.
8. Reports on effectiveness of sales promotion campaigns, etc.

iii) Purchase Manager :

1. Raw Materials purchased, actual material received and orders pending
2. Use of raw materials for production
3. Raw materials balance and information when minimum level or maximum level reaches.
4. Analysis of purchase expenses.
5. Budgeted cost of purchases and actual cost of purchases, etc.

vi). Finance Manager

1. Cash and Bank position reports.
2. Periodic fund flow and cash flow statements.
3. Debtors collection period reports.
4. Average payment period.
5. Analysis of working capital
6. Reporting on budgeted profit and actual profit.
7. Statement of financial position.
8. Capital expenditure reports, etc.

c) Reports for lower level Management : Junior level management consists of foremen or sectional in-charge. They are responsible for the actual execution of policies. They are in touch with the day to day performance of their sections. They get daily reports from their juniors. Junior level management prepares and sends regular reports to middle level management. Reports for foremen may include.

1. Labour utilisation report and cause of lost time
2. Worker's efficiency reports.
3. Scrap report.
4. Actual shop expenses against budgeted expenses.
5. Maintenance cost report, etc.

15.12 Information to be Presented :

On the basis of nature of information to be presented before the management, the report can be divided into four groups i.e., production, sales, cost and finance. All the periodic or routine or regular reports and most of the special reports will fall under either one of these categories. Below are given some of the important periodical report generally prepared in any organisation.

a) Reports to production Division :

1. Statement showing actual output achieved against the standard output.
2. Statement making a comparison on actual capacity worked against budgeted capacity.
3. Report showing labour turnover and absenteeism.
4. Machine and labour utilisation report.

5. Analysis of idle man hours.
6. Analysis of lost machine hours.
7. Effect on cost and productivity of overtime and shift working
8. Analysis of cost variances.
9. Cost of each department or product duly analysed by components of cost.
10. Analysis of abnormal loss, spoilage, defective work and scrap
11. Analysis of stock of raw materials, work-in-progress and finished goods.
12. Analysis of maintenance cost.
13. Analysis of power consumption and cost.
14. Analysis of ratio of indirect labour cost to direct labour cost.

b) Reports to sales division :

1. Statement showing comparison of actual sales against budgeted sales.
2. Analysis of orders on hand, orders received and orders executed.
3. Product and area wise analysis of sales.
4. Comparison of actual selling and distribution expenses with the budgeted expenses.
5. Market survey reports on sales trends and the expected demand for the company's products in future.
6. Analysis of outstanding debtors.
7. Analysis of gross profit earned in each area on each product.
8. Analysis of sales promotion compaigns.
9. Analysis of customer complaints.
10. Report on credit worthiness of customers.
11. Reports on ratio of bad debts to total debtors or credit sales.
12. Reports on ratio of selling and distribution overhead to cost of sales or sales.
13. Report on effectiveness of various sales compaigns.

c) Reports to finance Division :

1. Summary of cash receipts and payment compared with the cash budget.
2. Analysis of capital expenditure
3. Analysis of working capital.
4. Analysis of outstanding debtors and creditors.
5. Statement showing actual profit against the standard profit
6. Cash flow statement and funds flow statement
7. Report on cost of operating and maintaining assets.
8. Report on funds required for expanding business.
9. Report on funds employed in the business.

d) Reports on cost :

1. Inventory reports.
2. Scrap and spoilage of materials.
3. Materials quality report.
4. Report on product cost estimate for price fixation and sending quotation.
5. Comparison of actual cost of materials with the budgeted cost of materials.
6. Report on carrying and ordering costs of materials.
7. Comparison of actual cost of labour with the budgeted cost of labour
8. Report on idle time cost under various causes.
9. Labour turnover statistics and costs.
10. Report on labour efficiency and productivity.
11. Report on idle capacity.
12. Report on steps taken to reduce the number of accidents
13. Comparison of actual overheads with the budgeted overheads.
14. Report on overheads recovered and under or over absorption of overheads.

15. Comparative income statement product wise
16. Report on research and development costs.
17. Comparison of actual costs and standard costs and analysis of reasons for the difference in two cost.

15.13 Frequency of Reporting :

Routine reports are rendered at periodic intervals. The intervals at which routine reports are to be presented should be fixed for each report. Production reports should be rendered at shorter intervals because delayed reporting on production may lead to a continuing loss for a longer period. Thus an effort should be made to take note of production losses as earlier as possible so that earlier corrective action may be taken to eliminate the losses.

Special Reports : Special reports are to be presented after making an investigation of the problem which requires to be investigated. The following matters may be covered by special reports.

1. Effect of idle capacity on cost of production of different products.
2. Make or buy decisions.
3. Whether to replace labour by machinery or not
4. Whether to explore the new market at a selling price which is below cost of production.
5. Whether to continue the selling of a product at a very low rate during depression.
6. Cost reduction schemes.
7. The most suitable method of raising funds.
8. The most suitable method of investing surplus cash.
9. Whether to purchase or hire fixed assets.
10. Research and development expenditure problems.
11. The effect of labour disputes on production and cost of production.
12. The effect of high rate of labour turnover.
13. Price fixation problems.
14. The effect of providing a particular facility to workers.
15. Feasibility study for a project.

16. Report on new taxation policy and its effect on company's profits.
17. Report on important developments in the industry.
18. Report on general economic forecasts..
19. Report on whether to operate a costing system or not.
20. Report on company's financial position and profitability.
21. Report on effect of change in Governement policy.

15.14 Specimens of Management Reporting

1. Comparative Statement of Management Ratios for the period ended

Ratio	Calculation	Unit	Actual	Budgeted	Variance (+) Or (-)
Return on capital employed	$\frac{\text{Net Profit to Sales}}{\text{Cap. Employed}}$	%			
Net Profit to sales	$\frac{\text{Net Profit to Sales}}{\text{Sales}}$	%			
Capital turnover	$\frac{\text{Sales}}{\text{Cap. Employed}}$	times			
Operating ratio	$\frac{\text{Operating Exp.}}{\text{Sales}}$	%			
Current ratio	$\frac{\text{Current Assets}}{\text{Current Liab.}}$	times			
Stock turnover	$\frac{\text{Cost of Sales}}{\text{Avg. Stock}}$	times			

2. SALES AND PROFIT STATEMENT FOR THE MONTH OF

To. Managing Director,

Area & Product	Budget			This Month			Cumulative			Variance
	Qty	Sales Amt.	Contribution Rs.	Qty	Sales Amt.	Contribution Rs	Qty.	Sales Amt.	Contribution Rs.	
North Zone :										
Product A										
Product B										
Product C										
Total										
South Zone :										
Product A										
Product B										
Product C										
Total										
Total										
Product A										
Product B										
Product C										
Grand Total										

Total Contribution :	Actual Rs	Budgeted Rs.....	Prepared by	Date.....	Copies ¹
Total fixed cost :	Actual Rs.....	Budgeted Rs.....	Checked by	Date.....	2
Profit earned before tax :	Actual Rs.....	Budgeted Rs.....			

2. To, Managing Director PRODUCTION AND COST STATEMENT FOR THE MONTH

	THIS MONTH				CUMULATIVE TILL DATES				
	Product A Qty. Produced	Product B Qty. Produced	Product cost	Product A Qty produced cost	Product B Qty produced cost	Total cost	Product A Qty produced cost	Product B Qty produced cost	Actual cost
	STD. Rs.	ACTUAL Rs.	STD Rs.	ACTUAL Rs.	STD Rs.	ACTUAL Rs.	STD Rs.	ACTUAL Rs.	STD Rs.
Direct material									
Direct labour									
overheads									
fixed									
variable									
Total									

VARIANCES :

Direct Materials	Rs.	Rs.	Overheads	Rs.
Price	----	----	Fixed	----
Usage	-----	-----	Variable	-----
Total	-----	-----		

Prepared by Date copies to 1

Checked by Date 2

15.13 Key words

Information : Data processed is evaluated for a specified purpose.

Report : Report is a document which carries the information.

Modes of Reporting : The various methods of reporting such as written reporting, Graphic reporting, oral reporting.

External Reports : meant for persons outside the business.

Internal Reports : Meant for different levels of Management

Special Reports : Meant to cover specific matters to be reported after a careful investigation of concerned problem.

15.16 Self - Assessment Questions / Exercises

1. What do you understand by Reporting to management ? What are the essential characteristics of a good report ?
2. What are the essential points kept in mind while preparing a report for the management ?
3. Describe the informational needs of different levels of management ?
4. Discuss various kinds of reports prepared by the management accounting and for different levels of management.
5. What are the objectives of reporting to management ? Suggest general principles to be born in mind when designing reports ?
6. A proper reporting system is essential for efficient management. Explain.
7. What are various kinds of reports ? Why are they generally prepare by a manufacturing enterprise for managerial control ? What are the characteristics of a good reporting system.
8. Explain the importance of proper system of reporting to the management. How the management accountant helps the management in this respect ?
9. The reports for the top management are broadly classified into two classes Routine and special. Mention three distinctive examples of each class briefly indicating the main points to be covered in each.
10. Reporting is one of the main duties of a management account art Discuss
11. Write a report covering any three aspects.

15.17 Further Readings.