

# **MANAGEMENT ACCOUNTING**

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# BASICS OF COST ACCOUNTING

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## 1.0 EVOLUTION OF COST ACCOUNTING, COST CONCEPTS AND COST CLASSIFICATION

### 1.1 INTRODUCTION

Traditionally, *cost accounting* is considered as the technique and process of ascertaining costs of a given thing. In sixties, the definition of cost accounting was modified as ‘the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and ascertainment of profitability of goods, or services’. It includes the presentation of information derived therefrom for the purpose of managerial decision making. It clearly emphasises the importance of cost accountancy achieved during the period by using cost concepts in more and more areas and helping management to arrive at good

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business decisions. Today, the scope of cost accounting has enlarged to such an extent that it now refers to the collection and providing all sorts of information that assists the executives in fulfilling the organisational goals. Modern cost accounting is being termed as management accounting, since managers being the primary user of accounting information are increasingly using the data provided by the accounts, setting objectives and controlling the operations of the business.

## **1.2 EVOLUTION OF COST ACCOUNTING**

*Accounting* is a very old profession. Financial accounting is in use with the dawn of civilisation. As soon as counting and arithmetic started, and the use of money replaced the barter system, the financial accounting emerged in some form or other. However, cost accounting is traceable to the earlier part of the seventeenth century. The earliest reference of cost accounting can be found in Robert Loder's farm accounts 1610–20. However, the industrial revolution in the 18th century brought about extensive mechanisation of production system resulting in large scale production. Some sporadic efforts were made in U.K. and U.S.A. to install factory cost systems as far back as 1805. But the concept of prime cost was used around 1875 by some industrialists. Between 1885 and 1901, a number of publications from London and New York explained the cost of manufacture, the distribution of establishment charges, the commercial organisation of the factories, factory accounts – their principles and practices, and finally a complete text book on Cost Accounting Theory and Practice was published by J.L. Nicholson from New York in 1913.

The cost accounting concepts advanced further with the beginning of the First World War. The 'cost plus' concept was introduced during the war time in order to avoid delay in executing urgent supplies. The contracts were entered on the basis that the supplier would be reimbursed the cost 'plus' a fixed percentage to cover administration and other overhead expenses and profit. Immediately, two things happened. One, a demand for qualified persons to calculate cost and two, deliberation of cost concepts for identifying the items or elements that enter the cost. The profession of cost accountancy got a real boost-up. More and more people got interested in the profession. In 1919, the Institute of Cost and Works Accountants was established in U.K., which is now known as the Chartered Institute of Management Accountants (CIMA) at London. Simultaneously, in U.S.A. the National Association of Cost Accountants, which is now known as the National Association of Accountants, was also established at New York. Under the leadership of these two institutes, the profession and the concepts of cost accounting developed significantly. Before the Second World War, the mechanism of standard cost accounting, budgetary control, flexible budgeting and direct costing became known in the U.S.A. and U.K.

In India, prior to independence, there were a few cost Accountants, and they were qualified mainly from I.C.M.A. (now CIMA) London. During the Second World War, the need for developing the profession in the country was felt, and the leadership of forming an Indian Institute was taken by some members of Defence Services employed at Kolkata. Costing profession was in an embryonic stage at that time. However, with the enactment of the Cost and Works Accountants of India Act, 1959, the Institute of Cost and Works Accountants of

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India was established at Kolkata. The Institute has grown in stature, having Fellow, Associate and Student Members. The Institute controls its function through its Head Office at Kolkata and four Regional Offices at Mumbai, Kolkata, Delhi and Chennai. Each of the Regional Offices has several chapter Offices to look after the interest of the local members and the profession.

The profession assumed further importance in 1968, when the Government of India introduced selective Cost Audit under Section 233-B of the Companies Act, 1956 and framed Cost Accounting Record Rules, 1968 for this purpose. Although Cost Audit is not compulsory, but selective for a few nominated industries yet the profession was greatly benefited, and more persons are now interested to join the profession. Today, the extensive use of cost accounting

techniques has led to new concept of information technology, operational control and performance measurement. The concepts of Activity Based Costing (ABC), strategic control systems, flexible production system etc. are key words for modern cost management.

### **1.3 FINANCIAL ACCOUNTING AND COST ACCOUNTING**

In financial accounts, the monetary transactions of the business are recorded, classified and analysed in an orderly manner, so as to prepare periodic results in the form of profit and loss account or income statement and balance sheet, indicating the financial position of the business

at the end of that period. The financial accounting is guided by various rules and regulations, some of which are mandatory. The system cannot normally deviate from the accepted accounting practices.

The object of financial accounting is to provide information mainly to outsiders such as shareholders, investors, government authorities, financial institutions, etc. The analysis and interpretation of financial data contained in the income statement and the balance sheet enable persons interested in the business to make meaningful judgement about the profitability, liquidity and solvency of the enterprise. Besides, income-tax, central excise, banks and insurance companies rely on the data contained in the financial statements. Cost accounting, on the other hand, deals with the ascertainment of the cost of product or service. It is a tool of management that provides detailed records and reports on the costs and expenses associated with the operations, mainly for internal control and decision making. Cost accounting basically relates

to the utilisation of resources, such as material, labour, machines, etc. and provides information like products cost, process cost, service or utility cost, inventory value, etc. so as to enable management taking important decisions like fixing price, choosing products, preparing quotations, releasing or withholding inventory, etc.

The objective of cost accounting is to provide information to internal managers for better planning and control of operations and taking timely decisions. In the early stages, cost accounting was considered as an extension of financial accounting. Cost records were maintained separately. Cost information and data were collected from financial books, since all monetary transactions are entered in the financial accounts only. After developing product cost or service cost and valuation of inventory, the costing profit and loss account is prepared. The profit and loss figures so derived by the two sets of books i.e. financial accounts and cost accounts, would have to be reconciled, since some of the income and expenditure recorded in

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financial books do not enter into product cost, while some of the expenses are included in cost accounts on notional basis i.e. without having incurred actual expense. However, a system of integrated account has been developed subsequently, wherein cost and financial accounts are integrated avoiding maintaining two sets of books. The basic difference between financial and cost accounting may be summarised as follows:

<i>Financial Accounting</i>	<i>Cost Accounting</i>
1. Accounting of monetary transactions of the business.	1. Accounting of product cost or service cost.
2. Consists of recording, classification and analysis of financial transactions.	2. Consists of developing product or service cost with elementwise cost breakdown.
3. Leads to preparation of income statement and balance sheet at periodic interval.	3. Leads to development of product or service cost, indicating profitability of each product or service as and when required.
4. Aims at external reporting to the shareholders, investors, Government authorities and other outside parties.	4. Aims at internal reporting both routine as well as special reporting to managers for internal control and decision making.
5. The accounting systems are mandatory and structured as per legal and other requirements.	5. The system is much less structured and is not mandatory, except those covered by cost audit required u/s 233-B of the Companies Act, 1956
6. Subject to verification by external auditor.	6. Cost audit is not compulsory but selective to some specific industries/products.

#### **1.4 MANAGEMENT ACCOUNTING**

Management accounting is not a specific system of accounts, but could be any form of accounting which enables a business to be conducted more effectively and efficiently. Management accounting in the words of Robert S. Kaplan, is a system that collects, classifies, summaries, analyses and reports information that will assist managers in their decision making and control activities. Unlike financial accounting, where the primary emphasis is on reporting outsiders, management accounting focuses on internal planning and control activities. Therefore management accounting requires the collection, analysis and interpretation not only financial or cost data, but also other data such as *sales*, price, product demands and measures of physical quantities and capacities. In the process, the system utilises all techniques of financial and cost accounting including marginal or direct costing, standard costing, budgetary control, etc. Management accounting therefore appears as the extension of the horizon of cost accounting towards newer areas of management.

Management accounting is largely concerned with providing economic information to managers for achieving organisational goals. The information flow system is, therefore, extremely important while designing the system. Managers at each level must have a clear understanding about the objectives and goals assigned and receiving flow of relevant information. It is important to note that overabundance of irrelevant information is as bad as lack of relevant information.

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## 1.5 FINANCIAL, COST AND MANAGEMENT ACCOUNTING

Having discussed the differences and similarities between the financial, cost and management accounting systems, we will now illustrate the difference with the help of an example :

**In Financial Accounts (in Rs. '000) :**

	<i>Current year</i>	<i>Previous year</i>
<b>Income :</b>		
Sales	1600	1200
Other income	15	9
	1615	1209
<b>Expenditure :</b>		
Opening stock of finished goods & work in progress	200	184
Add: Purchases/consumption of raw materials	880	760
	1080	944
Less : Closing stock of finished goods and work in progress	144	200
Cost of goods consumed/sold	936	744
Manufacturing expenses	124	115
Selling expenses	40	26
Salaries wages & other employee benefits	175	124
Interest on loan	9	8
Depreciation	21	19
Amortisation of preliminary expenses	10	8
TOTAL	1315	1044
Profit before tax	300	165

The statement reveals that the business has made comparatively higher profit than previous year through increased sales, lower material cost, controlled factory expenses, better inventory management, etc., but it does not reflect how the profit was earned, or what was the profitability of each of the products.

### In Cost Accounts

Cost accounting records reveal the following results:

**Productwise profit statement (Rs. '000)**

<i>Cost elements</i>	<i>Product X</i>	<i>Product Y</i>	<i>Product Z</i>	<i>Total</i>
Direct material	400	276	260	936
Direct wages	50	40	30	120
Direct expense	10	4	6	20
PRIME COST	460	320	236	1076
Applied overheads:				
Factory, admn., selling & distrn.	93	73	54	220
COST OF SALES	553	393	350	1296
PROFIT/ (LOSS)	147	207	(50)	304
SALES	700	600	300	1600

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The profit statement above leads to further analysis of product costs to find out what went wrong with product Z? Should it be discontinued? If so, what would be the effect on profit? Obviously, the answers cannot be obtained straightaway from the above statement. In fact, some further details will be required to find out the extent of variable expenses included in the applied overheads, so that all expenses can be classified under product costs, which are variable with the increase or reduction of unit-product and period costs which are fixed overhead expenses and remain unaffected with change in volume during the period. This technique of marginal cost system is applied and the profit statement reveals the following position :

<i>COST ELEMENTS</i>	<i>PRODUCT X</i>	<i>PRODUCT Y</i>	<i>PRODUCT Z</i>	<i>TOTAL</i>
	<i>Rs. '000</i>	<i>Rs. '000</i>	<i>Rs. '000</i>	<i>Rs. '000</i>
SALES (A)	700	600	300	1600
Less: Direct cost of sales :				
Material	400	276	260	936
Labour	50	40	30	120
Expenses	30	14	8	52
TOTAL (B)	480	330	298	1108
CONTRIBUTION (A – B.)	220	270	2	492
Less: Fixed overheads				188
PROFIT				304

The above statement indicates the relative profitability of the three products and also establishes the fact that the product Z just recovers its direct cost of sales. Investigation shall immediately start to find out whether — (a) material cost is too high, or (b) there is generation of excessive scrap and defective, or (c) the selling price is too low.

When such questions are raised, the dividing line between cost accounting and management accounting vanishes.

With a view to increase overall efficiency and profit improvement, the management accountant will have to collect various data for analysing other norms to judge efficient use of resources. For example, he may find out that there is more stress on product Y than product X while establishing costly materials used in the products fearing drop in sales. A value engineering exercise on the usage of materials for Product X may reveal the scope for further substitution without impairing quality. A 15% drop in material cost i.e. 15% of Rs. 400, will increase the profit by Rs. 60 i.e. by 8.6%. Now, this exercise can be done by the cost accountant or management accountant with the assistance of marketing, industrial engineering, production, purchasing and materials management departments. Can you, therefore, make any line of demarcation between cost and management accounting today?

## 1.6 COST CONCEPT AND COST OBJECT

The dictionary meaning of cost is “a loss or sacrifice”, or “an amount paid or required in payment for a purchase or for the production or upkeep of something, often measured in terms of effort or time expended”. *CIMA Terminology* defines cost as ‘resources sacrificed or forgone to achieve a specific objective’. Cost is generally measured in monetary terms.

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Cost is the amount of expenditure (actual or notional) incurred on or attributable to, a specified thing or activity. Thus, material cost of a product will mean the expenses incurred in procuring, storing and using materials in the product. Similarly, labour cost will represent that part of payment made to the workmen for time spent on the product during its manufacture.

Again, the term 'cost' can hardly be meaningful without using a suffix or a prefix. The cost is always ascertained with reference to some object, such as, material, labour, direct, indirect, fixed, variable, job, process, etc. Thus, each suffix or prefix implies certain attribute which will explain its nature and limitations.

Cost object is defined by Charles T. Horngren as 'any activity for which a separate measurement of cost is desired'. It may be an activity, or operation in which resources, like materials, labour, etc. are consumed. The cost object may be a product or service, a project or a department, or even a program like eradication of illiteracy. Again, the same cost may pertain to more than one cost objects simultaneously. For example, material cost may be a part of product cost as well as production department cost.

## **1.7 COST MANAGEMENT**

The techniques and process of ascertaining cost involve three steps, viz.

- (i) Collection of expenditure or cost data,
- (ii) Classification of expenditure as per cost elements, function, etc. and
- (iii) Allocation and apportionment of expenditure to the cost centres and cost units.

The system accumulates and classifies expenditure according to the elements of costs, and then, the accumulated expenditure is allocated and apportioned to cost objects i.e. cost centres and cost units. We should, therefore, know what are cost elements, cost centres and cost units.

### **Elements of Cost**

For the purpose of identification, accounting and control, breakup of cost into its elements is essential. Elements are related to the process of manufacture i.e. the conversion of raw materials into finished products. Costs are normally broken down into three basic elements, namely, material, labour and expense. Material cost includes all materials consumed in the process of manufacture up to the primary packing. Labour cost includes all remuneration paid to the staff and workmen for conversion of raw materials into finished products. Expenses consist of the cost of utilities and services used for the conversion process including notional cost for the use of owned assets.

Each of the cost elements can be further divided into direct and indirect cost. Direct costs are those which can be identified with or related to the product or services, so much so that an increase or decrease of an unit of product or service will affect the cost proportionately. Indirect cost, on the other hand, cannot be identified or traced to a given cost object in economical way and are related to the expenses incurred for maintaining facilities for such production or services. Thus, the elements of cost may be summarised as follows – (a) Direct materials and indirect materials, (b) Direct wages and indirect wages, (c) Direct expense and indirect expense

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The aggregate of direct materials cost, direct wages and direct expense is called **Prime cost**, while indirect materials cost, indirect wages and indirect expenses are collectively called **overhead** cost.

Overheads are classified into production overheads i.e. indirect costs relating to manufacturing activities, administration overheads i.e. costs relating to formulating the policy, directing the organisation and controlling operations and selling and distribution overheads i.e. indirect costs relating to the activity of creating and stimulating demand and securing orders as well as operations relating to distribution of goods from factory warehouse to customers. Factory cost, cost of production and cost of sales are arrived at by adding respective overheads to prime cost, factory cost and cost of production as indicated in the chart below :-

	<i>Rs.</i>
Direct materials cost	x
Direct wages	x
Direct expenses	x
PRIME COST	
Factory overhead	x
FACTORY COST	x
Administration overhead	x
COST OF PRODUCTION	x
Selling and distribution overhead	x
COST OF SALES	x

### **Allocated and Apportioned Cost**

*Cost allocation* is the allotment of the whole items of costs to cost centres or cost units. *Cost apportionment* refers to the allotment of proportions of item of cost to cost centres or cost units. A cost which is allocated to a cost centre is a direct cost of that cost centre, whereas the cost which is apportioned to different cost centres on suitable basis is an indirect cost of that cost centre. Thus, direct costs are allocated, since they can be directly identified with a cost centre or cost unit, and indirect costs are apportioned expenditure. The concept of direct and indirect cost is very important for costing purposes.

### **Cost Centre**

*Cost centre* is defined as a location, person or item of equipment (or group of them) in respect of which costs may be ascertained and related to cost units for the purposes of cost control. It is the smallest segment of activity or area of responsibility for which costs are accumulated. Thus cost centres can be of two kinds, viz.

- (a) **Impersonal cost centre** consisting of a location or item of equipment (or group of these) such as machine shop, and
- (b) **Personal cost centre** consisting of a person or a group of persons such as factory manager, sales manager, etc.

Cost centres are also classified in manufacturing concerns into production and service cost centres. Production cost centres relate to those centres where production or manufacturing

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activities take place. Service cost centres are those, which are ancillary and render services to the production cost centres, so that manufacturing activities can take place. In a biscuit manufacturing company, making, baking and packing are production cost centres while personnel, purchase, stores, canteen, accounts are service cost centres.

The main purpose of cost centre is two fold :-

- (i) *Recovery of cost:* Costs are collected, classified and accumulated in respect of a location, person or an item of equipment and then the costs are distributed over the products for recovery of incurred cost, and
- (ii) *Cost control:* Cost centres assist in making a person responsible for the control of expenditure incurred by the cost centre. Manager of each cost centre shall control costs incurred in his area of responsibility.

The size of the cost centre depends on the activity and operation, and feasibility of cost control. Sub-cost centres are created if the size of the cost centres become too big from control point of view.

### **Cost Unit**

While cost centres assist in ascertaining costs by location, person, equipment, operation or process, *cost unit* is a unit of product, service or a combination of them in relation to which costs are ascertained or expressed.

The selection of suitable cost unit depends upon several factors, such as, nature of business, process of information, requirements of costing system, etc. but usually relates to the natural unit of the product or service. For example, in steel and cement industry, the cost unit is 'tonne', while in transportation services, the unit may be passenger-kilometre or tonne-km, etc. It may be noted that while the former is a single cost unit, the latter is a composite unit, i.e. a combination of two units. A few examples of cost units are given below :-

<i>Industry or product</i>	<i>Cost unit</i>
Automobile	Number
Biscuit	Kilogram
Bread	Thousand loaves
Breweries	Barrel
Bricks	Thousand bricks
Cigarettes	Thousand cigarettes
Chemical	Litre, gallon, kilogram
Coal, cement	Tonne
Cotton textile	K.G. of yarn or metre of cloth
Gas	Cubic foot or cubic metre
Hospital	Patient day
Hotel	Guest-day, guest room, etc.
Power and electricity	Kilowatt-hour
Steel	Tonne
Transport	Passenger kilometre, Tonne-kilometre

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## 1.8 COST CLASSIFICATION

*Cost classification* refers to the process of grouping costs according to their common characteristics, such as nature of expense, function, variability, controllability and normality. Cost classification can be done on the basis of time, their relation with the product and accounting period. Cost classification is also made for planning and control and decision making. Thus, classification is essential for identifying costs with cost centres or cost units for the purpose of determination and control of cost :

- (a) **By nature of expenses:** Costs can be classified into material, labour and expenses as explained earlier.
- (b) **By function:** Costs are classified, as explained earlier, into production or manufacturing cost, administration cost, selling and distribution cost, research and development cost.
  - Production cost begins with the process of supplying material labour and services and ends with primary packing of the finished product.
  - Administration cost is the aggregate of the costs of formulating the policy, directing the organisation and controlling the operations of an undertaking, which is not related directly to production, selling, distribution, research and development activity or function.
  - Selling cost refers to the expenditure incurred in promoting sales and retaining customers.
  - Distribution cost begins with the process of making the packed product available for despatch and ends with making the reconditioned returned empty package available for reuse.
  - Research and development cost relates to the costs of researching for new or improved products, new application of materials, or new or improved methods, processes, system or services, and also the cost of implementation of the decision including the commencement of commercial production of that product or by that process or method.
  - Pre-production cost refers to the part of development cost incurred in making trial production run preliminary to formal production, either in a new or a running factory. In a running factory, this cost often represents research and development cost also. Pre-production costs are normally considered as deferred revenue expenditure and are charged to the cost of future production.
- (c) **By variability:** Costs are classified into fixed, variable and semi-fixed / semi-variable costs according to their tendency to vary with the volume of output.
  - **Fixed costs** tend to remain unaffected by the variation or change in the volume of output, such as supervisory salary, rent, taxes, etc.
  - **Variable costs** tend to vary directly with volume of output, such as direct material, direct labour and direct expense.
  - **Semi-fixed/semi-variable cost** is partly fixed and partly variable, such as telephone expense, electricity charges, etc.

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- (d) **By controllability:** Costs can be classified under controllable cost and uncontrollable cost.
- Controllable cost can be influenced by the action of a specified member of an undertaking.
  - Uncontrollable cost cannot be influenced by the action of a specified member of an undertaking.
- (e) **By normality :** Costs can be divided into normal cost and abnormal cost.
- Normal cost refers to the cost, at a given level of output in the conditions in which that level of output is normally attained.
  - Abnormal cost is a cost which is not normally incurred at a given level of output in the conditions in which that level of output is normally attained.
- (f) **On the basis of time :** Costs, may be classified into historical or actual cost and predetermined or future cost.
- Historical cost relates to the usual method of determining actual cost of operation based on actual expenses incurred during the period. Such evaluation of costs takes longer time, till the accounts are closed and finalised, and figures are ready for use in cost calculations.
  - Predetermined cost as the name signifies is prepared in advance before the actual operation starts on the basis of specifications and historical cost data of the earlier period and all factors affecting cost. Predetermined cost is the cost determined in advance and may be either estimated or standard.
  - Estimated cost is prepared before accepting an order for submitting price quotation. It is also used for comparing actual performance.
  - Standard cost is scientifically predetermined cost of a product or service applicable during a specific period of immediate future under current or anticipated operating conditions. The method consists of setting standards for each elements of cost, comparing actual cost incurred with the standard cost, evaluating the variance from standard cost and finding reasons for such variance, so that remedial steps can be taken promptly to check inefficient performances.
- (9) **In relation to the product :** Costs may be classified into direct and indirect costs.
- Direct costs are those which are incurred for a particular cost unit and can be conveniently linked with that cost unit. Direct costs are termed as product cost.
  - Indirect costs are those which are incurred for a number of cost units and also include costs which though incurred for a particular cost unit are not linked with the cost unit. Since such costs are incurred over a period and the benefit is mostly derived within the same period, they are called period costs.
- (h) **Cost analysis for decision making:** Here costs are classified under relevant costs (e.g. marginal cost, additional fixed cost, incremental cost, opportunity cost) and irrelevant costs (e.g. sunk cost, committed costs, etc.) **(For detail refer Cost Accounting Methods and Problems by B. K. Bhar Chapter 1 and Chapter 20 Para 20.3)**

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## 1.9 METHODS OF COSTING

Various methods of ascertaining costs are available to suit the business need. But the basic principles are the same in every method. The choice of a particular method of costing depends on the nature of business of the concern.

There are two basic methods of costing viz. – (a) Specific order or job costing (b) Continuous operation or process costing

All other methods are either variation of job or process costing or are just techniques used for particular purpose under specific conditions. Brief description of each of the methods are as follows:

### Job Costing

Job costing is the basic costing method applicable to those industries where the work consist of separate contracts, jobs, or batches, each of which is authorised by a specific order or contract. The most important feature is that each job or order can be identified at each stage of production and therefore, costs which can be directly identified with a job or order is charged to that job or order. A share of indirect expenses is also charged to the same. Variation of job costing are contracts costing and batch costing.

- *Contract costing* is the form of specific order costing, generally applicable where work is undertaken to customer's special requirements and each order is of long duration, such as building construction, ship building, structurals for bridge, civil construction, etc. The work is usually done outside the factory.
- *Batch costing* is that form of specific order costing which applies where similar articles are manufactured in batches either for sale or for use within the undertaking. Costs are collected according to batch order number and total costs are divided by total numbers in a batch to arrive at unit cost of each job. The method is applicable in aircraft, toy making, printing industries, etc.

### Operation Costing - Process and Services

Process costing method is applicable where goods or services result from a sequence of continuous or repetitive operations or processes and products are identical and cannot be segregated. Costs are charged to processes and averaged over the units produced during the period. Examples are food processing, chemical, dairies, paints, flour, biscuit making, etc. Variations of process costing are found in single or output costing, operation costing, departmental costing as explained below:

- Single or output costing is used when the production is uniform and identical and a single article is produced. The total production cost is divided by the number of units produced to get unit or output cost. Examples are mining, breweries, brick making, etc.
- Operation costing refers to the methods where each operation in each stage of production or process is separately costed. Thereafter, the cost of finished unit is determined. This is suitable to industries dealing with mass production of repetitive nature — for example, motor cars, cycles, toys, etc.

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- Departmental costing refers to the method of ascertaining the cost of operating a department or cost centre. Total cost of each department is ascertained and divided by total units produced in that department to arrive at unit cost. If one product passes through a number of departments for completion, cost of each department will be picked up and the total unit cost will be the aggregate of unit cost of the departments through which the product passes.

### **Service or Operating Costing**

**Operating costing** is applicable to service organisation that do not make or sell tangible goods but render services. Examples are transportation companies, hotels, hospitals, schools, electric and gas generation and distribution, etc. Cost of providing and operating a service is ascertained and unit cost is found out by dividing total cost of units of services rendered. Composite units, such as tonne-mile, passenger-kilometre, KWH, etc. are generally used.

**Composite or multiple costing:** The manufacture of certain products involve a lot of complexities and therefore, any one of the basic methods of job or process costing cannot be used for collecting and presenting product cost. In fact, industries making complex products such as cycles, automobiles, aeroplanes, radios, etc. use combination of various costing methods and the methods are known as composite or multiple costing.

#### **1.10 TECHNIQUES OF COSTING**

In each of the costing methods, various techniques may be used to ascertain cost, depending on the management requirement. These techniques may be grouped as follows :

- A. **Absorption costing :** It refers to the ascertainment of costs after they have been actually incurred. As per this system, fixed as well as variable costs are allotted to cost units and total overheads are absorbed by actual activity level. Absorption costing is termed as total costing, since total costs are ultimately allotted to cost units. It is also termed as historical or traditional costing. However, since costs are ascertained after they have been incurred, and substantial time-gap exists between occurrence of expenditure and reporting off cost information, it does not help to exercise cost control.
- B. **Marginal costing :** It refers to a principle whereby variable costs are charged to cost units and the fixed costs attributable to the relevant period is written off in full against the contribution for that period. Contribution is the difference between sales and variable or marginal cost of sales. Marginal costing is also known as direct or variable costing. It is a valuable aid to management in taking important policy decisions, such as product pricing, choosing product mix, decision to make or to buy, etc.
- C. **Standard costing:** It refers to the technique which uses standards for costs and revenues for the purpose of control through variance analysis. Standards are established for each cost element on a scientific basis for immediate future period, and actuals are compared against the standard. Variances from standards are analysed, reasons established and corrective action taken to stop recurrence of inefficient operation. Thus, standard costing is extremely helpful for cost control. Standard costing is normally used along

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with budgetary control, which refers to the establishment of budgets relating to responsibilities of executive to the requirements of a policy and the continuous comparison of actual with budgeted results, either to secure by individual action the objective of that policy or to provide a basis for its revision .

Absorption costing system and marginal or direct costing system can be used in conjunction with standard costing system.

- D. **Differential costing:** It is defined as a technique used in the preparation of adhoc information in which only costs and income differences between alternative courses of action are taken into consideration. It considers only the additional costs and additional revenues arising out of the decision regarding addition of a project. Similarly, incremental costing technique considers incremental costs and incremental revenue arising out of a decision to change the level of nature of activity.
- E. **Uniform costing:** It refers to the use by several undertakings of the same costing system i.e. the same basic methods, principles and techniques. This is not a distinct method of costing. The system is applied by a number of units of the same undertaking or several undertakings within the same industry with a view to promote operating efficiency by comparing inter-unit or interfirm performance data. Trade associations and multinational companies often use this system.

### 1.11 SPECIFIC COST SYSTEMS

Having discussed the basic methods and techniques of cost, let us look into the other specific types of cost systems developed on the principle of different cost for different purposes. As the word “cost” can rarely stand alone, every prefix or suffix changes its connotation. Some of the frequently used terms not explained earlier are briefly mentioned as follows

- A. **Opportunity cost :** It is the value of a benefit sacrificed in favour of an alternative course of action. It is the measurable advantage foregone as a result of the rejection of best alternative uses of resources, whether of materials, labour or facilities. This cost does not involve any cash outlay and is computed only for the purpose of comparison in the context of managerial decisions. The concept recognises that resources are scarce and have alternative uses.
- B. **Imputed or Notional cost :** It is a hypothetical cost taken into account in a particular situation to represent a benefit enjoyed by an entity in respect of which no actual expense is incurred. For example, interest on own capital, rent on own premises, etc. are not included in financial accounts, but for determining comparative cost may be included in costs.
- C. **Out of Pocket cost :** It is just the opposite of imputed cost. This is that portion of cost which represents actual cash outlay. Out-of-pocket cost is very much relevant in price fixation during trade depression or when a make or buy decision is to be made.
- D. **Sunk cost :** It represents historical costs, incurred in the past and is irrevocable in a given situation. Hence, a sunk cost is not relevant to current decision making. Generally the book value of an asset is treated as sunk cost, while considering the replacement of the asset.

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- E. Relevant cost :** Costs that are affected by decisions are relevant costs. These are expected future costs, that will differ between alternatives. Future variable costs generally become relevant for decision making, while fixed costs may be irrelevant, if they do not change in total. In the same way if an item of future cost remains same for two or more alternatives, it becomes irrelevant for the decision making.
- F. Replacement cost :** It is the current market cost of replacing an asset or a material.
- G. Policy cost :** Costs incurred as a result of particular policy decision are policy costs. For example, ownership of assets will create a charge for depreciation. Hiring a new office will create a charge for rent. Such depreciation and rent will be policy costs. Policy costs are fixed or period costs.
- H. Discretionary cost :** Discretionary costs are those which arise from yearly budget appropriation and reflect management policy, having no direct input output relationship between their costs and activity volume. Example are training expenses, advertisement, Employee welfare expense. This is also termed as managed or programmed cost.
- I. Engineered cost :** It refers to any cost that has an explicit and specified physical relationship with the selected measure of activity. Such a relationship is established either through engineering analysis or analysis of past data. Examples are direct material, direct labour.
- J. Avoidable cost :** Costs that are specifically incurred of an activity or sector of a business and can be identified with the activity and such costs would be avoided, if the activity or the sector of the business does not exist are avoidable costs. For example, the cost of a machine hired specially to make a particular product will be avoided by discontinuing production of that product, and therefore, is an avoidable cost.
- K. Unavoidable cost :** Common costs apportioned to a particular activity or a segment of a business are usually unavoidable cost, because total common costs cannot be avoided or even reduced even if that activity or sector does not exist. For example, rent of factory premises apportioned to various activities is unavoidable cost for a particular activity, say machine shop, because a decision to discontinue the machine shop will not help reducing rent of the factory.
- L. Common cost :** These are costs which are incurred collectively for a number of cost centres and are required to be suitably apportioned for determining the cost of individual cost centres. For example, rent of the factory premises may be apportioned over production and service cost centres on the basis of area.
- M. Traceable cost :** This is cost which is easily identifiable with a department process or product. This is just the opposite of common cost.
- N. Joint cost :** Joint cost is the cost incurred up to the split off point between individual joint products arising out of a production process. When joint products and/ or by products are processed from the same material and common conversion costs are incurred for these products, the main problem is to apportion joint costs incurred up to the split off point to joint products.

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- O. Step cost :** Step costs are those costs which increase in steps. These costs remain constant over small ranges of output but the cost increases by discrete amounts as activity moves from one range to the next. For example, supervisory expenses, light and heating, etc. will increase when a second shift is started to cope up with additional orders.

### 1.12 COST DEPARTMENT AND ITS RELATIONSHIP WITH OTHER DEPARTMENTS

In the organisation chart, the cost department occupies a very important position. The cost department is responsible

- (a) for keeping records connected with material, labour and expenses,
- (b) for analysing all costs of manufacturing, marketing and administration, and
- (c) for issuing control reports and data for decision making to the executives, department heads, section heads and foremen. When management is provided with useful reports, they assist in controlling and improving cost and operations. Such information data are, again, used for making new decisions.

The effectiveness of the control of cost depends upon proper communication through control reports from the cost accountant to the various levels of operating management. Accounting and control reports are directed to these levels of management, i.e. top management, middle management and lower level or shop floor level of management. Each management level requires data for deciding and solving various problems. The cost accountant must devise a cost system into which data are marshalled to fit the numerous problems confronting management. Therefore, the chart of accounts, which is the accountant's means of classifying costs and expenses must be closely associated with the organisation chart showing principal management position with the line of delegation of authority, responsibility and accountability. Thus, an organisation chart is essential to the development of a cost system.

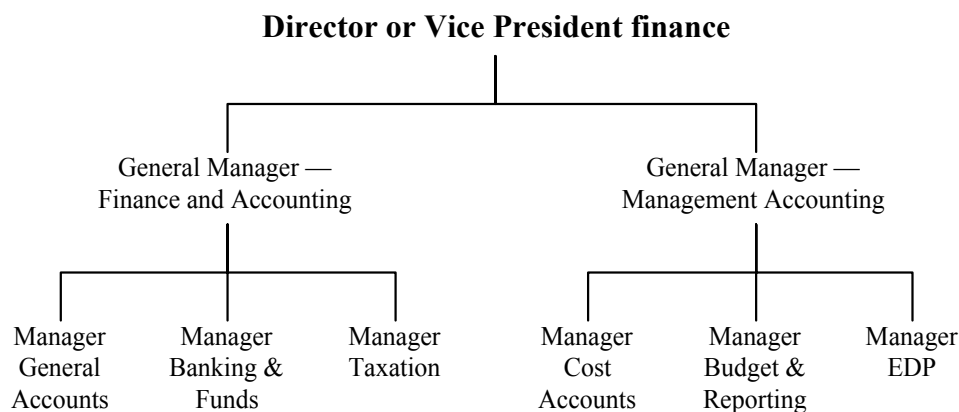
Analysis of costs and preparation of reports are greatly facilitated by proper division of functions generally listed under cost department. Proper coordination is also necessary with other functions closely allied with cost accounting, such as budget and data processing. These functions should come under the supervision of the finance chief unless they report to the chief of operation directly for other reasons.

The cost department is intimately connected with the other departments in the organisation. Their relationship can be briefly established as follows :–

- A. **Manufacturing departments** control the scheduling, manufacturing and inspection of each job or processed products to their finished stage in terms of efficiency norms established. Costs incurred at each stage are measured and compared with the norms.
- B. **Production planning, research and design department** involve cost department for cost estimates needed for each type of material, labour and machine process before a decision can be reached in accepting or rejecting a design.
- C. **Personnel department** is interested in maintaining employee cost up-to-date. The wage rate and methods of remuneration agreed with the employees form the basis for computing payroll. Cost department provides all data.

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- D. **Marketing department** needs a good product at a competitive price. While cost cannot determine price, it can influence fixation of price. Besides, accurate cost data help sales manager distinguish profitable with nonprofitable products and compare cost of marketing against sales volume.
- E. **Public relation department** establishes good relations with the public in general and customers, creditors, shareholders, and employees in particular. The cost department provides information concerning price, cost, etc.
- F. **Legal department** finds cost department helpful in keeping many affairs of the company in conformity with the law, specially excise, customs, sales tax and other legislation regarding maintenance of accounts and cost records.
- G. **The finance department** relies on the cost department for accounting, valuation of inventory, cash flow statements, C.A.S. data for banks, etc. Where finance department is composed of general accounting and cost accounting, besides taxation and funds management departments, it is usual to consider cost accounting department providing unit cost of goods manufactured and sold to general accounting department. The organisation chart of a finance department usually takes the following form.



### 1.13 INSTALLATION OF COSTING SYSTEM

Having established the need for a cost department in an organisation, let us find out the method of installation of a cost system. Obviously, it will depend on the objectives of costing, the nature of business and information flow system.

The system will be simple, if object is simple like only price fixing. It aims at controlling cost and measuring efficiency of operations, the requirements will be different. If it is installed as per legal requirement, then it must satisfy the legal needs. The nature of the business will again indicate the degree of complexity of the system. The information flow will depend on the levels of management, who will receive information and the periodicity of reporting required.

In most industries products, cost accounting record rules as prescribed by the Government are to be maintained. In such cases care must be taken so that prescribed proforma can be filled in from the cost records/books of accounts so maintained.

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It is evident that installing a good cost system is quite a challenging task. The three fundamental requirements are as follows :-

- (i) Organisation chart – showing the lines of authority and delegation of responsibility.
- (ii) Departmentalisation – dividing the organisation into production and service cost centres, to which expenses are charged.
- (iii) Chart of accounts – showing control accounts for the elements of cost as well as expense items, so as to enable collection and classification of costs both expensewise and cost centrewise.

The system requires total involvement by all the beneficiaries i.e. sales, production, engineering, purchase, personnel, quality control departments. The success of the system will finally depend on the top management which must extend full support to the system.

In actual handling of the installation work, the following technical aspects are to be carefully considered.

- to study the existing organisation chart and layout of the factory.
- to follow the production process right from the production planning, purchase and storage of materials, issues of materials to production, production process from initial till primary and secondary packing and loading on transport for distribution.
- to examine documents and reports prepared and issued by each department, including records maintained for returns furnished with the Government and outsiders.
- to interact with various levels of management to find out their expectations of the system.

Finally, the system has to be developed keeping the following factors in view :

- The system should be simple and easy to operate. Complexity should be avoided.
- The system should give accurate, timely and adequate information.
- The system should be elastic and capable of adopting to changed situation.
- The system should be cost-effective. It should yield a much higher return on capital invested in installing and running the department.

**NOTE:** Students are advised to study up to this portion 3 times, and then attempt Test Questions. Also refer **Chapter 1 of Cost Accounting Methods and Problems** by **B. K. Bhar**.

## ◆ SPECIMEN QUESTIONS WITH ANSWERS — 1

**Question 1:** A company manufactures and retails clothing.

You are required to group the costs which are listed below and numbered 1 to 20 into the following classifications (each cost is intended to belong to only one classification).

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(i) Direct materials, (ii) Direct labour, (iii) Direct expenses, (iv) Indirect production overhead, (v) Research and development costs, (vi) Selling and distribution costs, (vii) Administration costs, (viii) Finance costs

1. Lubricant for sewing machines
2. Floppy disks for general office computer
3. Maintenance contract for general office photocopying machine
4. Telephone rental plus metered calls
5. Interest on bank overdraft
6. Performing rights society charge for music broadcast throughout the factory
7. Market research undertaken prior to a new product launch
8. Wages of security guards for factory.
9. Carriage on purchases of basic raw material.
10. Royalty payable on number of units of product XY produced.
11. Road fund licences for delivery vehicles
12. Parcels sent to customers.
13. Cost of advertising products on television
14. Audit fees
15. Chief accountant's salary
16. Wages of operatives in the cutting department
17. Cost of painting advertising slogans on delivery vans
18. Wages of storekeepers in materials store
19. Wages of fork lift truck drivers who handle raw materials
20. Developing a new product in the laboratory

**Answer :**

(i) Direct materials	9
(ii) Direct labour	16
(iii) Direct expenses	10
(iv) Indirect production overhead	1,6,8,18,19
(v) Research and development costs	20
(vi) Selling and distribution costs	7, 11, 12, 13, 17
(vii) Administration costs	2, 3, 4, 14, 15
(viii) Finance costs	5

**Question 2 :** “Cost accounting provides financial statements for managers within the business whereas financial accounting is intended for external users.”

Comment on this statement, with particular reference to the different information needs of managers and of shareholders of large public limited companies.

**Answer :** In relation to most modern businesses the statement is slightly flawed in the sort that a single integrated system of accounting is used to provide information both for management purposes and for external parties. The real contrast is in the nature of the information that is reported to each of these groups. Management have the responsibility of planning and controlling the resources of a business. To do this they need detailed information about the operations of

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the business to form a basis for managerial action and decision making. The concern of a 'cost' accountant is therefore to present information in whatever form best enables managers to perform their function.

Shareholders are interested primarily in whether their investment in the company is secure, and also (depending upon their needs) whether it is likely to provide the required income in the form of dividends and/or show an acceptable level of growth in the future (and hence an increasing share price). Financial accounting is intended to satisfy each of these needs and is governed by stringent standards and legal requirements to ensure that shareholders are given adequate information to make judgements on these matters.

Shareholders are frequently interested in comparing current results with information about previous years and hence consistency from year to year is an important consideration. Managers are concerned with the future and so are interested in reviewing current results and forecast information.

Shareholders also need to be able to compare the results with those of other companies, not least because of a desire to diversify their investments. They therefore need information in a standard form which facilitates comparison of widely different types of companies, for example a 'safe bet', like Marks and Spencer, with a high risk prospect, like a newly established information technology business. Managers, on the other hand, would be more interested in comparing the results of organisations that operated in the same line of business and would ideally like far more detailed operational information than is available from financial accounts.

## ◆ TEST YOURSELF

### I. Objective Type Questions

1. Which of the following statements are true?
  - (a) Cost accounting can be used only in manufacturing organisation.
  - (b) Financial accounting is concerned with external reporting.
  - (c) Cost accounting is a branch of financial accounting.
  - (d) Cost accounting is not necessary for a non-profit making service organisation.
  - (e) Prosperous and profit making concerns do not need costing system.
  - (f) Costing techniques refer to those used for analysis and interpretation of cost data.
  - (g) All costs are controllable.
  - (h) Direct costs are those which are identified with a particular cost centre or cost unit.
  - (i) Notional costs are not included for ascertaining costs.
  - (j) Prime cost is the total of direct material, direct labour and production expenses.
  - (k) Fixed costs per unit remains fixed.

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- (l) Multiple costing means a combination of two or more methods.  
 (m) Transactions of purely financial nature are excluded from cost accounts.  
 (n) Contribution margin is the difference between sales and cost of sales.
2. Fill in the blanks :
- (a) One of the function of cost accounting is proper matching of \_\_\_\_\_ with revenues.  
 (b) The emphasis of cost accounting is on \_\_\_\_\_.  
 (c) \_\_\_\_\_ accounting refers to the information system which provides information to managers to assist them in fulfilling organisation objectives.  
 (d) Basic methods of costing are job costing and \_\_\_\_\_ costing..  
 (e) Basic principles of costing are \_\_\_\_\_ costing and marginal costing.  
 (f) Conversion cost plus direct material is cost.\_\_\_\_\_.  
 (g) Cost of sales is factory cost plus \_\_\_\_\_ and \_\_\_\_\_ cost.  
 (h) \_\_\_\_\_ costs are charged directly to costing profit and loss account.  
 (i) On the basis of behaviour of cost, overheads are classified into \_\_\_\_\_ & \_\_\_\_\_.  
 (j) \_\_\_\_\_ costs are hypothetical or notional cost.  
 (k) The ascertainment of costs after they have been incurred is known as \_\_\_\_\_ cost.  
 (l) \_\_\_\_\_ is the difference between sales and variable cost of sales.
3. Pick up which ones are cost centre and which ones are cost unit :-
- |                  |             |                  |
|------------------|-------------|------------------|
| (a) Passenger-km | (b) Canteen | (c) Machine shop |
| (d) Tonne        | (e) Lathe   | (f) Salesman     |
| (g) Delivery Van | (h) Litre.  |                  |
4. Given below are three lists of industries, costing methods, and cost unit. Mention the method of costing and cost units applicable against each of the industries :-
- | <i>Industry</i>     | <i>Method</i> | <i>Cost unit</i>   |
|---------------------|---------------|--------------------|
| (i) Advertising     | A. Job        | a) Piece           |
| (ii) Building       | B. Process    | b) Kilogramme      |
| (iii) Biscuit       | C. Operating  | c) Tonne           |
| (iv) Cycle          | D. Multiple   | d) Tonne-kilometre |
| (v) Hospital        | E. Contract   | e) Bed-week        |
| (vi) Road transport | F. Output     | f) Each Job        |
| (vii) Cigarette     |               | g) Each contract   |
| (viii) Motor car    |               |                    |
| (ix) Coal           |               |                    |
5. Select the most suitable answer in each of the following multiple choice questions :-
- (A) The main purpose of cost accounting is to
- (a) Maximise profits.  
 (b) Provide information to management for decision making.  
 (c) Help in fixing selling price.

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- (B) Direct material is a
- (a) Fixed cost
  - (b) Variable cost
  - (c) Semi-variable cost.
- (C) Conversion cost is total of
- (a) Direct material and direct wages.
  - (b) Direct material, direct wages and production overheads.
  - (c) Direct wages and production overheads.
- (D) A cost which does not involve cash outlay is Called
- (a) Historical cost
  - (b) Imputed cost and
  - (c) Out of pocket cost.
- (E) Committed fixed costs are those which
- (a) Arise from yearly budget appropriations.
  - (b) Are incurred because management can afford.
  - (c) Arise from additional capacity.

## II. Descriptive Questions

1. “Cost accounting is an essential tool of management”. Give your comments on the statement.
2. What are the basic objectives of cost accounting ? In which way it differs from financial accounting ?
3. Can a functional relationship be established between cost accounting and management accounting ? State some of the objectives of management accounting ?
4. What are the functions and characteristics of a good costing system ?
5. Write notes on the following methods, indicating the type of organisation where the same are applicable :-
  - (a) Output costing,
  - (b) Multiple costing
  - (c) Operating costing, and
  - (d) Process costing.
6. Distinguish between absorption costing and marginal costing system. Can standard cost be applicable to either of the systems ?
7. You have joined as a cost accountant in an industry where there is no costing system. Discuss the various steps you will take to install the system.
8. What is a cost centre ? Explain the types of cost centres and the purpose they serve ?
9. “Overheads in a manufacturing concern are usually classified by functions”. Define each major function.
10. Trace the evolution of cost accounting in India, and the role of the Government of India thereof.

## PRIME COST

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## 2.0 MATERIALS COST MANAGEMENT

*Materials management* is a function responsible for coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as to provide predetermined services to the customer at a minimum cost. It is therefore desirable that every materials manager should try to apply proper materials planning, purchasing, handling, storing materials so as to achieve the desired objective of minimising materials procurement and stock holding costs. Recently, the integrated materials management concept has gained greater acceptance. This has necessitated professional development managers so that they can fulfil the requirements of an integrated materials management function which demands an ability to bring together conflicting and yet interrelated functions, viz. materials planning, purchasing, receiving and inspection, stores, inventory control, scrap and surplus disposal. The economic pressures in the form of inflation and credit squeeze have placed exacting demands on the materials manager. In an integrated set up, the materials manager who is responsible for all such interrelated function, is in a position to exercise control and coordinate with an overview that ensures proper balance of the conflicting objectives of the aforesaid individual functions. The important advantages of integrated materials management are better accountability, better performance, better growth and adaptability to electronic data processing.

Material cost to be effective involves the cooperation of various departments viz: purchasing department, receiving and inspection department, stores, production and stock control department.

### Material Cost

Having discussed about the basic principles, methods and objectives of cost accounting, we now turn to study the details of each aspect of costing. To start with, each element of cost will be taken up separately. Let us begin with the first element of cost that is material—

Material is the most significant element of cost and accounts for anywhere between 40% to 70% of the total cost of production. Cost control activities are, therefore, directed mostly towards selection, purchase, storage and consumption of material.

The following are the **salient features of material cost control** :

- (a) The quality and specification of materials shall commensurate with the requirements of the product, so that neither too expensive or superior nor cheap or inferior material shall be selected for use in product.
- (b) The purchasing shall aim at minimum price to suppliers and timely procurement and shall avoid urgent purchases at higher cost.
- (c) Storage of materials shall be such that there will be neither overstocking, and thereby blocking Capital, nor running out of stock and creating interruption in production process.
- (d) Wastage and losses shall be avoided at every stage of operation i.e. from storing till usage in production.

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- (e) Materials should be classified and accounted for both in physical units and value in such a way that information about availability in stock can be obtained promptly so as to assist production, planning as well as timely buying.

### **Direct and Indirect Material Cost**

Materials or stores control relates to both direct and indirect materials. Direct materials are those materials which enter into and form part of the product, such as flour, fat and sugar in biscuits, and include:

- (a) all materials specially purchased for a job order or a process,
- (b) all materials issued from the stores against a particular job order number or process,
- (c) all components or assembly parts purchased for use in the jobs and process directly,
- (d) all materials or processed materials transferred from one process or operation to the other, and
- (e) all primary packing materials such as poly bag, gunny bag cardboard box, etc. Indirect materials are those which cannot be traced as a part of the product, such as,
  - (a) Consumable stores used in the operation,
  - (b) Lubricating oil, grease, fuel oil, etc.
  - (c) Tools, jigs, and fixtures, etc.
  - (d) Sundry stores of small value like cotton waste, broom stick, etc.

Grouping of materials under direct and indirect may often become a matter of convenience, and materials of small value may not be treated as direct cost even if it is possible to identify the same. For example, thread used in stitching a shirt may be calculated and charged as direct material cost, but the cost of such collection will not justify the segregation. Costing system has to be cost-effective.

### **2.1 MATERIAL COST CONTROL**

Material cost control involves the following activities, viz.

- (a) Purchase and procurement
- (b) Receipt and inspection
- (c) Storage, Issue and consumption
- (d) Stock control
- (e) Valuation and accounting

## **Purchase and Procurement**

In a big organisation, purchasing may be an independent function reporting to the chief of operations. It may be under production department if the size of the organisation is very small. Under either circumstances, the purchase department must be equipped with efficient staff fully conversant with the production process and requirements. Purchasing is a very specialised job and requires the skill of an expert buyer. Both cost and quality of the product depend to a large extent on the judgement of the buyer.

## **Centralised and Decentralised Purchase**

If the organisation has several units scattered over a wide area, it may be beneficial to have centralised purchasing for those items of materials, which are used commonly by all units. This will impart better control on purchasing, can obtain better terms of payment, and reduction in price. This will also lead to the economy in the process and cost of buying. The centralised buying, however, is limited to the materials of relatively high value and common usage by all units.

If the quantum requirement by each unit is small and materials are dissimilar between the units, it will be more economical to have decentralised buying. Each unit will buy locally and enjoy the benefit of lower price, lower transportation cost and less wastage in handling. In a big multiunit organisation, centralised buying is done for a few major materials, while decentralised or local buying is adopted for the other materials.

## **Purchase Procedure**

The purchase procedure starts with the receipt of purchase requisition from indenting departments and ends with the receipt of advances/excess payments and replacement of rejected materials. The procedure follows the steps, such as,

- a) Receiving purchase requisitions.
- b) Inviting quotation and enquiries.
- c) Receipt of quotation.
- d) Finalisation and placement of purchase order.
- e) Follow-up of orders, receipt and quality-check.
- f) Follow-up of payments with the accounts Department.
- g) Follow-up of advances, rejections and replacements.

## **Purchase Requisition**

Purchase requisition is received from—

- i) General and engineering stores for replenishment of stocks based on inventory position,
- ii) Production planning department for materials required as per production schedule,
- iii) Engineering department for machines, spares and equipment,

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- iv) Administration, selling and other departments for purchase of stationery, office equipment, etc. including capital items, in preprinted forms, duly signed by the indenter and authorised by the Department Head. Generally, for regular items of materials, Storekeeper initials the purchase requisition and factory manager authorises it. If materials are required as per Bill of Materials or specification sheet, the production planning and control department initiates the purchase requisition and the departmental head authorises it. A specimen copy of the purchase requisition is shown below:

**PURCHASE REQUISITION**

Department.	No				
Cost centre	Date.				
Please purchase the	department				
<hr/>					
<i>Item No.</i>	<i>Code No.</i>	<i>Description of material</i>	<i>Unit</i>	<i>Qty. Reqd.</i>	<i>Date Reqd.</i>
<hr/>					
Checked by.....			Approved by.....		
<hr/>					
To be filled in by the purchase dept.					
Purchase order No.			Date.		
Name of supplier			Delivery date		
<hr/>					
Circulation :					
1. Purchase department					
2. Production planning and control					
3. File copy					
<hr/>					

### Inviting Quotation Enquiry

On receipt of the approved purchase requisition, the purchase department shall invite price-quotations from the approved suppliers. It is a good custom to enlist suppliers of repute for timely supply of quality materials. The list is periodically updated after considering vendor performance.

### Receiving and Finalisation of Quotation and Placing Purchase Orders

After receiving quotations from the suppliers, the purchase officers shall tabulate them in a sheet of paper indicating the details of each offer covering items, quantity, rate, time and delivery terms, terms of payment, etc. The accepted offer is marked on the comparative statement and signed by the department head as authority to issue order to the supplier. Normally lowest offer is accepted, unless other considerations such as quality, urgency, etc. prevail over it. Purchase order is placed in the official order form which is usually serially numbered and maintained in different sets for raw materials, packing materials, engineering stores and other general stores including stationery and printing. Purchase orders are prepared in a set of seven/eight copies for distribution as follows:

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- Original and acknowledgments copy to supplier for acceptance.
- Copy to department initiating the purchase requisition.
- Copy to accounts (bill section) for payments authority.
- Copy to EDP/production planning and control for information and record.
- Two copies to stores (one for receiving material and retaining in the department, and the other to return to accounts department through quality control department after inspection).
- Copy for purchase department for follow up.

Conditions of purchase, indicating detail instructions as to indemnify against dispute with the third party, method of settlement of disputes, arbitration and the liquidated damages in case of non-supply within scheduled time etc. are printed on the reverse side of the order.

### **Follow up of order**

Purchase orders are followed up scrupulously by purchase department till the material is received in stores, accepted after quality inspection, and replacement received for rejected materials. Amendments for the order regarding quantity, rate, delivery date, etc. are made after obtaining approval for the same. Coordination with accounts department is also done by purchase department in case of any difficulty. Adjustments for advance payment or recovery of excess advance from suppliers are also coordinated by the purchase department.

### **Internal Control over Purchase**

For effective internal control over purchase, it is imperative that the functions of placing order, receiving and approving materials and payment of suppliers bill are so entrusted that one department's function is automatically checked by a subsequent department. The system is interlocked in the following way:

- (a) Purchase order is placed only on the basis of purchase requisition.
- (b) Store keeper receives materials on the authority of purchase orders only.
- (c) Stores received are physically checked by the storekeeper, but quality is approved by quality control department.
- (d) Accounts make the payment of supplier's bills on the basis of supplier's bill accompanied with receipted challan, authority of purchase order and proof of actual receipt of Stores of approved quality as per stores receipt note.

### **Essentials of Purchasing Process**

A good purchasing procedure ensures purchase of right quality, right quantity, at right time, at right price and from right supplier. Purchase of right quality of material is possible by referring to the specification of each material mentioned in the Purchase requisition or bill of materials. A bill of material is a complete schedule of raw-materials and components or processed materials

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required for a job or work order along with blueprint of drawing and charts. Purchase department must follow the bill of materials meticulously while procuring them. If the specified quality is not available, the department concerned must be consulted before accepting alternate or substitute material. It should be remembered that quality of the product depends on the quality of inputs.

Purchase of right quantity depends on such factors as average consumption, inventory levels i.e. maximum, minimum, reorder level, quantity already on order, financial considerations, such as availability of funds, interest on capital, quantum of discount allowed, etc. besides consideration of cost of storage space. There should not be overstocking thereby blocking capital and storage space. On the other hand, production should not suffer for want of material, and thereby incur loss for stock-out. A good purchasing system balances these two situations by skilfully determining Economic Order Quantity (or E.O.Q.) at a point, where cost of ordering and cost of carrying the inventory will be minimum. If the purchase quantity is increased, the cost of ordering decreases, but the cost of carrying increases. If the quantity is reduced, then the cost of ordering increases with the decrease of the cost of carrying. At economic order quantity, carrying cost equals to ordering cost.

The skill of purchase often depends on the judgement of right time to buy. Urgent material and spare-parts required for machine-breakdown shall be purchased immediately. But others, depending on the nature of requirement can be procured economically by using judgement. Average consumption and reordering level are often considered for timing of purchase. Sometimes, rate contract is entered with major suppliers for a specified period of time, say, six months or one year, within which price shall remain same, but quantity will vary from month to month. Rate contract is entered for avoiding price fluctuation of major materials.

Purchase of material should be made at right price. It does not mean lowest price, but points to most economical price. Seasonal conditions and market fluctuations are considered while agreement is made between the purchaser and the supplier. The price agreement as well as the purchase order shall clearly indicate —

- (a) The basic price of the material per unit,
- (b) The excise duty, octroi and sales tax applicable,
- (c) Transportation, packing and insurance, whether FOR work or FOR destination,
- (d) Trade and cash discounts applicable, and
- (e) Charges for returnable containers.

As regards item (c) above, it shall be made clear as to which expense will be borne by the buyer and which one by supplier. Otherwise, it will create dispute at the time of payment of invoices.

Lastly, the purchase department shall procure materials from the right source. As far as possible purchases are made from the manufacturer or authorised wholesalers of the various inputs in order to avoid middlemen, ensuring quality and keeping price at minimum. The department is therefore equipped with market reports, trade journals, catalogues & price-lists and list of

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suppliers. While selecting suppliers, the department shall ensure that the supplier is reliable, having good market reputation for timely delivery of quality goods at price quoted and have the capacity to fulfil the contract both financially and production-wise. Such list of suppliers are periodically updated with the help of Analysis of Vendor Performances once a year.

## **2.2 STORING PROCEDURES**

### **STORES, LOCATION**

In order to keep material handling cost and wastage due to multiple handling to a minimum, the location and layout of stores should be decided very Carefully.

The following factors may be considered while deciding about the location:

- (a) Heavy stores should be located nearer to the receiving station.
- (b) Bulky materials should be stored near to the user departments.
- (c) Free access should be provided for reaching the bins and racks.
- (d) Unnecessary movements and transfer from one location or bin to another should be avoided.
- (e) Access to stores for verification should be easy.

### **Centralised vs. Decentralised Stores**

Centralised store is more economic and easier to control compared to decentralised stores at different production centres. However, the decision depends on the size, nature of business and feasibility of operation of individual business. The advantages of centralised stores are as follows:

- (a) Lower stock level and less investment.
- (b) Less stock records.
- (c) Better supervision and control.
- (d) Less expensive to administer.
- (e) Bulk buying at lower cost.
- (f) Better inventory control.
- (g) Better security arrangements.

The main disadvantages of centralised control are increased material handling and transportation cost and inconvenience and delay. Besides, the risk of loss due to fire, flood, etc. is higher. Any breakdown in transportation system may affect movement of materials with a consequential loss of production. To obviate the aforesaid difficulties, it is convenient to have sub-stores also in addition to central stores similar to petty cash system.

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**Imprest system of stores** is used for replenishment of stores, so as to bring the stock to a predetermined level. The storekeepers of sub-stores are made responsible to the chief storekeeper. The system is very useful in a large factory with different production departments using various standard materials regularly.

In some organisations, *two bin system* of inventory control is used, wherein materials are kept in two bins. One of the two bins contain sufficient stock for usage during the period between the date of placing order and the receipt of fresh supply of the material. Purchase requisition is issued as soon as the second bin is tapped.

### **Storekeeper — Functions and Responsibilities**

The stores department should be under the control of a storekeeper. He is responsible for receipt, storage and issue of materials. His duties and responsibilities are as follows:

- (a) To receive materials, arrange for inspection and accept them after proper verification of documents.
- (b) To prepare stores received note promptly and circulate the copies to other departments.
- (c) To store the accepted materials of right quantities against authorised stores requisitions.
- (d) To issue correct materials of right quantities against authorised stores requisitions.
- (e) To enter receipt, issues and return of materials in the bin cards, and to maintain other stores records.
- (f) To issue purchase requisition when reordering level is reached.
- (g) To check bin card balances with the physical quantities in the bins periodically.
- (h) To follow rotation of stocks to avoid holding old stocks.
- (i) To report on waste, scrap, slow-moving, non-moving and obsolete items.
- (j) To maintain stores in a tidy manner for easy access to bin at any time.
- (k) To prevent entry of unauthorised person.

### **2.3 STORES RECEIPT AND INSPECTION**

With the receipt of materials from the supplier, the storekeeper shall refer to the challan to find out purchase order concerned, and shall prepare a Stores Received Note (SRN), a specimen of which is as follows —

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**Stores Received Note**

Supplier's name:	No.	:				
Code :	Date	:				
Purchase order no.:	Challan no. & Date :					
<i>Description</i>	<i>Code No.</i>	<i>Unit</i>	<i>Quantity received</i>	<i>Quantity rejected</i>	<i>Quantity accepted</i>	<i>Bin Card reference</i>
Carrier's name :			Received by	Quantity checked by	Quantity inspected by	Entered in bin card by
Bill No..... Date.....						

*Circulation :*

1. Accounts through Q.C.
2. EDP/production planning and control
3. Stores through Q.C.
4. File copy.

After verification with the specifications given in the purchase order and physical counting, the storekeeper shall enter the quantity columns, and send two copies of the SRN to quality control department along with sample material for inspection and approval of quality. When the materials are accepted by the quality control department, one copy of the SRN is sent to stores for recording in bin card, while the first copy is sent to accounts department as a record of acceptance of materials ordered and supplied by the vendor. Stores received note is checked and priced out by accounts department with reference to purchase order. Invoices when received are checked with priced SRN for issue of pay order.

When materials are rejected by the quality control department, the purchase department informs the supplier for replacement free of cost. The storekeeper shall keep the rejected material separately for return to supplier. If payment has already been made, the accounts department shall raise a debit note on the supplier, when rejected store is not replenished.

**MATERIAL RECEIVED UNDER CENVAT SCHEME**

All materials received indicating amount of excise duty paid by the supplier should be entered in a separate register, recording such details as the name of the supplier, supplier's invoice No., date and amount of excise, Document No. and Date, classification number, i.e. Tariff

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Item No., Excise duty rate and amount. Under Cenvat Scheme, excise duty paid on inputs can be used to pay excise duty on the dutiable finished products.

## 2.4 STORES ISSUE, TRANSFER AND RETURN

Movement of materials from store takes place on the basis of the following documents:

### (I) MATERIAL REQUISITION NOTE (MRN)

This is an authorisation to the storekeeper to issue material duly signed by the authorised person of the receiving department. This is an acknowledgment of material received by the user department. It contains necessary details like job number, name of the department, description, code no., unit and quantity of the material requisitioned.

Generally, the material requisition note is pre-numbered. It forms the basis of material accounting, and therefore, all columns should be filled in clearly and legibly for correct accounting of materials issued from stores to production, maintenance and other departments. A specimen copy of MRN is shown below :

#### Material Requisition Note

Department :			Serial no. :			
Job/Work order no.:			Date :			
<i>Description</i>	<i>Code No.</i>	<i>Unit</i>	<i>Quantity</i>	<i>Quantity issued</i>	<i>Rate</i>	<i>Value</i>
Checked by		Authorised by		Entered in Bin Card No.	Storekeeper	Cost office use Stores ledger Folio No. Priced by

Circulation:

1. Stores
2. Cost accounts
3. Material control department
4. File copy

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The indenting department shall fill in first four columns, and send the MRN in a set of three copies depending on the requirement of the organisation. The stores department shall fill in 'Quantity Issue' column and send 2nd & 3rd copies to accounts and material control department, and post the quantity issued in the bin card and note the same in stores copy of the MRN. The accounts department shall record the issue in the Stores ledger and value the material issued for proper accounting. Material control will record the issues in their control card for future action.

**(II) MATERIAL TRANSFER NOTE (MTN)**

This document is used to record transfer of materials from one department or job to another. When excess material remains in one department, and another neighbouring department need the same, it becomes easier and economical to transfer the material rather than receiving back in stores, and again issue them. However, the MTN should be prepared correctly to avoid incorrect accounting. It is preferable to use pre-numbered forms for better control. A specimen copy is shown below:

**Material Transfer Note**

Department issuing :				Serial no. :	
Department receiving :				Date :	
<i>Description</i>	<i>Code No.</i>	<i>Unit</i>	<i>Quantity</i>	<i>Rate</i>	<i>Value</i>
Authorised Dept.....		Received by Dept.....		Stores ledger No.	
				Cost office use Priced by	
<i>Circulation :</i>					
1. Receiving department					
2. Cost department					
3. Stores					
4. Issuing department					

**(III) MATERIAL RETURN NOTE (MRN)**

This document is an authorisation to return excess materials to stores. This form also should be pre-numbered and filled in carefully in order to avoid wrong accounting. A specimen copy of the format is as follows :-

*Prime Cost***Material Transfer Note (To store)**

Department issuing :		Serial no. :		Date :	
Job no. :					
<i>Description</i>	<i>Code No.</i>	<i>Unit</i>	<i>Quantity</i>	<i>Rate</i>	<i>Value</i>
Authorized Dept.....		Received by Dept.....		Bin no.	Cost office use Stores ledger folio no. Priced by

Circulation:–

1. Stores;
2. Cost department;
3. Material control department;
4. Issuing department

The material return note is an internal document for returning excess material to stores. This format shall not be used for returning any material to the outsider. Returning materials to outsider should be done by way of a letter, duly accompanied with gate pass.

**Materials Issued to Outsiders**

Materials are issued to outside parties on account of the following:

- (a) Re-work or rectification of defects in the materials supplied.
- (b) Conversion of a basic material into useful component or assembly. For example, card board can be purchased in Jumbo rolls and can be sent for conversion into cartons of various sizes for packing biscuits.
- (c) Conversion of material under Cenvat scheme (under Section 57(f)(2) of the Central Excises Act).

In all such cases, detailed records are maintained in stores, production planning & control and accounts to watch the movement and reentry of the goods in the stores. Control is established by using returnable gate pass, while the materials leave the factory. All reworked, rectified, reprocessed and converted materials shall enter the store with a reference on the challan, so that cross-reference is established.

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### Material Records

For stores control, two sets of records are maintained. First one is Bin Cards by Stores, and the second one is stores ledger by accounts (cost) department. Bin cards account for quantity only, while stores ledger indicate value also.

**BIN CARD** This refers to quantitative details of receipt, issue and balance. Entries are made immediately on receipt or issue of a material. This is known as bin card, as the cards are usually kept attached to the bins in which materials are kept. The card also indicates maximum, minimum and reordering levels.

<b>BIN CARD</b>						
	Bin no.	:	Location :		Maximum	:
	Description	:			Minimum	:
	Code	:			Ordering	:
	Unit	:			Reorder qty.	:
	<i>Receipt</i>		<i>Issue</i>		<i>Balance</i>	<i>Physical</i>
<i>Date</i>	<i>Srn/mtn No.</i>	<i>Qty.</i>	<i>Mtn. No.</i>	<i>Qty.</i>	<i>Quantity</i>	<i>Verification</i>

### Stores Ledger

The stores ledger (also called as priced stores ledger) is maintained in the cost accounting department and contains the same information as in bin card with addition of rate and value of materials. Generally, stores ledger is maintained in a loose-leaf ledger form. The number of ledger cards are the same as in case of bin cards, and the two sets are reconciled when physical inventory is taken. The sources of posting in bin cards and stores ledger are the same. Hence, there should not be any quantity difference between the two. Any discrepancy in quantity must be reconciled periodically. A specimen of stores ledger account is as follows :-

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**Stores Ledger Account**

Material :		Folio No. :
Code No. :		Maximum qty. :
Location :		Minimum qty. :

<i>Date</i>	<i>Receipt</i>			<i>Issue</i>			<i>Balance</i>				
	<i>Srn</i>	<i>Qty.</i>	<i>Unit</i>	<i>Amt.</i>	<i>Mr.</i>	<i>Qty</i>	<i>Unit</i>	<i>Amt.</i>	<i>Qty.</i>	<i>Unit</i>	<i>Amt.</i>
	<i>mtn.</i>			<i>Rs.</i>	<i>No.</i>			<i>Rs.</i>			<i>Rs.</i>
	<i>No.</i>										

The difference between **Bin Card** and **Stores Ledger** may be as follows :

<i>Bin card</i>	<i>Stores ledger</i>
i) A record of quantities only.	i) A record of both quantity and value
ii) Kept in the stores department	ii) Kept in the cost accounting department.
iii) Maintained by the storekeeper.	iii) Maintained at the cost department.
iv) Posted as soon as the transaction takes place.	iv) Posted long after transaction takes place.
v) Each transaction is individually posted	v) Transactions are summarised and posted once a month.
vi) Bin card balance is physical quantity.	vi) Balance in stores ledger is reconciled with bin card for quantity, and with general ledger for total value.

### Stock Control Card

Sometimes, a second set of quantitative record is maintained in the stores, called stock control cards which are similar to bin card with additional information as regards stock on order. While bin cards are kept attached to bins or racks for easy identification of stock, the stock control cards are kept in cabinets or trays or loose-leaf binders.

Advantages of stock control cards are as follows:

- (a) Records are maintained in a compact way.
- (b) Reference to the stock records is facilitated.
- (c) Overall idea of stock-holding can be had by running through the store bins & racks.
- (d) Division of labour between record keeping and material handling is possible.

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The following is the flow chart of stores records/accounting :

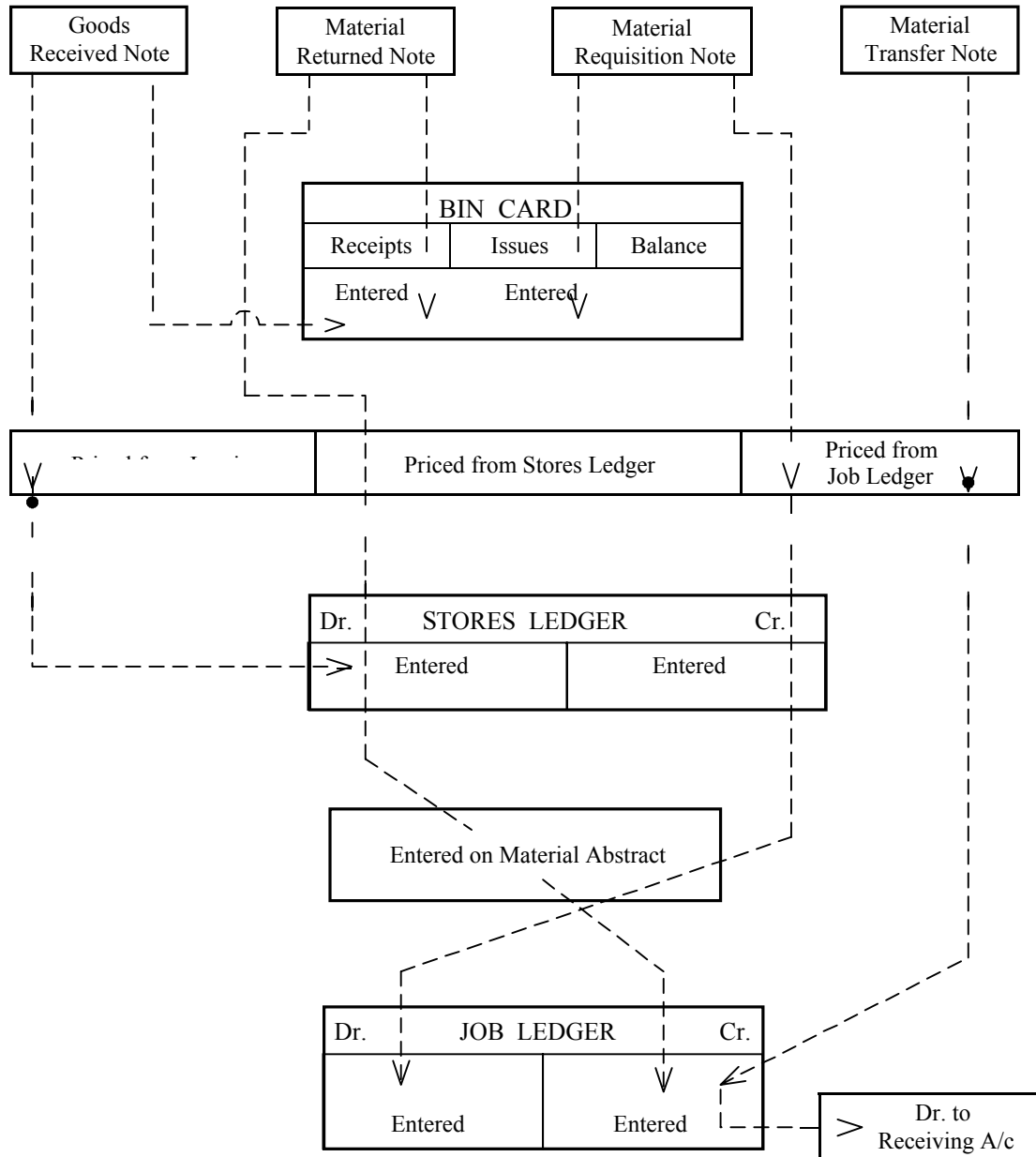


FIG. Flow chart of Stores Records

*Notice particularly how these documents are priced and ultimately entered in the job ledger.*

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## Computerisation

In large organisations, stock control is effectively done through computer. Transmission of data becomes quicker and any information of stock in hand, stock on order, availability in next few days, etc. is available on the screen of the computer. For this purpose, data base is created first by feeding information to computer by departments concerned.

## 2.5 STOCK CONTROL

Stock levels are maintained in such a way that there is no overstocking, so that chances of loss through damage, deterioration in quality, risk of obsolescence, etc. are avoided along with unnecessary blocking of capital or paying interest on borrowed funds. At the same time, there shall be no stock-out situation, leading to interruption of production and loss of sale and profit. The production planning and control or material control department looks after this aspect of stores-management by fixing maximum, minimum and ordering level and reorder quantity for stock items i.e. standardised items of regular use. Within these guidelines noted in each bin card/stock control card, the storekeeper places requisitions with the purchase department for replenishment of stock. But, how these levels are determined?

### Reorder level

This is the level at which the Storekeeper initiates purchase requisition for fresh supplies of materials. Reorder level takes into account the maximum consumption during lead time and unexpected delay in receiving fresh supply. Lead time means time necessary to obtain delivery of materials from date of order. In case of unusual delay, stock should not reach zero level. Reorder level is, therefore, calculated as maximum reorder period multiplied by maximum consumption.

### Minimum level

This represents a level which the stock will reach with fresh delivery of material provided the fresh delivery is made within the reorder period and usage remains normal during the period. Stock is normally not allowed to fall below this level. This is considered as buffer stock for use in emergency. If however stock level falls below minimum level it will be called **Danger Level**, when emergency measure should be taken to replenish stock. Otherwise, there will be stock-out situation, with consequential loss of production. Minimum level is, therefore, computed as reorder level *less* normal consumption during normal reorder period.

### Maximum level

This represents stock level above which stock should not be allowed to rise. The main purpose of this level is to ensure that capital is not blocked up unnecessarily in stores. The maximum stock level is computed as reorder level *plus* reorder quantity *minus* minimum consumption during reorder period. This level is a control indicator and if the stock exceeds this level, the consumption pattern and reorder period should be reviewed. The maximum stock level is fixed after considering the following factors also:

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- i) Storage facilities available.
- ii) Cost of maintaining stores including insurance cost.
- iii) Availability of funds.
- iv) Possibility of loss by deterioration, evaporation, etc. and risk of obsolescence.
- v) Possibility of price fluctuation. For instance, in case of seasonal materials, price may be low in season and high in off-season.
- vi) Government restriction on import or procurement.
- vii) Economic order quantity.

It is important to note that setting of stock levels requires correct projection of usage pattern, lead-time and estimate of reordering quantity, stock-levels, therefore, cannot be established where:

- (a) rate of consumption is erratic,
- (b) material is not in common use,
- (c) market of the particular material is uncertain.

### **Stock Turnover and Average Stock-holding**

Stock turnover ratio indicates how many times stock is rotated, on an average, during a particular period, say a year. This is calculated for different groups of materials separately in the following way:

Stock turnover ratio = cost of materials used during the period divided by average stock of materials held during the period.

Average stock holding is obtained by –

- (a) Averaging opening and closing stocks,
- (b) Averaging maximum and minimum levels of stock, or
- (c) Minimum stock *plus* half of reorder quantity.

### **Reorder Quantity**

This refers to the quantity to be covered in a single purchase order. While deciding the reorder quantity, the following factors are considered:

- (a) Consumption pattern of the material.
- (b) Nature of the material i.e. risk of deterioration, evaporation, etc.
- (c) Risk of price-fluctuation.
- (d) Seasonal consideration as to the price and availability of supplies.
- (e) Storage space availability.
- (f) Quantum of discount.
- (g) Carrying cost and ordering cost.

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### Carrying Cost and Ordering Cost

Cost of carrying stock includes rent, insurance and other cost of storage, interest on capital blocked, losses and pilferage, risk of obsolescence, etc. Cost of ordering consists of the cost of placing an order, setting up of production-run, transportation and receiving cost. Carrying costs are mostly variable, while ordering costs are mostly fixed and partly variable with the number of orders. Carrying cost increases with the increase in reorder quantity, while ordering cost decreases with the increase in number of orders. Thus, carrying cost and ordering cost move in opposite direction.

### Economic Order Quantity (EOQ)

The concept of Economic Order Quantity or EOQ has emerged out of this behaviour of carrying cost and ordering cost. EOQ is the quantity fixed at a point where total cost of ordering and the cost of carrying the inventory will be the minimum. EOQ may be arrived at by tabular method by preparing purchase order tables, showing the ordering cost, carrying cost and total cost of various sizes of purchase orders, or can be established by algebraic equation or by graph.

Let us take an illustration:

Material: Airtight box                      Code No.: P 3002  
 Monthly usage :250 pcs.  
 Cost of placing and receiving one order Rs. 60. Cost of materials per unit Rs. 10  
 Carrying cost = 10% of inventory value. Find out EOQ by *i)* tabular method, & *ii)* eqn. method.

**Solution :**

**(i) By tabular method**

<i>Material</i> : Airtight box		<i>Code no. : P 3002</i>				
<i>Annual usage</i> :		<i>3000 pcs. Unit : Pc.</i>				
<i>No. of orders</i>	<i>Units for order</i>	<i>Value for order</i>	<i>Average inventory value</i>	<i>Carrying cost</i>	<i>Ordering cost</i>	<i>Total</i>
	<i>Pcs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
1	3000	30000	15000	1500	60	1560
2	1500	15000	7500	750	120	870
3	1000	10000	5000	500	180	680
4	750	7500	3750	375	240	615
5	600	6000	3000	300	300	600
6	500	5000	2500	250	360	610
7	428	4280	2140	214	420	634
8	375	3750	1875	188	480	668

**Note :** Average inventory value is half the value of order.

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\* Thus EOQ is 600 units and when orders are placed using EOQ, the carrying cost and the cost of placing and receiving order are the same and the total cost is minimum.

(ii) By equation method :

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2 \times \text{Annual requirements} \times \text{Cost per order}}{\text{Cost per unit of material} \times \text{Carrying cost}}} \\ &= \sqrt{\frac{2 \times 3000 \times 60}{10 \times 0.10}} = \sqrt{360000} = 600 \text{ units} \end{aligned}$$

The above formula can be developed in the following way :

Let    E    =    EOQ  
        RU   =    Annual requirement units  
        CO   =    Cost per order  
        CU   =    Cost per unit of material  
        CC   =    Carrying cost

Now,

- (i) Total number of orders to be placed =  $\frac{\text{RU}}{\text{E}}$
- (ii) Total cost of placing the order in a year =  $\frac{\text{RU} \times \text{CO}}{\text{E}}$   
 $\frac{\text{EOQ}}{2} = \frac{\text{E}}{2}$
- (iii) Average stock =

$$\text{Hence, annual carrying cost} = \frac{\text{E}}{2} \times (\text{CU} \times \text{CC})$$

At EOQ level, carrying cost equals to ordering cost

$$\text{i.e. } \frac{\text{E}}{2} \times \text{CU} \times \text{CC} = \frac{\text{RU} \times \text{CO}}{\text{E}} \text{ or, } \text{E} = \sqrt{\frac{2 \times \text{RU} \times \text{CO}}{\text{CU} \times \text{CC}}}$$

EOQ model is based on the following assumptions :

- (i) Material cost per unit remains unaffected by order size.
- (ii) Orders will be received on the expiry of lead time.
- (iii) Variable inventory carrying cost per unit and ordering cost per order remain constant throughout the order.
- (iv) Production and sales can be forecast perfectly.

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### **ABC Analysis**

ABC analysis is a technique of selective control of inventory by classifying all items of stores into three categories, namely, –

- Category A :** A few items accounting for substantial usage in term of total monetary value (10% items covering 75% value).
- Category C :** Large number of items of small value (70% items covering 10% value).
- Category B :** In between items A and C (20% items representing 15% value).

The main object of the analysis is to decide guidelines for selective control over inventories. It is extremely difficult to control effectively if there is large number of items in stock. This system ensures stricter control over a few materials, which represents bulk of the cost, so that the direction of control is more cost-effective. This system also saves time and investment by taking action on the three categories of stores by using discretion. Generally, category A items deserve very strict control with say weekly control reports, maximum follow-up, efforts to reduce lead time, etc., category B items require moderate control, while less expensive control may be applied to category C items. However, care should be taken for critical items, which are in category B or C, but extremely important from the view of production process. For example, ginger powder may be a C class item, but without this material, production of Gingernut biscuit cannot take place. Adequate attention should be given to take care of such items, since ABC analysis in no way ranks stocks in terms of importance.

The procedure for preparing ABC analysis is as follows :

- (i) Determine the cost and usage of each material over a given period.
- (ii) Multiply unit cost by estimated usage to obtain net value of each material.
- (iii) List all items with quantity and value and arrange them in descending value.
- (iv) Accumulate value and add up number of items and calculate percentage on total inventory in value and in number.
- (v) Draw a curve of percentage items and percentage value.
- (vi) Mark off from the curve the rational limits A,B,C categories.

The advantages of this method are —

- (i) It ensures closer control on costly items in which large amount of capital is tied up.
- (ii) With the scientific control of inventories, the stock turnover rate can be maintained within a range of 6 to 12.
- (iii) Clerical costs are reduced and inventory is balanced and maintained at the optimum possible level.
- (iv) The storage cost is reduced under this method as reasonable quantity of high valued items are maintained in the stores.

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ABC analysis may be well-conceived with the help of graphs or charts:

ABC analysis, popularly known as “Always Better Control” is based on Pareto’s Law, developed by an Italian economist in the nineteenth century. He observed that a minority of population owned the majority of his country’s wealth. Same principle has been applied to stocks which show that majority of inventory value will be represented by relatively few items.

**Just-in-time (JIT) purchasing:** Business enterprises are now giving in creating attention to reducing stock levels to a minimum by creating closer relationship with suppliers and arranging more frequent deliveries of small quantities. The objective of just-in-time (JIT) purchasing is to purchase goods so that delivery immediately precedes their use. This ensures holding of stocks as minimum as possible.

With this system of purchasing the company and the supplier work in close cooperation. The company generally guarantees for large quantity of purchases. The suppliers, on the other hand, guarantee proper quality of materials at reasonable (or lower) prices as and when needed. With this arrangement, there is no need to move goods received into stores because the goods (of proper quality) are delivered direct to the shop floor. Moreover, it is unlikely that raw material stock will consist of different consignments of materials purchased at different prices. Thus, FIFO, LIFO and average cost issue prices will be the same.

The main advantages of JIT purchasing are —

- (i) It results in enormous savings in materials handling and investments in stocks.
- (ii) It reduces the clerical costs of recording stores issue. As purchase price of different lots will not fluctuate to a great extent, the issue prices under FIFO, LIFO or average cost methods will be the same.

**The Pareto distribution :** The Pareto (80/20) distribution is similar in concept to ABC method of stock control. Its name is derived from an economist, Vilfredo Pareto, who suggested that 80% of a nation’s wealth is held by 20% of its population and so the remaining 80% of the population hold only 20% of its net wealth. This 80/20 analysis has been applied to stocks so that 20% of stores items account for 80% of the value of stocks in hand. This indicates that rigorous stock control methods should be applied to these 20% of items in order to derive maximum benefits from stock control. The remaining 80% of items do not require such rigorous control methods applied to them because the cost and effort might not be justified by the savings obtainable.

**VED analysis:** Vital, Essential and Desirable (VED) analysis is done mainly for control of spare parts keeping in view the criticality to production. Vital spares are spares the stock-out of which even for a short time will stop production for quite some time. The stock-out cost of vital items will stop production for quite some time. The stock-out cost of vital items is very high. Essential spares are spares the absence of which cannot be tolerated for more than a few hours a day and the cost of lost production is high. Such spares are essential for the production to continue. The desirable spares are those which are needed but their absence for even a week or so will not lead to stoppage of production. Some spares, though negligible in value,

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may be vital for the production to continue and require constant attention. Such spares may not receive the attention they deserve if they are maintained under ABC analysis method because their consumption value is small.

**FSN analysis:** Here the items are classified according to Fast-moving (F), Slow moving (S) and Non-moving (N) on the basis rate of consumption. The non-moving items are items not consumed for a long period say 24 months. Such non-moving items block quite a lot of capital and as such they should be disposed of as quickly as possible without further deteriorating. The classification of fast and slow moving items are determined on the basis of stores turnover and it helps in proper arrangement of stocks in stores and distribution and handling methods.

### **Perpetual Inventory System**

Perpetual Inventory System is defined by C.I.M.A. as “a system of records maintained by the controlling department, which reflects physical movement of stocks and their current balance”. In other words, it is a technique of controlling stocks by maintaining stock records, such as bin cards in stores and stores ledger in accounts, in such a manner that the stock balance is available at any point of time i.e. perpetually. Under this system, stores balance is recorded after each transaction of receipt, issue or transfer This facilitates regular stock verification physically which obviates the stoppage of work for stock-taking.

The success of perpetual inventory system depends on the following :-

- (a) Maintenance of bin card and stores ledger up-to-date.
- (b) Reconciliation of quantity balance shown by bin cards with that in stores ledger
- (c) Continuous verification of physical stock with bin card quantity.
- (d) Reconciliation of discrepancies arising out of physical verification, as well as comparison with stores ledger.
- (e) Remedial action to remove the cause of discrepancies.
- (f) Correction of stock-records.

### **Physical Verification of Stock**

Checking of stock by physical verification is an essential feature of stock control. Such checking may be periodic or continuous. Under periodic stock verification system, all the items of stocks are to be verified once a year at the time of preparing annual accounts resulting in the following difficulties:

- (i) Loss due to stoppage of production for stock-taking.
- (ii) Shortage of experienced stock-verifiers, if all items of stores are to be verified at a time.
- (iii) Thus, quality of verification suffers.
- (iv) Discrepancies revealed during verification are rectified only at the end of the year.
- (v) Element of “surprise check” which helps to detect irregularities are absent.

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Periodic verification is, therefore, carried out in those areas, which are not covered under continuous stock verification, such as, work-in-progress, stock on shop-floor, laboratory, canteen, etc.

### **Continuous Stock Taking**

It consists of counting and verifying a number of items daily throughout the year, so that all items of stores are covered at least once during the year. The frequency may be three to four times depending on the nature of the material. Such verification is carried out by experienced technically trained persons, as per programme planned to cover all items by rotation. The advantages of continuous stock-taking are as follows:

- (i) Stoppage of production is not necessary.
- (ii) Experienced staff can be appointed as stock verifiers, who can apply their skill in the assignment.
- (iii) Stock discrepancies are brought out promptly, and corrective actions taken fast.
- (iv) Surprise checks act as a moral check on the stores personnel.
- (v) Helps identification of slow-moving, dormant, obsolete and unserviceable stocks.
- (vi) Final accounts as well as Half-yearly accounts can be completed quickly.

### **Stock verification procedure**

The stock verification procedure differs under continuous and periodic stock verification system. Under continuous stock verification plan, the stock verifier counts or weighs or measures the physical quantity of a particular item, and records his results in the 'stock verification sheet' or in 'bin card'. Stock verification sheet is a preprinted form having columns for 'quantity as per bin card', 'quantity as per physical count', 'difference' and 'remarks'. The stock-verifier records the bin card balance, result of physical count and difference, if any, and puts his remarks regarding reasons for difference and obtains the signature of the storekeeper. Where result of stock verification is recorded on the bin card itself, the stock verifier puts his initial and date against the balance quantity, if the latter agrees with the physical count. In case of discrepancy, a stock difference memo will be prepared and circulated to departments concerned for action.

In case of periodic stock verification, normally inventory tags are used. Inventory Tags are serially numbered and contain stores description and code no., location, unit code, quantity, signature of stock verifier and date of verification, and have two identical portions with perforation in between, so that after verification, the lower part can be taken by stock verifier while the upper part remains attached to the bins. Inventory tags shall be used for every material at each of the bins, racks in the stores, sub-stores and in the shop-floor for unused stores and work-in-process. Tags are sent to raw material, packing material and engineering stores and production departments well in advance. When tags are tied up with all items, the

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stock verifier starts picking up the tags from one end and completes verification of every section without break. Quantities are then totalled up and recorded in the stock sheet, showing physical stock, book balance and difference.

### **Stock Discrepancies**

The discrepancies between physical stock and stores ledger balance may occur due to various reasons. Some of these are normal, natural and unavoidable, such as,

- (i) Breaking bulk,
- (ii) Evaporation loss, shrinkage and drying loss or absorption gain,
- (iii) Volume fluctuation due to temperature,
- (iv) Units of purchase and issues being different i.e. purchased by weight, but issued by quantity.

The avoidable causes of discrepancies are as follows:

- (i) Incorrect entries in bin cards.
- (ii) Storage in wrong bins.
- (iii) Short or excess issues or wrong issues of material.
- (iv) Excess or shortage in packages or bundles not checked at the time of receipt.
- (v) Pilferage and theft.

After reconciling the discrepancies and rectifying clerical and accounting errors, a Stores Adjustment Note is prepared, wherein the stock-difference quantities are listed materialwise with code no., and valued at cost, and the net amount shall be transferred from stock account

to stock difference adjustment account for disposal, after investigation of the difference, to either factory overheads or costing profit and loss account. Bin cards and stores ledger quantities shall be immediately rectified to the physical quantity verified.

## **2.6 MATERIAL CONTROL**

We have seen that in a manufacturing concern, the production department needs raw-materials, processed materials, components and consumable stores for manufacture, the purchase department procures such materials of right quality and right quantity from various suppliers, the stores department receives and stores them after quality approval by quality control department and finally issues them to production department. Thus, it is evident that a perfect coordination between these departments are absolutely necessary in order to keep the cost under control. Otherwise, situations like stock-out, production distress purchase at higher price, wastage due to wrong quality, with consequential loss of customers will occur. In big organisations, a material control or production planning and control department is created to coordinate the activities of sales, production, purchase, stores, quality control and accounts departments. It ensures effective control at each stage of operation right from placing purchase

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requisitions till the disposal of scraps and obsolete materials. The essential requirements of the system encompasses the following :

- a) Classification, codification, standardisation and rationalisation of all stores into raw-material — classified into standard and nonstandard items, packing materials, components and assemblies, engineering stores and machine parts, loose-tools, laboratory supplies, inspection materials, etc.
- b) Determining standard or norm for consumption of stores as well as stockholding at various levels.
- c) Use of standard forms and documents.
- d) Planning of material requirements by reviewing sales plan, position of finished stock and work-in-process, production plan, stock-status in stores, and expected arrival as per orders placed.
- e) Continuous updating of stock position with the information available from purchase, stores, production and despatch departments.
- f) Arranging conversion of basic raw materials into components through convertors or contract labour.
- g) Preparing regular reports to management indicating stock-holding, ordering position, consumption, critical items, excess storage, slow-moving, non-moving, dormant, surplus and obsolete stocks, etc. by quantity and value.

### **Payment for Purchase**

Supplier's bills are received by accounts through inward mail or reception. Generally, bills are entered in a register, indicating supplier's name, bill no., date and amount, so that the record of payment, such as date of passing the bill for payment, cheque no. and date may be maintained therein. The process starts with the receipt of the accounts copy of the purchase order in advance. Accounts copy of Stores Received Note is received from stores after the quality control certifies about the quality of the accepted materials. Bill is scrutinised with reference to purchase order, receipted challan and stores receipt note regarding accepted quantity, rate and terms of payment. The following points need special attention before passing pay-order on the supplier's bill.

- (a) Discount allowed for prompt payment i.e. cash discount apart from trade discount.
- (b) Incidental charges recoverable from the bill, for example, the cost of material includes freight and insurance, but the material has been collected by own transport.
- (c) Recovery of demurrage charges, if despatch documents are not received in time.
- (d) For CENVAT items, the receipt of central excise gate pass or equivalent document.
- (e) Sales tax declaration forms, if applicable.
- (f) Rent or deposit for returnable containers.

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#### **Material Cost Price**

Material cost price shall include all expenses incurred on placing the material in stores or at any other hired or owned location as required by the purchase order. Such price shall include cost, insurance, freight, excise duty, sales tax, octroi and any other special charges such as rent or deposit for container, interest charges for credit period allowed, and will be reduced by the following credits:

- (a) **Trade discount** - Normally, net of discount is shown as invoice price. This includes quantum of discount allowed periodically.
- (b) **Cash discount** - is shown separately in the invoice as an allowable amount since it is optional for the buyer. If cash discount is available, it should not be included in material cost, as it is a purely financial income.
- (c) **Cenvat credit** - Cenvat is actually 'Central Value Added Tax', which allows credit to a manufacturer of dutiable product, on the excise duty portion paid on input materials. Such material cost should, therefore, be reduced by the duty amount.

#### **Storage and Handling Loss**

Material cost price is inflated to cover normal storage and handling losses, which arise because of the following reasons:

- (a) Units of receipt and units of issue may differ. For example, aluminium foil is purchased by weight, but used by square metre.
- (b) Natural losses due to evaporation, shrinkage or drying.
- (c) Some of the materials may gain or loss due to change in temperature.

In case of such materials, cost per unit is inflated to ensure that such losses are recovered while the material is issued to production. For example, if there is a natural loss of 10% of a material, which is purchased @ Rs. 10 per Kg., the unit price for the same will be:

$$\frac{\text{Rs. } 10}{9} = \text{Rs. } 1.11 \text{ per kg.}$$

However, where any abnormal loss occurs, the same should be charged to the profit and loss account.

## **2.7 PRICING ISSUES OF MATERIAL**

Materials issued from stores should be valued at the rate they are carried in stock. Materials are valued at cost and entry in the stores ledger is made with every receipt. Different lot of materials may be received at different prices. Hence, when issues are made from stock, it may happen that materials from more than one lot may have to be issued. Which price will be applicable in such case? Actual cost or average price, market price or notional price? Various methods for pricing materials issued from stores are classified in the following manner:

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**A. Cost price methods :**

- i) Specific price
- ii) First in, first out (FIFO)
- iii) Last in, first out (LIFO)
- iv) Highest in, first out (HIFO)
- v) Base stock price.

**B. Average price methods:**

- i) Simple average
- ii) Weighted average
- iii) Periodic simple average
- iv) Periodic weighted average
- v) Moving simple average
- vi) Moving weighted average

**C. Current price methods :**

- i) Replacement price
- ii) Next in, first out (NIFO)

**D. Notional price methods :**

- i) Standard price
- ii) Inflated price
- iii) Re-use price

**A.(I) Specific Price Method**

Specific price method is applicable to materials purchased for a particular job, order or process, and are identified when received either in stores or in the shop floor directly. Such materials are usually nonstandard and the actual cost is charged to the job or order or process concerned. No question of difference arises out of such pricing.

**A.(II) First In, First Out (FIFO)**

This method assumes that materials are used in the order in which they are received in stores. Hence, the price of the first lot is charged to all issues till the stock lasts. In other words, the issues are priced in the chronological order of receipts. As a result, closing stock will be valued at latest purchase price.

To illustrate, let us take an example. A manufacturing company has recorded the following transactions of material A-320 oil, during the month of September, 2001.

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				Quantity	Unit	Rate (Rs.)
2001 Sept.	1	—	Opening Stock	300	Litre	9.70
	5	—	Purchase	250	"	9.80
	9	—	Issues	400	"	
	14	—	Purchases	300	"	10.00
	16	—	Issues	200	"	
	25	—	Purchase	150	"	10.50
	26	—	Issues	150	"	

The consumption value of the material and closing stock as on 30.9.01 will be as follows under FIFO method :

**Stores Ledger (FIFO Method)**

Material : A 320 oil		A/c : Raw material									
Code No. :		Unit : Litre									
<i>Receipt</i>		<i>Issue</i>			<i>Balance</i>						
<i>Date</i>	<i>SRN. No.</i>	<i>Qty.</i>	<i>Rate Rs.</i>	<i>Amt. Rs.</i>	<i>MRN. No.</i>	<i>Qty.</i>	<i>Rate Rs.</i>	<i>Amt. Rs.</i>	<i>Qty.</i>	<i>Rate Rs.</i>	<i>Amt. Rs.</i>
2001											
Sept. 1									300	9.70	2910
5	x	250	9.80	2450					550*		5360
9					x	300	9.70	2910			
						100	9.80	980			
						400		3890	150		1470
14	x	300	10.00	3000					450		4470
16					x	150	9.80	1470			
						50	10.00	500			
						200		1970	250		2500
25	x	150	10.50	1575					400		4075
26					x	150	10.00	1500	250		1575
				7025				7360			

* Breakdown of closing stock	100	@	10.00	1000
	150	@	10.50	1575
	250			2575

The consumption and closing stocks values are as follows :

Opening stock	Rs. 2910	
Add : Receipts	Rs. 7025	(2450 + 3000 + 1575)
Less : Consumption	Rs. 7360	(3890 + 1970 + 1500)
Closing stock	Rs. 2575	

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\* Alternatively, the stocks can be shown chronologically as 300,250 separately in the balance column and FIFO or LIFO method can be followed. See **Cost Accounting Methods and Problems by B. K. Bhar (Refer Chapter 5)**.

*Advantages :*

- a) Simple method to understand and operate.
- b) Material cost represents actual cost which should be charged to product or process.
- c) Stock value is closer to current price.

*Disadvantages:*

- a) In fluctuating price and too many purchases and issues, this method will involve more calculations.
- b) It overstates profit at the time of rising prices.
- c) If price changes frequently, comparison of one job with the other will not serve useful purpose. Similar jobs will have different costs because of price change.
- d) Adjustment for rejection and returns become complicated.

### A.(III) Last In, First Out (LIFO)

This method assumes that the last receipt of stock is issued first. The method has advantage under inflationary condition of the market. Using the same data of the earlier illustration, the issue prices and closing stock valuation of the material will be as follows :

#### **Stores Ledger (LIFO Method)**

Material : A 320 oil		A/c : Raw material									
Code No. :		Unit : Litre									
Date	SRN. No.	<i>Receipt</i>			<i>Issue</i>			<i>Balance</i>			
		<i>Qty.</i>	<i>Rate</i>	<i>Amt.</i>	<i>MRN. No.</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amt.</i>	<i>Qty.</i>	<i>Rate</i>	<i>Amt.</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>No.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
2001											
Sept. 1									300	9.70	2910
5	xx	250	9.80	2450					550*		5360
9					xx	250	9.80	2450			
						150	9.70	1455			
						400		3905	150		1455
14	xx	300	10.00	3000					450		4455
16					xx	200	10.00	2000			
									250		2455
25	xx	150	10.50	1575					400		4030
26					xx	150	10.50	1575	250		2455
				7025				7480			

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* Breakdown of closing stock	150 @	9.70	1455
	100 @	10.00	1000
	250		2455

The consumption and closing stock values are as follows :

Opening stock	Rs. 2910	
Add : Total receipts	Rs. 7025	(2450 + 3000 + 1575)
Less : Total consumption	Rs. 7480	(3905 + 2000 + 1575)
Closing stock	Rs. 2455	

*Advantages:*

- Issues are charged at current price, which is more appropriate.
- Profit is realistic.
- Since issues are charged at actual cost, no adjustment for profit or loss is necessary.

*Disadvantages:*

- Stock-value does not represent current market price.
- Unfair comparison of job cost when price changes too frequently.
- Like FIFO, this method also involves too many calculations, if frequent price changes occur and purchases are made in small lots.

However, the method is useful for materials used, less frequently and under inflationary condition.

**A.(IV) Highest In, First Out (HIFO)**

Under this method, issues are valued at the highest price i.e. costliest items are issued first, and inventory is kept at lowest possible price. Thus, a secret reserve is created by undervaluing stock. This method is complicated to administer, if there are numerous purchases within short period.

In the previous, illustration, if last purchase on 25th September costs @ Rs.10.50 per unit, then the consumption and stock value will be Rs.7480 and Rs.2455 as receipts will be valued at Rs.7025. (Try yourself following previous solution). HIFO method is mainly used by monopoly products or cost-plus contracts.

**A(V) BASE STOCK METHOD**

This method assumes that a minimum stock is always carried at original cost. The issues are priced using one of the conventional methods, i.e. FIFO or LIFO, at actual cost. In the given illustration, if the base stock is taken at 150 litres @ Rs.9.70 per litre, then under LIFO method there will be no change in consumption and closing stock value.

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The advantages and disadvantages of FIFO and LIFO methods will apply to this method also. This method is suitable in tanning, smelting, oil refineries, etc. using basic raw materials like hides, nonferrous metals and crude oil for their products.

**B(I) Simple Average**

Under this method, issues are valued at simple average price of the number of prices available at the time of issue, irrespective of the quantities purchased. The lot which is exhausted, based on 'first in first out' principle, is excluded in computing the average.

In the given illustration, the issue prices, consumption and closing stock will be valued as follows:

**Stores Ledger (Simple Average Method)**

Material : A 320 oil						a/c : Raw material					
Code No. :						Unit : Litre					
Date	Sr No.	Receipt			Mrn No.	Issue			Qty.	Balance	
		Qty.	Rate Rs.	Amt. Rs.		Qty.	Rate Rs.	Amt. Rs.		Rate Rs.	Amt. Rs.
2001											
Sept. 1									300	9.70	2910
5	xx	250	9.80	2450					550		5360
9					xx	400	9.75	3900	150		1460
14	xx	300	10.00	3000					450		4460
16					xx	200	9.90	1980	250		2480
25	xx	150	10.50	1575					400		4055
26					xx	150	10.25	1538	250	10.07	2517

\* Issue price calculation  $(9.70 + 9.90)/2 = 9.75$

The consumption and closing stocks values are as follows :

Opening stock	=	Rs. 2910	
Add : Receipts		Rs. 7025	
Less : Consumption		Rs. 7418	(3900 + 1980 + 1538)
Closing stock		Rs. 2517	

*Advantages:*

- a) Easy to operate.
- b) Gives reasonably accurate results, if prices do not fluctuate, and purchase quantities are similar.

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*Disadvantages:*

- a) Under fluctuating prices and purchase of different quantities at each time, this method gives incorrect results.
- b) Verification of closing stock becomes difficult.
- c) Value of closing stock may indicate absurd figure, in case of violent price changes.

The method can be applied when materials are received in uniform quantities and purchase prices do not fluctuate significantly.

### B.(II) Weighted Average Method

Unlike the simple average method, this method gives due importance on quantities received also. Issue prices are calculated at the average cost price of materials in hand, i.e. by dividing value of materials in stock by the quantities in stock. Weighted average rate is calculated each time a fresh lot is received. Average price remains the same till the next issue is received. Thus, issue prices are derived at the time of receipt, not at the time of issues. In the given illustration, the issue price, consumption and closing stock will be valued as follows :

#### Stores Ledger (Weighted Average Method)

Material : A 320 oil		a/c : Raw material									
Code No. :		Unit : Litre									
Date	Sr No.	<i>Receipt</i>		Mrn No.	<i>Issue</i>		<i>Balance</i>				
		Qty.	Rate Rs.	Amt. Rs.	Qty.	Rate Rs.	Amt. Rs.	Qty.	Rate Rs.	Amt. Rs.	
2001											
Sept. 1								300	9.70	2910	
5	xx	250	9.80	2450				550	9.75	5360	
9					xx	400	9.75	3900	150	9.75	1460
14	xx	300	10.00	3000					450	9.91	4460
16					xx	*200	9.91	1982	250	9.91	2478
25	xx	150	10.50	1575					400	10.13	4053
26					xx	150	10.13	1520	250	10.13	2533

The Consumption and Closing Stocks values are as follows :

Opening Stock	=	Rs. 2910	
Add : Receipts		Rs. 7025	
Less : Consumption		Rs. 7402	(3900 + 1982 + 1520)
Closing Stock		Rs. 2533	

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*Advantages:*

- a) Easy to calculate and operate.
- b) When prices fluctuate considerably, it smooths out the fluctuations.
- c) Closing stock value is acceptable.

*Disadvantages:*

- a) Since issues are not valued at actual cost, profit or loss may occur.
- b) Issues and closing stock are not at current cost.

This method is suitable where wide fluctuation of prices occur, as it evens out prices over the accounting period.

### B.(III) Periodic Simple Average

Under this method, simple average price is calculated periodically, say, monthly or quarterly, and not at each receipt or issue. Similarly, issues for the period is totalled and valued at the end of the period. Receipts are maintained on perpetual inventory basis to ensure adequate control of stock.

In the given example, the issue price, consumption and closing stock will be valued as follows:

#### Stores Ledger (Periodic Simple Average Method)

Material : A 320 oil		a/c : Raw material									
Code No. :		Unit : Litre									
Date	Sr No.	Receipt Qty.	Rate Rs.	Amt. Rs.	Mrn No.	Issue Qty.	Rate Rs.	Amt. Rs.	Qty.	Balance Rate Rs.	Amt. Rs.
1993											
Sept. 1											
									300	9.70	2910
5	xx	250	9.80	2450					550		5360
14	xx	300	10.00	3000					850		8360
25	xx	150	10.50	1575					1000		9935
30					xx	750	10.10	7575	250		2360

Issue price will be calculated as follows :

Purchase : Date	Qty.	Rate	Amount
Sept 5	250	9.80	2450
14	300	10.00	3000
25	150	10.50	1575
	700	30.30	7025

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September issues will be priced @ Rs. 10.10 i.e. Rs. 30.30 divided by 3. Stock value will not be considered while calculating periodic simple average.

*Advantages and disadvantages*

- a) Very simple to operate.
- b) Issues can be valued only at the end of the period. Hence, it could be useful where process costing is applicable.
- c) Not useful where job costing is used.

#### **B.(IV) Periodic Weighted Average Method**

Periodic weighted average rate is calculated at the end of each period, say, a month, with reference to the purchases made during the same period, and shall be applicable to the total issues made during the period. Records are however maintained on perpetual inventory system as shown in the previous example.

In the given illustration, excepting issue value and closing stock value, all other entries will be same as in periodic average system. Issue price and closing stock will be calculated in the following way:

$$\text{Issue rate} = \frac{\text{Total purchase value}}{\text{Total quantity}} = \frac{\text{Rs. 7025}}{700 \text{ litres}} = \text{Rs. 10.04 per litre}$$

$$\text{Issue Value} = 750 \text{ litres @ } 10.04 = \text{Rs. 7530}$$

$$\text{Closing Stock} = 2910 + 7025 - 7530 = \text{Rs. 2405}$$

This method has the same advantages and disadvantages as periodic simple average method except that this method is more accurate as it takes care of quantity as well as rate of purchases.

#### **B.(V) Moving Simple Average**

This is calculated by dividing the total of the periodic simple average prices of a given period, including the period of issue by the number of periods. The moving average method may be used to even out price fluctuation. The effect of using the average prices of a number of periods is that in conditions of rising prices, a price is used which is lower than the corresponding periodic simple average price, as will be evident from the following example.

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**Calculation of Moving Simple Average**

Month	Under Rising Price			Under Falling Price		
	Periodic simple average price	5-monthly moving total	Moving simple average price	Periodic simple average price	5-Monthly moving total	Moving simple average price
Jan	9.00			9.00		
Feb	9.20			8.80		
Mar	9.50			8.50		
Apr	10.10			8.40		
May	10.20	48.00	9.60	8.30	43.00	8.60
Jun	10.50	49.50	9.90	8.00	42.00	8.40
July	10.70	51.00	10.20	7.80	41.00	8.20
Aug	11.00	52.50	10.50	7.50	40.00	8.00

**B.(VI) Moving Weighted Average Method**

This method is similar to the previous method with the difference that instead of simple average, weighted average prices of monthly average is adopted. This system renders more accurate results for considering quantity as well as prices for arriving at weighted average.

**C(I) Replacement Price**

Under this method, issues are valued at the replacement price prevailing in the market on the date of issue. The system presupposes that material identical to that which is being replaced or revalued could be purchased.

*Advantages:*

- a) It is easy to operate, as no calculation is involved for ascertaining issue prices.
- b) The issues are priced at current market price.

*Disadvantages:*

- a) Not easy to get market price daily.
- b) Issues are not priced at actual cost. Hence, an element of unrealised profit or loss has to be adjusted periodically.
- c) Valuation of closing stock will not be at current market price. This method is not applicable in case of material of daily use.

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**C(III) Next In, First Out (NIFO)**

Under this method, issues are valued at the price expected for the next purchase i.e. price of the material which has been ordered but not yet received. The problem will arise, if the price ruling at the time of supply differs from the purchase order price. However, this method attempts to value issues at nearest to current market price.

**D.(I) Standard Price**

It is a predetermined price fixed on the basis of a specification of all the factors affecting the price of material in a future period. It is normally a part of the process of standard cost system. Under this method, standard prices in respect of each type of material is fixed and all the issues are valued at standard price. The difference between the standard and actual prices results in material price variance. Such variance can be calculated at the point of purchase i.e.

on receipt of materials or at the point of consumption or issues to production. In the former method, the stores ledger is maintained at standard price, while the same is maintained at actual price, when the latter method is adopted.

*Advantages:*

- a) It reveals the efficiency of purchase department.
- b) It is easy to operate as only one standard rate prevails for the period, say, a year.
- c) Comparison between jobs or processes can be useful.
- d) Reduces clerical cost.

*Disadvantages:*

- a) It is difficult to determine standard price during fluctuating market conditions.
- b) Issues are not made at actual or current cost, which should be charged to products.
- c) Adjustment is required for closing stock valuation at the year end.
- d) The trend of actual prices will not be available from the stores ledger.

**D.(II) Inflated Price**

Under this method, price of materials is inflated by including all costs incurred till they are used. That is, apart from the invoice price, which includes the cost, insurance, freight and taxes less discounts, other related expenses like cost of receiving, inspection storing and carrying, handling of materials and losses arising out of evaporation and breaking bulk, etc., which are otherwise charged to production overheads, are also added to determine material price for issues. This is not a separate method of pricing, but a principle, which can be adopted with any of the methods described earlier.

*Cost and Management Accounting***D.(III) Reuse Price**

It is a price which is used to value a material for its reuse. The method is used when a rejected or excess material is applied for an alternate use. The reuse price will naturally be lower than actual price. However, the price should be more than its scrap value.

**2.8 PRICING OF RETURNS, TRANSFERS, SHORTAGE AND EXCESS MATERIALS****A. Returns from Production to Stores**

Material Return Note shall be prepared by the production department returning materials to store with full description, code No. and quantity returned. If the price at which the material was issued to production department is known, then same price will be applied. If not, latest issue price will be applicable.

**B. Returns to Suppliers**

Sometimes materials are accepted after inspection, and yet are not usable by production department due to some defects which could not be detected at the time of inspection. These materials, after inspection by the suppliers, are returned to them. Such materials shall be valued at invoice price at which they were supplied originally.

**C. Transfer Inter-department**

Excess material of one job may be used by another job, if required, instead of returning the materials to stores and again requisitioning for other job. Similarly, excess material of one production department can be conveniently transferred to a neighbouring production department, if required by the latter, instead of returning to the stores. This saves double handling with associated loss. In both cases a Material Transfer Note shall be prepared by the transferor department indicating transfer from job/production department to the transferee job/department with description, code no. and quantity transferred, and receipted by the transferee department. One copy of the MTR shall be sent to stores while the original copy will be sent to costing department for pricing at the same rate at which the material was issued to the transferor department as per material requisition note.

**D. Shortage and excess found during Physical Verification**

The shortage or excess found during physical verification shall be entered in the issue column on the basis of stock verification adjustment note, and shall be valued at the last issue price depending on the method i.e. FIFO, LIFO, Wtd. average, etc. followed by the unit. Excess quantity should be shown as deduction from issues, and not as receipt.

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## **2.9 VALUATION OF CLOSING STOCK FOR BALANCE SHEET**

For the purpose of preparing annual income statement and balance sheet, closing stock has to be valued at lower of cost or net realisable, as per Indian Companies Act, 1956. International Accounting Standard has issued guidelines for valuation and presentation of inventories in the context of Historical Cost System (IAS - 2). Accordingly, inventories should be valued at lower of historical cost and realisable value. The Institute of Chartered Accountants of India has also issued a standard on valuation of inventories (AS-2), the basic principles of which are almost similar to IAS2, but the I.C.A. guidelines offer wider choice. The standards cover valuation of inventories which include raw-materials, components, work-in-progress, finished goods, and maintenance supplies and consumables other than machinery spares.

Usually, the value of closing stock as per cost records differs from the value taken for Balance Sheet. The method of valuing stores for Balance Sheet is independent of the system of pricing for costing purpose.

## **2.10 CLASSIFICATION, CODING AND COMPUTERISED MATERIAL ACCOUNTING**

### **Coding of Material**

Use of code numbers to all materials helps easy reference, understanding and accounting. Use of short description with a code number reduces clerical time to record transactions. In mechanised accounting and computer, coding is a must. Classification and accounting become easier and effective with a good coding structure.

Coding system may be alphabetic, numeric, alphanumeric, mnemonic or decimal. Any of the systems that fits well with the size and nature of the materials can be adopted. However, the system should be comprehensive, flexible and suitable for accounting requirements. Decimal system is most commonly used. Alphanumeric is also popular method of coding.

In a large organisation with multi-products using numerous materials and stores for production and maintenance, accurate stores recording and accounting is a difficult task. Enormous record-keeping needs plenty of clerical efforts. Even then, accuracy and timely completion of data and reporting are often not achieved. The monotony of the work also leads to find a method whereby the same can be avoided. Mechanised accounting system came as a great help to that direction. Today, most of the large organisations depend on computerised statements for material accounting and control. Right from the point of indenting and purchase to receipt, Issue and consumption of materials and stores are now computerised. The essential features of the system are as follows:

- i) Classification of materials into raw-materials, components or assemblies, semi-finished products, packing material, engineering supplies, and general supplies, depending on the nature of business.
- ii) Raw-materials and others can be also classified under indigenous and imported materials.

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- iii) Having classified all materials, a suitable code number for each material and group of materials shall be assigned. For example, a five digit code may be developed for chemicals, say Sulphuric Acid.

0	0	0	0	0
<i>Source</i>	<i>Group</i>	<i>Detail of each material</i>		
1 – Imported	1 – Chemical	110 – Sulphuric acid		
2 – local	2 – Plastics	120 – Nitric acid		
	3 – Metals			
	4 – Paper and board			

Thus, a Code No. 21110, will refer to Sulphuric acid procured from local market.

Units of measurement of materials are different. Hence, each of the units shall be coded such as 1 - for Pc, 2 - for litre, 3 - for Kg., etc.

Each of the suppliers also shall have code numbers, so that the same is indicated in the indents, purchase order, stores receipt note, stores return Memo, etc. for accounting .

For accounting of work-in-progress and finished goods, all products - intermediate and finished shall be coded. Even saleable scrap materials and seconds products require to be coded properly.

\*\* [ Students are advised to study the IAS-2 and AS-2 guidelines for inventory valuation.

## ◆ SPECIMEN QUESTIONS WITH ANSWERS

### Question 1:

- (a) What are the considerations that are to be kept in view while fixing the maximum and minimum levels of inventory in a large organisation.
- (b) 'ZEE' is a product manufactured out of three raw materials 'M', 'N' and 'Q'. Each unit of ZEE requires 10 Kgs, 8 Kgs, and 6 Kgs. of M, N and Q respectively. The reorder levels of 'M' and 'N' are 15000 kgs. and 10000 Kgs. respectively while the minimum level of 'Q' is 2500 Kgs. The weekly production of ZEE varies from 300 to 500 units, while the weekly average production is 400 units. You are required to compute –
- (i) the minimum stock level of M,
  - (ii) the maximum stock level of N, and
  - (iii) the reorder level of Q.

The following additional data are given:

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	<i>M</i>	<i>N</i>	<i>Q</i>
Reorder quantity (in Kgs.)	20000	15000	20000
Delivery (in weeks)			
Minimum	2	4	3
Average	3	5	4
Maximum	4	6	5

**Answer :**

- (a) Maximum stock level is that quantity of material above which the stock of any item should not generally be allowed to exceed. This level is fixed after taking into account such factors as :

- i) rate of consumption of material
- ii) storage space available
- iii) lead time from date of placing the order
- iv) nature of material
- v) amount of capital needed and is available
- vi) incidence of storage and insurance costs
- vii) risk of obsolescence and deterioration
- viii) reorder quantity.

$$\text{Maximum level} = \text{Reorder level} + \text{Reorder quantity} - (\text{Minimum consumption} \times \text{Minimum reorder period}).$$

Minimum stock level is the lower limit below which the stock of any item should not normally be allowed to fall. This is also known as safety stock or buffer stock. The prime considerations in fixing minimum stock level are —

- i) average rate of consumption
- ii) time required for replacement to avoid stoppage of production.

Minimum stock level = Reorder level – (Normal consumption × Normal reorder period *i.e.* average delivery time)

- (b) (i) Minimum stock level of M  
= Reorder level – (Normal usage or average usage × Average delivery time)  
= 15,000 kgs. – (400 units of Zee × 10 kg. per unit × 3 weeks)  
= 15,000 – 12,000 = 3,000 kgs.
- (ii) Maximum stock level of N  
= Reorder level + Reorder quantity – (Min. consumption × Minimum reorder period)  
= 10,000 kgs. + 15,000 kgs. – (300 × 8 × 4) kgs. = 15,400 kgs.
- (iii) Reorder level of Q = Maximum reorder period × Maximum usage  
= 5 × 500 × 6 = 15,000 kgs.

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**Question 2:**

Shown below is an extract from the stores ledger card for material X.

<i>Date</i>	<i>Qty.</i>	<i>Receipts</i>		<i>Qty.</i>	<i>Issues</i>		<i>Qty.</i>	<i>Balance</i>	
		<i>Value</i> <i>Rs.</i>	<i>Total</i> <i>Rs.</i>		<i>Value</i> <i>Rs.</i>	<i>Total</i> <i>Rs.</i>		<i>Value</i> <i>Rs.</i>	<i>Total</i> <i>Rs.</i>
April 1								8	84.40
April 12	10	10.50	105.00					18	189.40
April 15	12	10.29	123.48					30	312.88
April 20				4					
April 21				15					

**Required :**

Value the issues of April 20 and 21 using each of FIFO, LIFO and periodic weighted average methods and under each of the above three methods, show the value of the closing stock.

**[Notes to students]**

- Under FIFO, issues are taken from the oldest items in stock, under LIFO from the most recently purchased. Whatever the order of use, the full quantity of a purchase is used up before the balance of an issue is taken from the next purchase (at a different price).
- Under periodic weighted average valuation, the issue price is calculated by reference to all of the purchases in a period.
- If you cannot answer part (c) from knowledge, conduct a quick experiment using simple figures to consider how large or small cost of sales will be and how the value of stock carried forward will be affected if costs are rising.]

**Answer :**

	<i>Quantity</i>	<i>Issues</i>		<i>Rs.</i>	<i>Closing stock balance</i>		
		<i>Quantity</i>	<i>Value</i> <i>Rs.</i>		<i>Quantity</i>	<i>Value</i> <i>Rs.</i>	<i>Rs.</i>
<b>FIFO</b>							
April 20	4	10.55	42.20		4	10.55	42.20
					10	10.50	105.00
					12	10.29	123.48
							270.68
April 21	4	10.55	42.20		11	10.29	113.19
	10	10.50	105.00				
	1	10.29	10.29				
			157.49				

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<b>LIFO</b>						
April 20	4	10.29	41.16	8	10.29	82.32
				10	10.50	105.00
				8	10.55	84.40
						271.72
April 21	8	10.29	82.32	3	10.50	31.50
	7	10.50	73.50	8	10.55	84.40
			155.82			115.90

**Weighted average**

The closing stock on April 15 can be analysed as follows.

<i>Quantity</i>	<i>Value</i>	<i>Amount</i>
<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
8	10.55	84.40
10	10.50	105.00
12	10.29	123.48
30		312.88

Weighted average price = Rs.312.88/30= Rs.10.43

	<i>Issues</i>			<i>Closing stock balance</i>		
	<i>Quantity</i>	<i>Value</i>		<i>Quantity</i>	<i>Value</i>	
	<i>Rs.</i>	<i>Rs.</i>		<i>Rs.</i>	<i>Rs.</i>	
April 20	4	10.43	41.72	26	10.43	271.18
April 21	15	10.43	156.45	11	10.43	114.73

**Question 3 :**

- (a) Calculate the three missing stock control levels using the information shown below concerning component 896.

Component 896: Usage (last six months)

<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>August</i>
2,800	3,000	2,400	1,800	1,600	1,750

Component 896: Delivery pattern

<i>Order</i>	<i>Due</i>	<i>Received</i>
2.2.19X2	2.5.19X2	17.4.19X2
7.6.19X2	7.9.19X2	6.10.19X2
18.10.19X2	18.1.19X3	19.12.19X2
7.2.19X3	7.5.19X3	26.4.19X3
31.5.19X3	31.8.19X3	4.9.19X3

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Component 896 : control levels

Maximum stock: 17,000

Minimum stock: .....

Reorder level: .....

Reorder quantity: .....

- (b) Annual demand for material 7786 is 1,00,000 units. One unit of item 7786 costs Rs. 4 per annum to hold in stock. Ordering costs of the item, are Rs. 20 per order. What should the reorder quantity be in order to minimise the total costs associated with stock.
- (c) A company is deciding whether to place orders for a component monthly, quarterly or half-yearly. Using the information below prepare a schedule to show the associated cost of each option, and thereby determine the optimum policy.

Annual usage of component	720 units
Unit cost of component	Rs. 3.50
Cost of placing an order	Rs. 7.00
Stock holding cost as % of average stock value	25%

<i>Frequency of order</i>	<i>Order size</i>	<i>Average stock</i>	<i>Average stock value</i>	<i>Stock holding cost</i>	<i>Annual ordering costs</i>	<i>Total cost</i>
Monthly						
Quarterly						
Half-yearly						

**Answer :**

- (a) Reorder level = maximum usage x maximum lead time  
 = 3,000 units × 4 months  
 = 12,000 units
- Reorder quantity = maximum level – reorder level + (minimum usage × minimum lead time)  
 = 17,000 units - 12,000 units + (1,600 units x 2 months)  
 = 8,200 units
- Minimum stock = reorder level - (average usage x average lead time)  
 = 12,000 units - (2,225 units x 3 months)  
 = 5,325 units

$$(b) Q = \frac{\sqrt{2 \times 20 \times 1,00,000}}{4} = 1,000 \text{ units}$$

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(c)

<i>Frequency of order</i>	<i>Order size</i>	<i>Ave. stock</i>	<i>Average stock value</i> Rs.	<i>Stock holding cost</i> Rs.	<i>Annual ordering costs</i> Rs.	<i>Total cost</i> Rs.
Monthly	60	30	105	26.25	84	110.25
Quarterly	180	90	315	78.75	28	106.75
Half-yearly	360	180	630	157.50	14	171.50

The optimum policy to minimise total costs is to order quarterly, ordering 180 components each time.

**Question 4 :**

Z Ltd had the following transactions in one of its raw materials during April 19X3.

Opening stock		40 units	@ Rs.10 each
April 4	Bought	140 units	@ Rs.11 each
10	Used	90 units	
12	Bought	60 units	@ Rs. 20 each
13	Used	100 units	
16	Bought	200 units	@ Rs. 10 each
21	Used	70 units	
23	Used	80 units	
26	Bought	50 units	@ Rs. 20 each
29	Used	60 units	

*Required*

- (a) Write up the stores ledger account using the following methods of stock valuation.
  - (i) LIFO
  - (ii) FIFO
- (b) State the cost of material used for each system during April.
- (c) Describe the periodic weighted average method of valuing stocks and explain how the use of this method would affect the cost of materials used and the balance sheet of Z Ltd compared to FIFO and LIFO in times of consistently rising prices. (Do not restate the stores ledger card for the above transactions using this method)

**Answer :**

[Notes to students : Note that the information in part (a) describes a period of fluctuating (not consistently rising) prices; take care if you use part (a) to illustrate your answer. Some variation is possible, but the layout shown below (with correct entries) would have earned you full marks. Presentation is everything here the neater and more careful your edger, the less likely you are to make mistakes]

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(a) (i) LIFO Method

Date	Receipts		Issues			Stock Balance		
	Units	Price Rs.	Units	Price Rs.	Value Rs.	Units	Price Rs.	Value Rs.
April						40	10	40C
Bif								
4	140	11				140	11	1,54C
						180		1,94C
10			90	11	990			
			90		990			
						40	10	40C
						50	11	55C
						90		95C
12	60	12				60	12	72C
						150		1,67C
13			60	12	720			
			40	11	440			
			100		1,160			
						40	10	40C
						10	11	11C
						50		51C
16	200	10				200	10	2,00C
						250		2,51C
21			70	10	700		40	10
400								
						10	11	11C
						130	10	1,30C
						180		1,81C
23			80	10	800			
						40	10	40C
						10	11	11C
						50	10	50C
						100		101C
26	50	12				50	12	60C
						150		161C
29			50	12	600			
			10	10	100			
			60		700			
						40	10	40C
						10	11	11C
						40	10	40C
						90		91C

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## (ii) FIFO Method

Date	Receipts		Units	Issues		Stock Balance		
	Units	Price Rs.		Units	Price Rs.	Value Rs.	Units	Price Rs.
April b/fd						40	10	400
4	140	11				140	11	1,540
						180		1,940
10			40	10	400			
			50	11	550			
			90		950	90	11	990
12	60	12				60	12	720
						150		1,710
13			90	11	990			
			10	12	120			
			100		1110	50	12	600
16	200	10				200	10	2,000
						250		2,600
21			50	12	600			
			20	10	200			
			70		800	180	10	1,800
23			80	10	800	100	10	1,000
26	50	12				50	12	600
						150		1,600
29			60	10	600	40	10	400
						50	12	600
						90		1,000

## (b) Price of issues under FIFO and LIFO

Date	FIFO Rs.	LIFO Rs.
10	950	990
13	1,110	1,160
21	800	700
23	800	800
29	600	700
	4,260	4,350

- (c) Using the weighted average method each issue is charged out at a rate determined by dividing the total value of stock at that time by the total number of units held. Thus the issue on 10 April would be charged out at

$$\frac{90}{180} \times \text{Rs. } 1,940 = \text{Rs. } 970$$

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This is higher than the FIFO price and lower than the LIFO cost. The effect of rising prices can be seen in the first two entries in the stores ledger prepared for part (a).

(Not in later entries since the price is fluctuating.)

- (i) The profit and loss account is affected by stock issues and the charge (and hence the cost of sales) will be greater under LIFO than FIFO, and somewhere in between using the weighted average method.
- (ii) The balance sheet (closing stock) is affected by the stock balance which is greater under FIFO than LIFO, and would be somewhere in between under the weighted average method.

## ◆ TEST YOURSELF

### I. Objective Type Questions

1. Which of the following statements are correct?
  - (a) Inventory includes raw-materials, work-in-progress and finished goods.
  - (b) Economic order quantity is the reorder quantity.
  - (c) Bin cards indicate quantity and value of stores.
  - (d) Cenvat credit is allowed on the basis of central excise gate pass/documents.
  - (e) ABC analysis is made on the basis of unit price of materials.
  - (f) “Perpetual inventory system” and “continuous stock verification” are the same.
  - (g) In FIFO method, the effect of current market price is reflected in the cost of production.
  - (h) When maximum stock level is fixed, the stock in hand should not exceed that level.
  - (i) Stock level cannot be established when rate of consumption is erratic.
  - (j) Obsolete stock can be determined by the frequency of issues.
  - (k) Primary packing material is usually classified under indirect material.
  - (l) Under certain circumstances, small valued items of direct materials are treated as overheads.
  - (m) Under inflationary condition, use of FIFO method of valuing material issues results in overstatement of profit.
  - (n) Stock at the beginning of the period enters into the calculation of periodic average rate.
  - (o) Inventories should be valued as lower of historical and realisable value.

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## 2. Fill in the blanks:

- (a) Purchase department procures material on the basis of \_\_\_\_\_.
- (b) Stores receive materials on the authority of \_\_\_\_\_.
- (c) Stores prepares \_\_\_\_\_ and send materials to \_\_\_\_\_ for inspection.
- (d) Bin cards are maintained by \_\_\_\_\_ and stores ledger is maintained by \_\_\_\_\_ department.
- (e) \_\_\_\_\_ scheme allows relief to a manufacturer of dutiable goods on the excise duty.
- (f) \_\_\_\_\_ is the time taken to obtain replacement.
- (g) \_\_\_\_\_ shows how many times on an average stock is rotated during a particular period.
- (h) Small valued items are treated as \_\_\_\_\_ without routing them through the stores ledger.
- (i) \_\_\_\_\_ method of valuing material issue assumes that a fixed minimum quantity is always carried at original cost.
- (j) Non-standardised material, when procured for a specific job, is issued at \_\_\_\_\_.
- (k) \_\_\_\_\_ method of valuing material issue assumes that materials are issued in strict chronological order.
- (l) Two most important cost factors in fixing Economic Order Quantity are \_\_\_\_\_ and \_\_\_\_\_.
- (m) The method of valuing stock for Balance Sheet purpose is \_\_\_\_\_ of the system of pricing for costing purpose.
- (n) Recorder quantity refers to the quantity to be covered in \_\_\_\_\_ purchase order.

## 3. Select the most suitable answer from each of the following sets:

- (i) When stock exceeds the maximum level, actions should be initiated:
  - (a) to suspend procurement,
  - (b) to find out alternative uses,
  - (c) to review consumption pattern and reorder period.
- (ii) Reorder level is fixed by calculating:
  - (a) Maximum usage and normal lead time.
  - (b) Maximum usage and average lead time.
  - (c) Maximum usage and maximum lead time.

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- (iii) Stock-levels can be established where:
  - (a) rate of consumption is erratic.
  - (b) market to the material is uncertain.
  - (c) material is in common use.
- (iv) ABC analysis applicable to:
  - (a) Stock valuation
  - (b) Stock holding
  - (c) Stock discrepancies
- (v) Obsolete stocks are those:
  - (a) having low turnover rate.
  - (b) having no demand for technological change.
  - (c) having no present demand, but may be in future.
- (vi) Perpetual inventory system refers to:
  - (a) a method of maintaining stores,
  - (b) continuous verification of stores,
  - (c) a method of maintaining store records.
- (vii) Continuous physical verification is suitable for:
  - (a) Raw material
  - (b) Work-in-progress
  - (c) Finished stock.
- (viii) Which of the following is considered normal loss:
  - (a) Loss due to accident
  - (b) Pilferage
  - (c) Loss due to breaking bulk.
- (ix) In which of the following methods, issue of materials are priced at predetermined rate :-
  - (a) Specific price method
  - (b) Inflated price method
  - (c) Standard price method
  - (d) Replacement price method.
- (x) When prices fluctuate widely, the method that will even at the effect of fluctuations is:
  - (a) FIFO
  - (b) LIFO
  - (c) Simple average
  - (d) Weighted average.

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**II. DESCRIPTIVE QUESTIONS:**

1. Describe briefly the functions of the following departments with regard to stores control:
  - (a) Purchase
  - (b) Stores
  - (c) Production.
2. What is Economic Order quantity? What factors shall be considered in determining the size of an economic order? Illustrate with example.
3. As a newly appointed Cost Accountant you observe the following procedure adopted in the factory:
  - (a) All materials are received and passed into stores by the storekeeper who maintains bin cards as well as stores ledger.
  - (b) All invoices are received by purchase department and passed on to the stores ledger clerk at stores to record invoice value, and thereafter, sent to Accounts department for payment.
  - (c) All stores required for production purposes are taken by the department foreman from stores and requisitions are made for the quantity used, returning the unused quantity. Do you approve the aforesaid procedure.? If not, suggest an alternative procedure.
4. What do you understand by ABC analysis of inventory? What are the advantages derived from such analysis?
5. What are the different stock levels for standard items of stores used in a large manufacturing organisation? State how these levels are fixed. is it possible to fix such levels under all circumstances?
6. Explain with examples the following methods of pricing issues of material:
  - (a) FIFO,
  - (b) LIFO, and
  - (c) Weighted Average.

Under conditions of rising prices which of these methods would you recommend and why?
7. You are asked by your management to investigate and report, if there is any over investment of capital in raw-materials. frustrate your report with your own figures for any industry with which you are familiar.
8. Describe briefly the documents used in an organisation of fairly big size, from the time a material is received in a factory till it is used for consumption.
9. In addition to purchase prices of store, other expenses are incurred until they are used in the factory. How are you going to deal with them in cost accounts?

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10. Discuss briefly the Perpetual Inventory System of stores control. is it different from Continuous stocktaking?
11. What is stock turnover ratio? Explain three measures of stock turnover with suitable examples. Which of these do you prefer and why?
12. During stock-verification, discrepancies are detected between the bins card, stores ledger and physical count. What are the possible reasons for such discrepancies?  
‘Suggest a system by which these balances can be periodically reconciled.

**\*\* Students are advised to pickup more questions from the following text books and past question papers of ICWAI & CIMA (Lond.). Thereafter, problems given in the text books should be thoroughly studied, and problems given in the Exercise and Examination Questions in the text books should be solved as many as possible. For this portion, read :**

1. Chapters 3 to 6 from “**Cost Accounting Methods and Problems**” by **B. K.Bhar**.
2. Chapters 3 and 4 from “**Principles and Practice of Cost Accounting**’ by **Asish K. Bhattacharyya**.

## 3.0 LABOUR COST

### 3.1 INTRODUCTION

*Labour cost* is a significant element of cost specially in an organisation using more manual operations. It is the cost of human endeavour in the product and requires coordinated efforts for its control. The management objective of keeping labour cost as low as possible is achieved by balancing productivity with wages. The object is often achieved by paying higher wages to limited satisfied workmen with high productivity. Low wages do not necessarily mean low labour cost. In recent labour agreements, it has been found that substantial increase in wages has been granted against corresponding increase in productivity, thereby reducing labour cost per unit.

The gain is reflected both in labour cost as well as in overheads expense per unit, since overheads are distributed over larger volume. Again, the productivity of labour is quite flexible. Given right type of motivation and incentive, it can reach amazing scale. It does not have any limitation like machines. Lastly, in India, under existing regulations, wages may be considered as fixed cost or committed cost rather than discretionary cost. Once hired, it is very difficult to remove a worker, and therefore, efforts should be made to make best use by imparting proper training, giving better tools and providing favourable working conditions. To this end in view, the management has to design methods of controlling labour cost.

In a large organisation, the control of labour cost involves the coordinated efforts of the following departments :–

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- (a) **Personnel department** — This department is responsible for manpower planning, recruitment, training, maintaining records of staff and workmen and reporting to chief inspector of factories and to top management on performance, overtime, absenteeism, leave, etc.
- (b) **Industrial engineering department** — This department prepares plans and specifications of each job, supervises production activities, undertakes time and motion studies, performs job-analysis, etc.
- (c) **Time-office** — This department is primarily responsible for collection of data relating to attendance, time spent on jobs or process by the workmen, and providing information on attendance and leave to Payroll department.
- (d) **Payroll department** — This department is responsible for computing total and net earnings of each worker, preparation of payroll and maintenance of various records relating to payroll.
- (e) **Cost department** — This department collects and classifies all cost data relating to labour utilisation by departments, and allocates them to respective job or process as per available documents.

### **Direct and Indirect Labour Cost**

*Labour cost* may be classified into direct and indirect labour. Direct labour refers to the time spent in altering the construction, composition, conformation or conditions of the products manufactured. Thus, the time spent by a worker, identifiable with a particular job or process or operation is a direct labour and is considered directly variable with the output. All other labour hours spent for the running of the factory in general, and cannot be directly identified with a job or process or operation are treated as Indirect labour. Examples of indirect labour are salaries and wages paid to Inspectors, supervisors, maintenance staff, assistants in purchase, stores and offices, security staff, etc. Again, workers- of production department engaged in productive job or process are called direct workers. Labour hours of direct workers, which cannot be identified with a job or process, such as idle time, waiting time, etc. shall be treated as Indirect labour. Same treatment is made when direct workers assist maintenance staff in machine repairs. Strictly speaking the distinction between direct and indirect labour depends on the nature of work, practicability and expediency. The distinction is important because while direct labour is charged to product cost, indirect labour is treated as a part of overheads expense. Direct labour being variable can be easily controlled. But indirect labour cost has to be controlled by preparing budget for each department and comparing actuals against budget periodically.

### **3.2 MANPOWER PLANNING, RECRUITMENT AND TRAINING**

Personnel or human resources department generally assess the requirement of man power at various levels of the organisation. Factors such as nature of activities, operations, promotions and retirement, rate of labour turnover, etc. are considered along with legal restrictions, if any,

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arising out of labour laws in force. Again, in India the labour laws restrict lay off of workers, unless approval is obtained from the Government. Hence, extreme care is normally taken before hiring a worker or filling a vacancy.

Personnel department initiates action for recruitment after obtaining authorisation from proper authority. The department looks for the correct candidate from within the organisation, failing which releases advertisement in the paper or contacts agency or employment exchange. After screening, candidates are normally put to test and interview in one or two rounds. Appointment letter is issued to the successful candidates specifying position, grade, job description and other usual terms and conditions of service. A copy of the letter is accepted and returned by the candidate, which is maintained in his service file. Copies of the same letter are sent to payroll department as authorisation for inclusion in pay-sheet, and to the head of the department concerned for information and record.

The personnel department arranges for induction and training programme of the newly appointed employee. The department maintains service history cards for all employees giving details of his name, address, date of birth, qualifications, experience, dates of joining and separation, change in pay and service and leave records.

### **3.3 ATTENDANCE AND TIME RECORDING**

Labour cost is essentially purchase of time from the employees at a price. Hence, the recording of his arrival, departure and utilisation of time in productive and other activities should be accurate. There are two aspects of recording :

- (a) Attendance - i.e. entry-time to the factory, and department, and exit time.
- (b) Time-booking - i.e. distribution of time present and paid over jobs or process or operations as well as in idle time or other indirect work.

The record of attendance is used for satisfying statutory requirements and for calculating earning of the employee while the record of time-booking helps allocating costs to jobs or process or operations and overheads expenses.

#### **Timekeeping**

Various methods of recording attendance are available, which may be grouped under manual and mechanical methods, as under:

- (a) **Manual methods :**
  - (1) **Attendance register method:** Under this method, an attendance register is kept at the entrance of the factory and the worker's in and out timing at the factory gate are noted, either by the worker himself or by a staff of the time office. Later, entries are made to the individual attendance records of the workmen.

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- (2) **Disc method:** Under this method, metal discs bearing employee's numbers allotted by the personnel department are placed on hooks on a board provided either at the gate or at the entrance of the department. On entering the factory, the worker removes the disc bearing his number from the board and places it in a box kept for this purpose. The box is taken away as soon as normal reporting time is over. A worker coming late will pick up the disc and put it in the "Late" box provided in the department. Such late box is normally changed every half an hour upto the maximum late attendance time allowed. The timekeeper records the attendance in the register on the basis of these discs.

(b) **Mechanical methods :**

Under this method, attendance cards are used in time clocks installed at the entrance of the factory or department. On entering the factory, the worker takes his card from 'OUT' racks and press it inside the clock, which will print arrival time in 'IN' column. He then places it in 'IN' rack of the department where he reports for duty. Late attendance is normally reported in red ink. Similarly, when the employee leaves the factory, he collects the card from the 'IN' rack and punches the time in the clock and keeps it in the 'OUT' rack. It is necessary that the timekeeping staff are present at the time of punching the cards to supervise the procedure. The clock cards are Collected by the timekeeping staff daily or weekly for recording in Statutory Attendance Register. Such cards are normally used for two-week period.

Some of the recent time clocks are hooked with mainframe computer, so that with the recording of time, the data is automatically processed for the purpose of the payroll as well as daily, weekly and monthly reports.

Correct recording of attendance time is very important where wages are paid on the basis of time worked. Where payment is made by results, such as, by piece rate method, it would still be necessary to record correctly the 'in' and 'out' timings.

### **3.4 TIME BOOKING**

Time booking refers to actual utilisation of time in the concerned department, job or process or operation. Proper accounting of labour cost requires an analysis of time purchased, whether the same is recorded manually or by clock cards. The following documents are generally maintained for the purpose, depending upon the size of the organisation, the degree of mechanisation, the extent of accuracy required, etc.

- (a) Job card or job ticket
- (b) Daily time sheet
- (c) Weekly time sheet.

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#### **Job-Card or Job-Ticket**

A job card or job ticket is used to record the time spent on each job, having a specified work order or job order number. Job cards may be of two types, one, which is a job order cost card, and contains information regarding material consumption as well as time spent by operators. The other one is, in effect, a job ticket, which is issued to an operator by the supervisor and contains only the operation details. When the operator starts the work, he records the time either manually or through time recording clock on the card. The finishing time is recorded when the operation is completed. If there is any break in between, then time

‘out’ and time ‘in’ are also recorded indicating hours not used on job and shall be considered indirect labour hours. When the job is completed, the operator deposits the card with the supervisor, and collects the next job ticket. At the end of each day, the time-keeper collects all these cards and records the time for each job or process or operation.

#### **Daily time sheet**

Daily time sheets are maintained where card time recorders are not used. Each worker is provided with a daily time sheet, in which he records the particulars of time spent on each job. This is mostly used where a number of small jobs are undertaken during the working hours. The sheet is completed daily and handed over to the supervisor concerned, who in turn, initials the same after scrutiny, as a check for correctness.

#### **Weekly time sheet**

Weekly time sheets are similar to daily time sheets with the difference that the worker records all jobs undertaken during the week. Since there is a tendency to fill in the sheets from memory once or twice a week instead of daily posting, chances of error creeping in the actual time spent are more. Often idle time or waste time is not reported correctly. This can be avoided by initialling the Sheet daily by the Supervisor.

### **Reconciliation of Attendance hour with time booked**

Time recorded at the gate or at the department as evidenced by clock card or attendance register must reconcile with the hours spent in the department in job or process or operation along with idle or wasted time. Time office should compare the number of workmen as per time office record with that shown by the department within the working hours i.e. within the same shift. Thereafter, total working hours of all workmen in the department must tally with the hours spent in the various jobs and operations and idle time. For this purpose, and for accounting of indirect labour cost, along with the job card, an idle time card indicating reasons for waiting and time spent for each reason should be prepared by each worker. Similarly, idle time details shall be mentioned in daily time sheet and weekly time sheet.

If clock card shows more hours as compared to total time booked on various jobs/products or operations, the difference is reported as idle time. If total hours booked are more than those recorded on clock cards, the error is rectified in consultation with the supervisor and workmen

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concerned. Where time keeping has been computerised, the reconciliation of attendance hours with time booked is done through computers.

For further detail refer the text book “**Cost Accounting Methods and Problems**” by **B.K. Bhar**

### 3.5 REMUNERATION METHODS AND INCENTIVE SCHEMES

Remuneration is the reward for labour and service while incentives are stimulation for extra effort to perform more efficiently by way of monetary and/or non-monetary inducements. Remuneration includes salaries and wages, commission, various allowances and statutory bonus. Monetary incentives refer to those payments which are made in excess over time-rates and piece-rates, and are related to the output of either an individual or a group. We shall discuss in detail afterwards.

#### Remuneration systems

Wages are paid either on time basis or on output basis. When employees are paid as per hours worked irrespective of the quantum of output produced, the system is called time-rate. When payment is made on the basis of production or output only, it is called piece-rate. A combination of both time-rate and piece-rate is also used. When incentives and bonus are added, various methods of remuneration may be obtained, which are classified as follows :

- |  |   |
|--|---|
| (A) Time rates                           | <ul style="list-style-type: none"> <li>i) Ordinary level</li> <li>ii) High wage level</li> <li>iii) Graduated</li> </ul>  |
| (B) Piece rates                          | <ul style="list-style-type: none"> <li>i) Straight piece rate</li> <li>ii) With guaranteed daily rate.</li> <li>iii) Differential piece rates               <ul style="list-style-type: none"> <li>— Taylor Plan</li> <li>— Merrick Plan</li> </ul> </li> </ul> |
| (C) Combination of time<br>& piece rates | <ul style="list-style-type: none"> <li>i) Emerson’s efficiency scheme</li> <li>ii) Gantt task bonus scheme</li> <li>iii) Bedaux scheme</li> </ul>   |
| (D) Bonus system                         | <p><i>Individual bonus —</i></p> <ul style="list-style-type: none"> <li>i) Halsey scheme</li> <li>ii) Halsey Weir scheme</li> <li>iii) Rowan scheme</li> <li>iv) Barth scheme</li> <li>v) Accelerating premium bonus.</li> </ul>                                |

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(E) Bonus system

*Group bonus —*

- i) Priestman's production bonus
- ii) Rucker plan
- iii) Scanlon plan
- iv) Towne gain sharing plan

(F) Other incentive schemes

*Monetary —*

- i) Profit-sharing
- ii) Copartnership

The aforesaid methods are discussed hereinafter.

**A.(I) Time Rate at Ordinary Level**

Under this method, payment is made on the basis of time worked, irrespective of the output. Payment may be made daily, weekly, fortnightly or monthly according to the convention and convenience of the organisation. However, such payment must be in conformity with the existing legislation including Minimum Wages Act. Normal wages are calculated for hours worked multiplied by hourly rate of wages. Any overtime work is paid extra.

Application of time rate system is preferred in the following cases :-

1. Where the work demands high degree of skill and quality of production is of utmost importance.
2. Where services cannot be directly measured, e.g. general helper, supervisory and clerical staff.
3. Where machine performs the job and workers have no control over the output as in process industries.
4. Where work is not repetitive, and
5. Where the unit is small and the work requires close supervision.

*Advantages* of the system are as follows:

- (a) Easy to understand and operate.
- (b) Easy to calculate, and hence, less clerical work involved.
- (c) Easier to negotiate rate with the employees and the unions.

*Disadvantages* of the system are as follows:

- (a) No incentive to increase the output.
- (b) No distinction between slow, inefficient, fast and efficient workers.
- (c) Fails to attract better workers.
- (d) Cost per unit is not known in advance.

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#### **A.(ii) Time Rate at High Wages Level**

This method is similar to the earlier one, with the difference that time rates are fixed at a higher level compared to rates prevailing in the industry in the neighbouring areas. Overtime is normally not paid. The object is to attract efficient employees who can meet with higher level of productivity, thereby reducing cost per unit in respect of labour as well as overheads. It is very difficult to maintain high level of efficiency over a long period unless adequate measure is taken to keep a careful watch over performance of individual employees. Alternatively, the management can create a work-culture by which the employees are motivated to maintain a sustained level of high productivity.

#### **A.(iii) Graduated Time Rate**

Under this method, time rate consists of two elements, such as basic rate which is fixed with the nature of job, and variable element like dearness allowance which depends on local cost of living index, and merit awards for personal qualities of the employee. Though the scheme is favourable to both employer and employees, the determination of a wage index is difficult. The system is complicated and difficult to administer multiple rates for each class of workers.

#### **B.(i) Straight Piece Rate**

Under this system, payment is made on the basis of a fixed amount per unit of output irrespective of time taken. Worker's earning equals to the number of units produced multiplied by rate per unit. Piece-rate may be fixed on the basis of standard time required to produce one unit. The rate is expressed per standard hour. For example, if rate per straight piece rate is Rs. 2 per unit, and two units can be produced in one standard hour, then standard hour piece rate will be fixed at Rs. 4. Hence, if a worker produces 10 pieces, it will be expressed as 5 standard hours and the worker will earn Rs.  $4 \times 5 = \text{Rs. } 20$ .

Considerable care and judgment are required for fixing piece-rate, as any loose norm will increase labour cost and too high standard will create discontent and may lead to labour unrest. Again, once norm is fixed low, it is very difficult to change it. Piece-rate should, therefore, be determined after time and motion study followed by trial runs. Another requirement for Piece-rate system is that the jobs should be repetitive and standard type, and there should be sufficient jobs to feed the workers continuously. Daily rate as per Minimum Wages Act may have to be paid whose piece-rate will be less than time-rate.

*Advantages* of the piece-rate system are as follows :-

- a) The system is simple to operate and easy to understand.
- b) Workers get payment by results, and hence, shall continue to improve and earn more.
- c) Employer is benefited by reduced overhead cost per unit.
- d) Labour cost per unit is known in advance and helps price fixation.

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*Disadvantages* of the system are as follows :-

- a) There is risk of quality to suffer.
- b) Increasing production may lead to more defective and spoilage, loss of material, damage of tools and machines, unless supervision is intensified.
- c) Overstrain on the part of the workers will cause frequent absenteeism and bad health.
- d) Involves more clerical work and document.
- e) Maintenance of discipline for arrival and departure may be a problem.

**B. (II) Piece Rate with Guaranteed Daily Rate**

Under this system, daily or hourly rate is guaranteed to those workmen who cannot achieve the piece-rate norm, and whose earning remains below minimum wages level prescribed by the payment of Minimum Wages Act. When piece-rate earnings fall below time-rate earnings, his time-rate earnings are paid. An alternative plan is guaranteed wages according to time rate plus a piece-rate payment for units above a required minimum. Such a system can operate with a fair production volume or standard by conscientious workers, who will not push the guaranteed time-rate to a high level and thereby, defeating the purpose of piece-rate.

**B.(III) Differential Piece Rate**

F.W. Taylor, the father of scientific management, introduced differential piece rates in terms of money — a lower piece rate for those who failed to achieve the standard, and a higher piece rate for those who achieved or excelled the performance standard.

Workers were paid as per rates applicable to their output. The difference between the lower and higher piece rates were kept so wide, that an efficient worker was amply rewarded, while a slow worker was punished. There was no guaranteed minimum wages. This is called Taylor's Differential Piece Rate System.

The following table illustrates the unit cost and earning relationships of five workers who are paid as per this plan :-

1. Standard production 12 pieces per hour.
2. Normal piece rate @ Re. 1 per piece.
3. Differential to be applied @ 90% when below standard, and @ 110% when at or above standard.

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<i>Worker</i>	<i>Output in 8 hrs. Pcs.</i>	<i>Lower rate Rs.</i>	<i>Higher rate Rs</i>	<i>Total earning Rs.</i>	<i>Hourly earning Rs.</i>	<i>Overhead per pce. Rs</i>
A	90	0.90	1.10	81.00	10.125	2.778
B	95	0.90	1.10	85.50	10.688	2.632
C	96	0.90	1.10	105.60	13.200	2.604
D	100	0.90	1.10	110.00	13.750	2.500
E	110	0.90	1.10	121.00	15.125	2.273

**NOTE :** If overhead per day is Rs. 250, the overhead cost per unit reduces significantly with increased output.

*Advantages* of the system are as follows:

- a) Simple to understand and calculate.
- b) High incentive attracts efficient worker.
- c) Where overheads are high, it is more beneficial as reduction of cost per unit of overheads cost more than compensates increased labour cost.

*Disadvantages* of the system lies in the fixation of higher and lower piece rate differential as any error may cause a disastrous effect.

**Merrick Multiple Piece Rate** plan enlarged the differential into three rates, recognising the difference between beginners, average workers and superior workers None of the rates are below normal rate. In fact, the first piece-rate is adopted at 83 % of the normal rate as indicated below:

<i>Efficiency level</i>	<i>Piece rate applicable</i>
— Upto 83 1/3%	Normal
— Beyond 83 1/3% and	10% above normal rate upto 100%
— Above 100%	30% above normal rate

Thus, this plan rewards the efficient worker and encourages the less efficient workers to increase their output. This method also does not guarantee day wages.

### C. Combination of Time and Piece Rates

#### (I) Emerson's Efficiency Scheme

The main features of this scheme are :-

- a) Day wages are guaranteed.
- b) A standard time is set for each job or operation. Alternatively, a volume of output is taken as standard.
- c) Worker is paid his hourly rate below 66 2/3% efficiency.

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- d) From 66 2/3% till 100% efficiency, payment is made at step bonus rate running from 1 % at 66 2/3% level to 20% at 100% level. The appropriate rate can be read from specially compiled tables.
- e) Additional bonus of 1 % of the hourly rate is added for each 1 % increase of efficiency above 100% .

The following **example** will illustrate the plan: Time-rate — Rs. 8 per hour. Standard production per week of 40 hours: 600 Pcs.

<i>Efficiency standard</i>	<i>Bonus</i>
%	%
66 2/3 – 75	1
76 – 80	2
81 – 85	4
86 – 95	10
96 – 100	20

**Calculation:**

<i>Worker</i>	<i>Production</i>	<i>Efficiency</i>	<i>Bonus</i>	<i>Total</i>	<i>Cost</i>	
<i>pcs.</i>	<i>per week</i>	<i>%</i>	<i>%</i>	<i>Amount</i>	<i>wages</i>	
				<i>Rs.</i>	<i>Rs.</i>	
					<i>per unit</i>	
					<i>Rs.</i>	
A	390	65	-	-	320.00	0.82
B	400	67	1	3.20	323.20	0.81
C	460	77	2	6.40	326.40	0.79
D	500	83	4	12.80	332.80	0.67
E	550	92	10	32.00	352.00	0.64
F	580	97	20	64.00	384.00	0.66
C	600	100	20	64.00	384.00	0.64
H	620	103	23	73.60	393.60	0.63

**(II) Gantt Task and Bonus Scheme**

This is a combined time, bonus and piece-rate plan using the differential piece-rate principle. Its main features are :-

- Daily wages are guaranteed.
- Standards set and bonus is paid if work is completed within the Standard time allowed.
- Performance below standard is paid on the hourly rate basis.
- Performance at standard is paid with bonus of usually 20% of the time-rate.
- Performance above standard is paid at high piece-rate on his total output. The Supervisor may also receive bonus, if the workers under him qualify for it.

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The piece-rate and bonus rates are fixed for each job and when a job is completed, the worker moves on to the next job. His earning, therefore, consists of his daily wages plus the sum of all bonuses of the job, if he reaches above standard. Thus, this plan provides an incentive for efficient worker to reach a high level of performance and also protects the less skilled workers. This plan is particularly suited to quality production conditions and where fixed overheads are high relative to labour cost.

*Advantages :*

- a) Very effective scheme, providing both adequate security and real incentive.
- b) Simple to understand.
- c) Stimulates better supervision.

*Disadvantages :*

- a) Extreme care should be taken to fix the standard and piece-rate.
- b) High guaranteed time-rate may frustrate the scheme.

### **(III) Bedaux or Point Scheme**

Under this system, hourly rate is guaranteed upto standard, and beyond that benefits from time saved are shared between workers and supervisors in the ratio of 75: 25. Bedaux expressed his standards in terms of Bedaux Point or “B” which is equal to one minute. An average worker is expected to earn 60 Bs in one hour without any extra effort. The standard “B” in each job is determined by accurate time and work study. For example, if standard points for a job is 480 Bs and actual number of points earned in eight hours is 560 Bs, and the rate of pay is Rs. 8 per hour. As per the original Bedaux Point Plan, his earning will be as follows :-

$$\begin{aligned}
 & (\text{Rs.}8 \times 8) + (75\% \text{ of } 80/60 \times \text{Rs.}8) \\
 & = \text{Rs. } 64 + 0.75 \times (80/60) \times 8 \\
 & = \text{Rs. } 64 + \text{Rs. } 8 \\
 & = \text{Rs. } 72.
 \end{aligned}$$

According to modified Bedaux scheme, the workers receive 100% of the bonus instead of original 75%.

This scheme is suitable where the output can be measured accurately under standardised condition.

*Advantages* of the system lies in the fact that it is flexible and can be used as an excellent basis for scientific management and evaluation of job. It requires strong managerial control.

*Disadvantages* of the system are as follows:

- a) Expensive to operate due to more clerical work.
- b) Needs strict supervision to control wastage, as workers tend to hurry up.

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#### D. Bonus System – Individual Bonus

Three schemes under this system combine time wages with bonus for time saved. Under Halsey Plan, the worker receives his guaranteed time wages whether he completes the job or operation within standard hour fixed. However, he gets bonus equal to 50% of wages for the time saved in addition to his normal time wages.

Under Halsey-Weir plan, the premium is set at 30% of the time saved. Other features are similar to Halsey Plan. For example, Normal hourly rate is Rs. 5 per hour, Standard hour for a job is 8 hours, and time taken is 6 hours, then the total earnings under Halsey plan will be:

$$(8 \times \text{Rs. } 5) + 50\% \text{ of } (8 - 6) \times \text{Rs. } 5 = 40 + 50\% \text{ of } 10 = \text{Rs. } 45$$

and under Halsey-Weir plan will be :

$$(8 \times \text{Rs. } 5) + 30\% \text{ of } (8 - 6) \times \text{Rs. } 5 = 40 + 30\% \text{ of } \text{Rs. } 10 = \text{Rs. } 43.$$

##### *Advantages*

- a) Simple to understand and operate.
- b) Efficient workers will be able to increase their earnings, while slow workers will not be penalised as they are assured of day wages.
- c) Employer will save 50% of the wages for time saved, and will therefore be interested to maintain machinery and equipment in good running condition.

##### *Disadvantages*

- a) Increase in productivity results in lower conversion cost. As a result employer gains more with the worker's efficiency. Therefore, the workers may object to share their bonus with the employer.
- b) Compared to other incentives schemes, this is not strong enough to induce efficient workers to work harder.

#### (III) Rowan Plan

Under this system, bonus is determined by the ratio of time saved to the allowed time. Normal time wages is guaranteed. Standard time is determined by multiplying actual output with time allowed per unit. Taking normal wage rate at Rs. 12 per hour and standard performance as 12 units per hour, the earning of workers for 40 hours a week will be as follows:

<i>Worker</i>	<i>Output Units</i>	<i>Standard hours produced</i>	<i>Time saved</i>	<i>Bonus Rs.</i>	<i>Total earning Rs.</i>	<i>Earning per hour Rs.</i>
A	432	36	–4	Nil	480.00	12.00
B	480	40	—	Nil	480.00	12.00
C	528	44	4	43.64	523.64	13.09
D	600	50	10	96.00	576.00	14.40
E	720	60	20	160.00	640.00	16.00

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**Calculation:**

Bonus = (Time saved/Time allowed) × Basic wages.

Let us take time allowed for Worker C i.e.  $528 \times (1/12) = 44$  hours.

Hence, bonus payable will be 4 divided by 44 times Rs. 480 = Rs. 43.64. It is evident from the above table that though it provides sufficient incentive to workers to improve their efficiency, they can earn only a part of the savings. This may work as a safeguard against workers indifference to quality in order to increase their earnings.

**D.(IV) Barth Scheme**

Under this scheme, day wages are not guaranteed and payment is also not proportional to output. Wages are arrived at by multiplying hourly rate by the square root of the product of time allowed and time taken. In other words,

Earning = Hourly rate ×  $\sqrt{\text{Time allowed} \times \text{Time taken}}$

For example, if hourly rate is Rs. 3, time allowed is 5 Hrs. and actual time taken is 6 Hrs, the earnings will be :

$$= 3 \times \sqrt{5 \times 6} = 3 \times 5.48 = \text{Rs. } 16.44$$

and hourly rate will be Rs. 2.74.

If he does in time, he gets Rs.  $3 \times 5 = \text{Rs. } 15.00$ .

If he does the job in 4 hours, his earnings will be

$$= 3 \times \sqrt{5 \times 4} = 3 \times 4.47 = \text{Rs. } 13.41$$

and his hourly rate will be @ Rs. 3.35.

It is evident that when efficiency increases, the rate of increase in the total earnings fall. This plan is useful for beginners, trainees and unskilled workers.

**D.(V) Accelerating Premium Bonus**

Under this scheme, bonus increases at a faster rate. There is no simple formula for the scheme. Generally, it is not considered suitable for workers, but is eminently suitable for supervisors and foremen who have to extract maximum output from workers.

A popular scheme is available by the graph of  $y = 0.8x^2$  where x is percentage efficiency and y is earnings.

Percentage efficiency	100	120	130	150
x	1	1.2	1.3	1.5
x <sup>2</sup>	1	1.44	1.69	2.25
y = 0.8 x <sup>2</sup>	0.8	1.15	1.35	1.80
Percentage earning = y×100	80	115	135	180

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### **E. Group Bonus Schemes**

We have so far discussed about bonus payable to individual worker on the basis of their effort. However, in some areas, bonus scheme for a group of workers is required, specially when,

- a) it is difficult to assess the performance of individual workers,
- b) the output depends on the combined effort of the workers, and,
- c) to create interest among the indirect workers who contribute generally for increase of overall output.

Group incentive scheme may be applicable for small groups to the factory as a whole. The advantages of the scheme are as follows :-

- i) Comparatively easy to measure the output.
- ii) Economic administration as less clerical work is involved.
- iii) Creates a team spirit.

The disadvantages are that efficient workers are not properly rewarded, and inefficient workers share equally with the efficient ones. The various group bonus schemes are given below.

#### **E.(I) Priestman's Production Bonus**

Under this method, a standard in terms of units or points is fixed. If actual output measured similarly exceeds the standard, the workers will receive a bonus in proportion to the increase. For example, if actual output is 1200 tonnes as against 1000 tonnes standard for the month, the workers will get a bonus equal to 20% of their wages, since output is 20% above the standard.

#### **E.(II) Rucker Plan**

Under this plan, employees receive a constant proportion of value added. As per CIMA terminology, 'value added' is defined as the increase in realisable value resulting from an alteration in form, location or availability of a product or service, excluding the cost of purchased material and services. Unlike conversion cost, value added includes profit. Value added can therefore be calculated as:

- (a) Sales value less cost of all purchased materials and services such as, power and fuel;  
or
- (b) Direct labour plus production overheads plus gross profit.

If the ratio of direct labour to value added at 75 per cent, is taken as standard, and if actual ratio is 72 percent, then 3 percent of actual value added is distributed as bonus, so that the ratio of direct labour to value added is retained at 75%. Generally, two thirds of bonus earned in a month is distributed, and balance one third is carried forward to a reserve fund to be used in a month in which performance falls below standard.

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This plan appears to be a more satisfactory method than the normal profit sharing method, because the workers may be motivated to seek opportunities to perform the jobs more efficiently, use machines and materials more economically and reduce value added to earn more.

#### **E. (III) Scanlon Plan**

This plan is similar to Rucker plan, except that the ratio of direct labour to sales value of production is adopted instead of direct labour to value added.

#### **E. (IV) Towne Gain Sharing Plan**

As per this plan, 50% of gain is calculated on the basis of reduction of labour cost against standard labour cost is paid to individual workers pro-rata in addition to their wages.

#### **F. Other Incentive Schemes**

These schemes do not relate to the performance of the individual or group workers directly. Workers receive additional remuneration, a share in the company or better amenities and perquisites to remain attracted to the company and share with its prosperity. Such indirect incentives may be grouped under:

- (a) Indirect monetary incentives, and
- (b) Indirect non-monetary incentives.

Indirect monetary incentives include profit sharing and copartnership, which are becoming more important nowadays.

#### **F.(I) Profit-Sharing**

*Profit sharing* refers to a scheme of additional payment to the employees over and above their normal wages and incentives - whether individual or group - by way of sharing the profit earned during the year. Such payments are made in cash after finalisation of accounts at certain mutually agreed rate between the employer and the employees. In India, this distribution of available surplus becomes a source of perennial dispute between the employers and the employees. The Payment of Bonus Act, was introduced in 1965 with a view to settle such disputes. The minimum and maximum bonus payable has been fixed at 8 1/3% and 20% respectively upto a certain wage limit. The minimum bonus is payable, even if no profit is generated.

Apart from profit bonus, there are some other schemes wherein a portion of the profit is invested by the employer, so that after retirement or separation from the organisation, the employee gets some benefit.

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### **F.(II) Co-partnership**

Under this scheme, employees are allowed to have a share in the capital as well as profit of the business. The shares held by the employees may or may not have voting rights. Companies often allow loans to buy shares. This scheme is expected to create a sense of belonging and partnership, which will encourage them to be more careful in using costly materials and machineries, and contribute effectively towards prosperity and growth of the company.

However, the following limitations may come in the way of reaching its objective:

- (i) Quantum of dividend is too small, and that too is paid long after the year ending.
- (ii) Profit depends upon managerial efficiency, and has no direct relationship with worker's efficiency.
- (iii) It weakens worker's loyalty to trade union.

### **Incentive to Indirect Labour**

Performance of indirect workers such as supervisors, maintenance, stores, office and canteen staff cannot be measured directly, and therefore, introduction of incentive scheme for them poses a problem. But it is essential to provide incentive to them as much as to the direct workers due to the following reasons:

- a) Indirect workers maintain the facilities for production. Without this, it would be difficult for direct workers to get incentives for better performance.
- b) It is unfair to deprive indirect workers from incentives because it is difficult to measure their performance.
- c) If direct workers enjoy incentives, and indirect workers remain without incentives, it would lead to gross dissatisfaction among the latter resulting in poor maintenance and ultimately lead to labour unrest.

On the other hand, an incentive system for indirect workers will assist in maintaining high efficiency levels at service cost centres and will create a good team spirit between direct and indirect workers.

For the purpose of incentives, indirect workers may be grouped as under:

- (a) Those working with direct workers, such as supervisors, inspectors, checkers, transport workers, etc.
- (b) Those rendering general service, such as, sweepers, canteen workers, maintenance workers, stores, dispensary, time office and other office staff, etc. For the first group, bonus may be based on the output of direct workers with whom they are attached. Under this group, wherever standard can be established say, for material handling, inspection, regular repair, etc. incentive can be based on those standards. For the second group, bonus to be paid shall be determined on a wider basis considering output of department or the factory as a whole, or a percentage of bonus payable to direct workers, etc.

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In designing the incentive scheme, the following general principles should be considered:

1. Payment of incentives should be made at regular interval, preferably biweekly or monthly
2. Payments should be related to results which should also be published.

### **Non-Monetary Incentives**

Incentives to the workmen could be given by way of good working environment, facilities for various needs of the employees and some free benefits which are not related to job functions. The range of non-monetary incentive is too wide. The objectives of such incentives are as follows :-

- (a) making condition of employment more attractive,
- (b) promoting better health,
- (c) reducing absenteeism,
- (d) encouraging loyalty,
- (e) minimising labour turnover, and
- (f) maintaining a happy and contented staff.

Non-monetary incentives may be offered in several ways, - some of which may be free, while others may be subsidised. A few examples are quoted below :-

- (a) Canteen — free or subsidised.
- (b) Fair Price shop — subsidised.
- (c) Medical facilities for employee and his family.
- (d) Education and training facilities — to the employee and his children.
- (e) Recreation club
- (f) Housing facility
- (g) Other welfare facilities like holding sports, annual day, long service awards.
- (h) Funds contribution - subsidies to sick and benevolent funds.

**\*\* — Students are advised to study the remuneration methods from other angles, such as, “Grouping all incentive plans where workers receive all the gains above standard” or “Grouping of all incentive plans where the workers share the gain with the employer”.**

**— Prepare charts showing differences between various incentive schemes, and tabulate their advantages and disadvantages.**

**— Solve yourself all worked out problems on labour remuneration from Chapter 8 of B. K. Bhar’s “Cost Accounting Methods and Problems”.**

### **3.6 BASIC PRINCIPLES OF REMUNERATION**

Having discussed the various methods of remunerating labour, it is necessary to sum up the principles underlying the methods. It is true that methods differ from unit to unit according to industry practice, requirements of individual concerns, labour rates prevailing in the neighbouring localities, cost of living index and employer's capacity to pay. The basic principles to be considered while selecting a wage payment system are mentioned below:

1. The method of payment should be simple, easy to understand and to calculate.
2. Fair wages for day's work should be assured.
3. Wage rate should be commensurate with the demand of the job, requiring individual skill, effort and initiative of the worker. In other words, there should be proper reward for work done.
4. System should provide incentive to achieve higher productivity. A higher output reduces labour cost as well as overhead cost per unit.
5. Workers should be satisfied with the method of payment.
6. The system should be economical to administer.
7. The system should assure quality of the product.
8. The system should control waste of material as well as defectives.

It should be remembered that the system of wage payment affects labour cost directly. A small incentive amount increases labour cost, but at the same time increases output. A higher output reduces overhead cost per unit, since the fixed overhead expenses are distributed over a larger units of output. This is very important where fixed expense is significant and represents sizeable amount of the total cost.

### **3.7 MEASUREMENT OF LABOUR EFFICIENCY AND PRODUCTIVITY**

In order to introduce a good remuneration system, it is necessary to know the contents of the job or operation that an employee is expected to perform. A detailed analysis of each job and operation will reveal its characteristics and scope for improvement, and lead to establish methods for measurement of efforts involved and productivity to be achieved. In big organisations, industrial engineer or time study engineer undertakes various work studies, while personnel department prepares job evaluation and merit rating for this purpose.

#### **Work Study**

*Work study* consists of method time and motion study in relation to the performance of a job or operation. *Time study* involves the technique of establishing an allowed time standard to perform a given task, based upon measurement of the work content of the prescribed method, with due allowance for fatigue and for personal and avoidable delay. [Read "Motion and Time Study" by Benjamin W. Niebel). Time study is concerned with the determination of standard time required by a worker of average ability, under normal condition to perform a task. Motion study technique, developed by F.B.Gilbraith, is defined by Benjamin W. Niebel as "the study of

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the body motion used in performing an operation, with the thought of improving the operation by eliminating unnecessary motion and simplifying necessary motions and then establishing the most favourable motion sequence for maximum efficiency". Time and motion study is incomplete without method study, which is concerned with determining the proper method of performing a job. All the three i.e. time, motion and method study are parts of the total work study which helps management in effective use of human efforts.

The steps in time and motion study are the following:

- i) Identify the work.
- ii) Observe the workers performing the job.
- iii) Record all the relevant parts of performing job by present method.
- iv) Note down wasteful movements and restructure proposed method giving due allowance for fatigue, interference, etc.
- v) Critically examine the proposed method, and develop the most practical, acceptable and effective method.
- vi) Install that method as standard practice.

The time and motion study serves the following purposes:

- a) Standardising jobs, operations, etc. by providing the best method of operating within the time allowed.
- b) Standardisation of equipments, methods, materials and working conditions.
- c) Fixation of wage-rates including piece rates and incentive schemes.
- d) Assessing manpower requirements correctly.
- e) Cost control through proper planning.

### **Job Evaluation**

*Job evaluation* is a process of analysis and assessment of each job determining its worth in relation to all other jobs within an organisation in order to provide a basis for wages and salary structure. It helps determination of correct grade of labour for each job or operation, and establishes the rationale for differentials in wages and salaries between different groups of employees.

The objectives of job evaluation is to evolve a systematic job, wages and salary structure according to characteristic features of each job. Job evaluation also imparts the following advantages:

- a) It helps employer to explain why one job is worth more or less than the other.
- b) It helps personnel department to plan manpower requirement, selection and training of employees. It also helps in placement, promotion and transfer of employees.
- c) It promotes reliability, equity and fair play in the design of wage structure and removes anomalies, if any.

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Methods of job evaluation can be classified into four groups as given below:

- (i) Ranking method
- (ii) Grading method
- (iii) Point rating method
- (iv) Factor comparison method.

#### **Ranking Method**

Under this method, jobs are graded from lowest to highest or *vice versa* according to relative requirements and responsibilities. The task of ranking each job is preceded by a careful job analysis and job description. Each job is valued in terms of other and is based on a survey of a few broad qualities required of all jobs in varying degrees.

#### **Grading Method**

Under this method, a number of grades are fixed and arranged in order of importance. It takes into account the nature of duty, complexities involved, degree of supervision required, responsibility and efforts demanded and job description. Once the grades are defined, each job is studied and assigned to the appropriate grade. Pay scales are normally fixed for each grade. The entire grading method i.e. review of jobs, placing in the appropriate grades and selection of pay-scales are done by a committee of experts, who have considerable experience in the subject.

#### **Point Rating Method**

Under this method, basic factors common to most of the jobs which determine their relative worth in the organisation are considered. The number of such factors could be many, but it is convenient to restrict them to a limited number, such as :-

- (a) education,
- (b) training and experience,
- (c) skill,
- (d) physical efforts required,
- (e) responsibility,
- (f) working conditions, and
- (g) complexity of duty.

Each of the above job factors is given a relative weightage and is allotted a number of points. The jobs are ranked in the order of points scored and are placed in the number of predetermined grades. Pay-scales are thereafter fixed for each of these grades. Jobs fitted into the grades will have the same pay scale.

*Prime Cost***Illustration I****POINT-RATING CHART**

<i>Factors</i>	<i>Job-A</i>	<i>Job-B</i>	<i>Job-C</i>	<i>Job-D</i>
Education	5	10	15	20
Training and experience	-	5	10	10
Skill	10	20	30	25
Efforts	20	15	-	10
Responsibility	5	10	20	30
Working conditions	20	15	10	10
Total points	60	75	85	105

**II. GRADING AND PAY SCALE**

<i>Points range</i>	<i>Grade</i>	<i>Monthly pay-scale (Rs.)</i>
40- 70	IV	1000-50-1500
71 - 90	III	1400-100-2400
91 - 100	II	2000-150-3500
101 - 110	I	3000-200-5000

The point rating method is very simple to understand and operate, but the assignment of points to the factors are arbitrary and may differ from person to person. To obviate such weakness, it may be required to collect a number of observations and then remove the element of business from the results.

**Factor Comparison Method**

Like point rating method, this method also considers a few key factors common to a few key jobs which are evaluated. The key jobs at each level within the existing wages/salaries structure are ranked against each factor at a time. Instead of ranking them as a whole, each of the factors is assigned by adding up the money value of all factors. All other jobs are evaluated against the key jobs on the basis of money values assigned to various factors in the key jobs.

**Merit Rating**

*Merit rating* is a systematic evaluation of an employee's personality and performance by his superior in his existing job. The assessment is made to find out the worth of each employee considering his suitability on the job in relation to various factors, namely,—

- (a) Education, training and experience,
- (b) Job knowledge,
- (c) Initiative and aptitude for work,
- (d) Cooperation,
- (e) Attendance and discipline, and
- (f) Ability to get along with others,

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It will be evident that some of the factors are directly related to the employees work, while others are not related to his work but his association with others as a member of the group or organisation. Points are allotted to each factor and the total points scored will be his merit rate. The object of merit rating is to reward an employee on the basis of his merit. Increments and promotions are the normal outcome of merit rating system.

Merit rating is different from job valuation, as the former rates the employees on the job, while the latter rates the job itself. Job evaluation is the assessment of the relative worth of jobs within an organisation, while merit rating is the assessment of the performance of employees in relation to their jobs. Job evaluation helps to set up a rational wage and salary structure, whereas merit rating helps to determine fair wages for each employee.

Further advantages of merit rating system are noted below: .

1. Since reward is related with merit rating, it acts as an incentive to the workers to improve himself as well as his productivity.
2. Merit rating creates competition among member of staff and workmen.
3. It eliminates discrepancies among workers by linking reward to merit, and hence, tends to improve labour relations and reduces labour turnover.

The only limitation that merit rating system suffers comes from human factor involved in deciding the points. Thus, the rating may be arbitrary, influenced by past records, and therefore, may not attract the workers.

### **3.8 PAYROLL PROCEDURE**

Salaries and wages are prepared in payroll department, which is normally a section of accounts department. All permanent records of an employee is maintained in the payroll department starting from his letter of appointment and report of resumption of duty by the departmental foreman concerned. Periodical change in wage rate arising out of normal increment or promotion is intimated by the personnel department. Thus, all permanent details such as name, token No., department, wage-rate, provident fund membership No., E.S.I.C. No. etc. are recorded on the wages sheet in advance i.e. before the details of actual work during the wage-period are prepared by Personnel department, and sent to payroll. When wages are paid on the basis of time, Time-Cards are sent to payroll department after tallying the hours present with hours worked and idle and rest time. Similarly, piecework cards are authorised by the department concerned certifying accepted units of production and such cards form the basis for wage payment under Piece-rate. For monthly paid staff, a copy of the attendance register is sent to payroll department for the preparation of wages sheet.

A third set of information is sent to payroll department for various deductions to be made from the wages. It is important to note that deductions from wages are required to be authorised. Some of the deductions are statutory viz. income-tax, professional tax, E.S.I .C. contribution, provident fund contribution, etc. Other allowable deductions are house rent, cooperative society dues, advance taken by workers, etc.

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Payroll is prepared with the aforesaid information either serially by token numbers or department wise. It is advisable to prepare departmentwise payroll due to the following advantages :-

- a) Payroll preparation work can be divided.
- b) Departmental labour rate can be developed.
- c) Reconciliation can be easier.
- d) Wage payment can be made in respective departments with the payroll.
- e) Assist in the preparation of budget and control of departmental labour cost.

In the payroll, the employee's name, ticket No., hours worked - normal and overtime, Wage rate and dearness allowance rates shall be mentioned. His gross earnings shall be computed with each component such as basic wages, dearness allowance, overtime wages, overtime premium, house-rent allowance, shift allowance, attendance bonus, incentive bonus, etc. Similarly, details of all deductions and net wages payable are indicated. Payee's signature is obtained against net wages figure. A specimen of wages sheet is reproduced below :-

**WAGESHEET**

<b>Department :</b>				<b>For the month of :</b>			
Ticket No.	Hours workers hourly rate	Normal Hrs.	Overtime Hrs.	Overtime premium	Dearness allowance	House rent allowa- nce	Gross wages
Name							

**DEDUCTIONS**

Income- tax	Professi onal tax	EISC	PF	Others	Total	Net wages	Sig- natures

### Computerised Payroll

With the increased use of computer, large organisations as well as small concerns have computerised payroll. In big organisations, a database is created with all permanent details of each worker, and thereafter, information is continuously fed in the computer starting from timekeeping and time-booking till preparation and accounting of payroll.

### Wages Disbursement

Wages sheets, after computation are verified by a second person to avoid any error. They are authorised by a responsible officer, and then handed over to the cashier for payment. It is a good practice to withdraw the net amount payable from the bank, and then use the same amount for filling the pay envelopes. Each envelope shall contain the payslip and the cash equivalent to net payable amount. Pay slip contains all the details of an employee as it appears in the wage-sheet. This is obtained by duplicating process while preparing wages-sheet manually. Under computerised system the pay slip is printed along with the payroll and itself can be used as envelope. Actual disbursement can take place from cash department or from the shop-floor, depending on the size of the organisation, and convenience of identification of the employees.

### Internal Control of Wages

*Internal control* at every stage i.e. from timekeeping till actual disbursement is necessary to check fraudulent payment of wages. Hours attended are reconciled with hours booked, which again should tally with the hours paid as per payroll. This will check inclusion of dummy workers in the payroll. Number of workmen and hours worked as shown in attendance register must tally with the time cards and total hours clocked therein. Timekeeping or personnel department staff shall not take part in the computation of payroll, while payroll department staff shall not disburse wages. Cashier or his staff should disburse wages against production of identity card in the presence of departmental supervisor.

In the preparation of payroll, the following checks should be observed:

- a) Basic information of each employee should be periodically verified with the records of personnel department.
- b) Any change in the basic records such as addition and deletion of names, transfer, promotions, change in rates of pay, etc. shall be properly authorised and duly verified after incorporating the change.
- c) Overtime working should be properly authorised.
- d) Calculation of incentive schemes should be verified independently by accounts.
- e) Payment of wages to a workmen on other than payday should be made after verification of the identity of the worker. Unpaid wages should be maintained in a register for proper control.
- f) Payment of wages should not be made in cash to any worker on behalf of an absentee worker, unless the former requests for the same in writing and the latter obtains approval from his department head.

## 3.9 LABOUR ANALYSIS AND ACCOUNTING

Analysis of wages is essential for accounting purposes. Such analysis is made in wages analysis book or in a computerised statement. Gross-wages paid to direct and indirect labour are

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distributed over work-in-progress account for jobs or process for direct labour and overheads control account for all indirect labour is shown in .

**WAGES ANALYSIS**

PERIOD: _____		DEPARTMENT : _____			
Cost centre	Total	Work-In-process. control a/c	Factory overhead control a/c	Admn. overhead control a/c	Selling/Distrn. overhead control a/c
	Rs.	Rs.	Rs.	Rs.	Rs.

**Total**

Wages analysis is prepared with the help of :-

- (i) time card,
- (ii) piece-rate card,
- (iii) job cards, and
- (iv) idle time card,

so that the hours worked is fully accounted for in respect of job or process as well as idle time or wasted time. If overtime is worked, the accounting of the same shall be noted in the overtime authorisation slip or time card. In case of direct labour, the time booking will be either on job order/work order number or process account. All indirect labour hour will be collected under standing order numbers or account code numbers. Once wages sheet is prepared, hourly rate of each worker and the departmental rate will be available. labour hours will be multiplied by the wage rates to arrive at the expense under each standing order No./ Accounts Head. Where computerised system is not available, a statement of wages summary is prepared in the following manner before preparing wages analysis

**WAGES SUMMARY**

COST CENTRE : _____			PERIOD : _____			
Ticket No.	Job order No.	Standing order No.	Hours worked	Gross wages	Rate per hour	Labour cost
			Pieces produced		Rate per piece	

Total labour cost of each of the Cost Centres will be posted in Wages Analysis Statement.

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### Accounting of Wages

In an integrated accounting system, the wages is accounted for in the following manner by using time cards, attendance hours, job cards, piece rate card and idle time card:

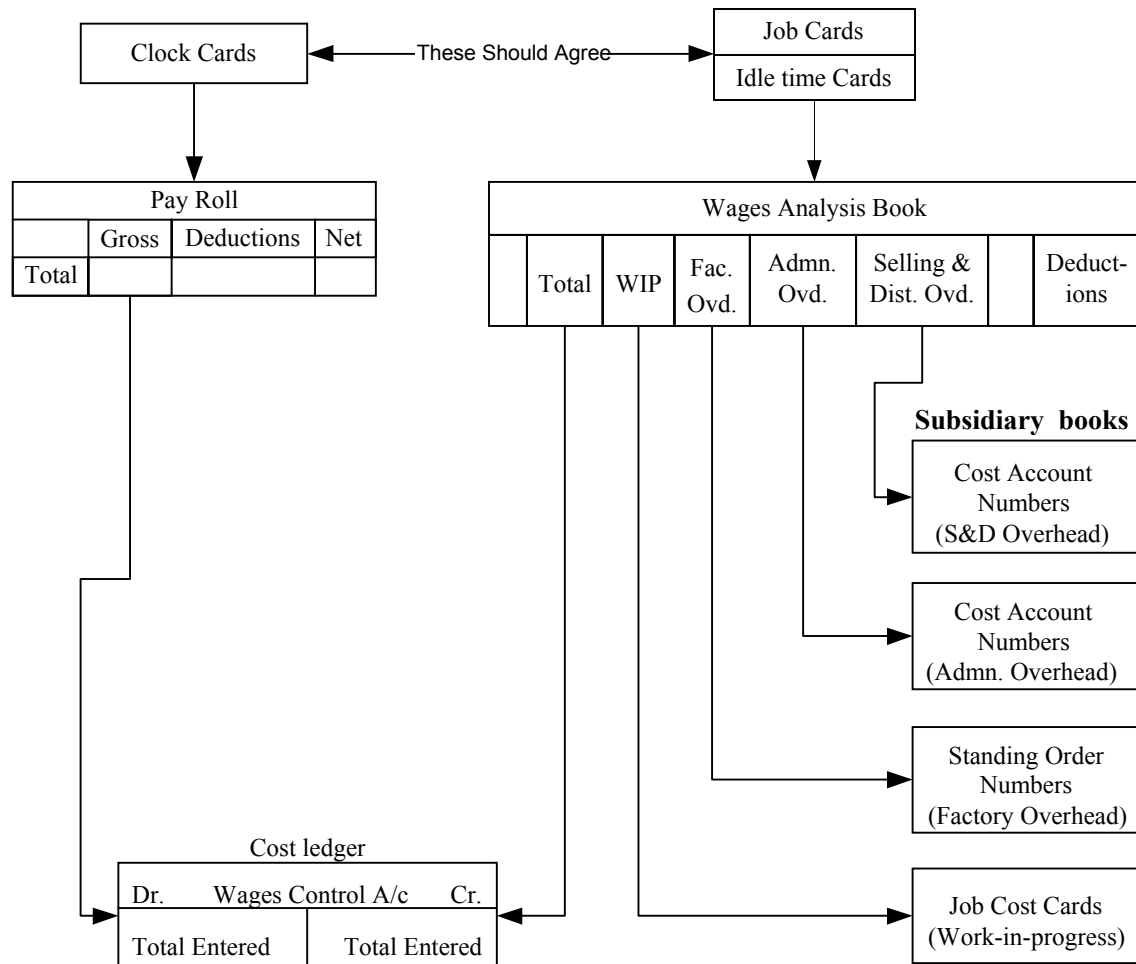


FIG. : *Flow of information for labour costs*

*This chart gives a complete picture regarding flow of information for labour costs.*

*Prime Cost***3.10 IDLE TIME AND OVERTIME****Idle Time**

Idle time refers to that portion of hours paid which are not utilised for productive purposes. This is reflected in the time card as the hours not booked in job or work order, and during which time the worker remains idle.

Idle time can be classified under normal and abnormal idle time. Normal idle time represents inevitable loss of labour hours arising out of the following situations:

- a) Time lost between factory gate and place of work, tea break, lunch break, etc.
- b) Time lost in setting the machine, tools, change-over from one job to another, fatigue, etc.
- c) Time lost in power-failure, machine breakdown, waiting for material, etc.

Out of the above causes, some are inherent in the process and controllable to a great extent. While time lost due to external causes such as general power-failure are uncontrollable in the hands of the management. Thus, it is possible to identify normal idle time, and any loss of time beyond the normal allowed hours shall be called abnormal idle time, such as:

- a) Excessive machine-breakdown.
- b) Excessive internal power failure.
- c) Excessive waiting time for material, instructions, etc.
- d) Too much time to rectify defectives.
- e) Strike, lockout, fire, floods, etc.

It is evident that most of the abnormal idle time arises out of abnormal situations. It is important to segregate normal and abnormal idle time arising out of internal as well as external reasons for accounting and control purposes.

Idle time can be controlled by adopting the following measures :-

- a) Preparation and analysis of labour utilisation report with breakdown of idle time.
- b) Minimising machine breakdown by adopting preventive maintenance.
- c) Proper material and production planning, and follow-up system.
- d) Timely purchase of materials and components.

A specimen format of labour utilisation report and idle time report is appended hereinafter :

*Cost and Management Accounting***Labour Utilisation Report**

Department :						Week ending :		
Ticket No.	Normal hours	Overtime hours	Total hours present	Booked to jobs	Idle hours	%Idle Hrs. to total hrs.	Standard Hours of jobs	% of Std. Hrs.to productive hours

**Idle Time Report**

Department :						Week ending :		
Total idle hours	Machine break-down	Power failure	Change over	No material	No component	Others	Total hours attended incl. of O.T.	% Idle hours to total hours

A careful analysis of the reasons for idle time will disclose the problem areas. Attention of the management should be focused to the controllable areas for effective remedial action.

**Accounting of Idle Time**

Normal idle time of all workers should be collected under standing order number and charged to factory overheads. However, some of the normal idle time of direct workers, which are associated with the job or work order, such as, time taken for machine setting, change-over or tool setting, can be added to the product cost as direct wages by inflating the hourly rate of wages. For example, if such idle time is normally 10% of total hours and wages paid for 8 hours is Rs. 72, then direct labour cost will be Rs. 72 divided by 7.2 (i.e. 8 hours less 0.8 hrs.) = 10 per hour.

Abnormal idle time cost shall be collected as per standing order numbers or accounts code numbers and shall be charged to costing profit and loss account. Under no circumstances, abnormal idle time can be charged to product-cost.

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## **Overtime**

The control of overtime is very important, because of its tendency to increase and to become a normal practice for earning extra money. It has harmful effect on the health and morale of the workers, besides unfavourable effect on productivity. It may also lead to high absenteeism. The overtime hours should, therefore, be controlled rigorously. Excepting unavoidable reasons, overtime work should not be allowed. Sanctioned overtime work should be supervised properly to ensure full utilisation of time. Daily or weekly overtime report should be reviewed by higher management.

Overtime is normally paid at a rate higher than normal wages. Usually, it is one and half or double the normal wage-rate. The extra amount over the normal wage-rate is called overtime premium. Normal wages form part of direct labour cost. The charging of overtime premium needs consideration of the circumstances under which overtime was undertaken, and accordingly, the standing order number will be debited.

### **Accounting of Overtime Premium**

- a) If overtime is paid to complete a job at the request of the customer, overtime premium is charged to the job order concerned.
- b) If overtime is undertaken in order to cope up with increased production, overtime premium is treated as factory overheads. Alternative method is to distribute the overhead premium over all the jobs undertaken during normal as well as overtime hours at an average rate
- c) If overtime is paid for any capital order, such as, fabrication of a machine to be used internally, the overtime premium shall be charged to capital work order account.
- d) If overtime is worked to recover production loss due to abnormal conditions such as, strike, lock out, flood, etc., the premium should be charged to costing profit and loss account.

Overtime work should be controlled in the following ways —

- a) No overtime work shall be allowed without prior authorisation.
- b) If overtime is unavoidable, then it should be planned in advance, and actual overtime hours should be compared against plan.
- c) Overtime hours with normal working hours should be reported daily. A monthly overtime report showing overtime hours, and cost compared to the previous month as well as plan should be submitted to higher authority.
- d) Cost of overtime work *vis-a-vis* recruitment of additional worker should be reviewed periodically.

### 3.11 LABOUR TURNOVER

*Labour turnover* is defined as the rate of change of labour force in an organisation during a specified period. Change in labour force takes place due to separations and new appointments, and therefore, cannot be avoided totally. However, a high labour turnover ratio adds to high cost and low productivity. It shall therefore be kept at as minimum level as possible by analysing the causes and initiating remedial measures to control it. The labour turnover rate depends upon many factors, such as, nature of the industry size and location of the unit, proportion of male or female in labour composition, etc.

#### Measurement of Labour Turnover

Measurement of labour turnover should be made department wise and for skilled and highly skilled labour separately instead of a blanket rate.

There are three distinct methods of measuring labour turnover based on separation and replacement of labour. The methods of computing labour turnover are:

(a) Separation method labour turnover

$$= \frac{\text{Number of separations in a period}}{\text{Avg. no. of employees in the period}} \times 100$$

(b) Replacement method Labour turnover =

$$= \frac{\text{Number of replacements in a period}}{\text{Avg. no. of employees in the period}} \times 100$$

However, new recruitment for some expansion project should not be included in the total of replacements.

(c) Flux method Labour turnover

$$= \frac{\frac{1}{2}(\text{No. of separations} + \text{No. of replacements in a period})}{\text{Avg. no. of employees in the period}} \times 100$$

In the above three methods, average number of employees denotes the simple average of the number of employees at the beginning and at the end of the period on pay roll.

The choice of a particular method depends on the emphasis given on separation or replacements or both. However, whichever method is adopted should be followed all through for effective comparison and analysis.

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### **Causes of Labour Turnover**

Various causes of labour turnover can be broadly divided into the following three categories:

- (a) Personal causes:
  - i) Dissatisfaction with job, remuneration, locality or environment.
  - ii) Domestic reasons like marriage.
  - iii) Change for betterment.
  - iv) Retirement due to superannuation or ill health.
  - v) Death. In the above cases the employer can hardly do anything to prevent it.
- (b) Unavoidable causes :
  - i) Redundancy due to seasonal nature of business.
  - ii) Shortage of resources like, material, power, finance, etc.
  - iii) Change of plant location.
  - iv) Drop in market demand for the product.
  - v) Discharge for disciplinary action.

In the above cases, the employer has to ask some of the employees to leave the organisation.

- (c) Avoidable causes:
  - i) Dissatisfaction with job or remuneration.
  - ii) Unsatisfactory working conditions.
  - iii) Lack of career prospect.
  - iv) Bad relationship with superior and co-workers.
  - v) Lack of transport, accommodation, medical and other facilities.
  - vi) Lack of amenities like sports and recreation centres, schools, etc.

In respect of the above causes, the management can take remedial action to keep such separations at the minimum.

### **Effect of Labour Turnover**

Generally, high labour turnover results in increased cost and low productivity due to the following situations:

- (a) It disturbs regular work force. Inclusion of new employees retards flow of production, since efficiency of new workers will be lower than others. Lower rate of production will increase overall cost of production.
- (b) It increases defectives and spoilage, and may adversely affect machines and equipments for inefficient handling.
- (c) For new recruits, selection, training and orientation expenses leads to increased cost.

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A very high labour turnover has adverse effect not only on the organisation or industry concerned, but it has repercussions on the society at large. It is a loss, which may lead to higher cost and higher prices with consequential cost effective to employ labour as before. However, a low labour turnover indicates dynamism and mobility. Specially, among young and energetic workers there shall always be some movement for better future.

### Cost of Labour Turnover

The cost of labour turnover can be grouped under two categories:

- (a) **Preventive costs** represent those expenses which are incurred, as the heading signifies, to keep the labour turnover at a low level by maintaining a satisfied and contented employees. These costs include the following:
- (i) Personnel administration.
  - (ii) Medical facilities.
  - (iii) Welfare activities, such as, sports and recreation facilities, education for children, housing facilities, subsidised canteen, etc.
  - (iv) Employee development programme.
  - (v) Better retirement benefits.
  - (vi) Attractive remuneration.
- (b) **Replacement costs** are those which arise due to labour turnover. The expenses start with the recruitment process, and ends with the new entrant becoming an efficient worker, and include the following:
- (i) Cost of recruitment, training and induction of new workers.
  - (ii) Loss of production due to the time lag between separation and recruitment, and low productivity of the new workers.
  - (iii) Cost of excessive defectives and spoilage.
  - (iv) Cost associated with abnormal breakage of tool and machineries by new entrants.
  - (v) Cost of additional supervision required for new entrants

The cost of labour turnover can be expressed as a ratio of the average number of workers employed or replaced.

**Illustration :**

No. of employees at the beginning	-	1,960
No. of employees at the end	-	2,040
Replacements	-	160
Preventive cost		<i>Rs.</i>
a) Personnel administration		14000
a) Personnel administration		14000
b) Medical facilities		6,000
c) Welfare expenses		25,000
d) Retirement scheme		55,000
TOTAL		1,00,000

*Prime Cost*

<b>Replacement cost :</b>	
a) Recruitment & training	8,000
b) 40% wages of new entrants not charged to direct labour	6,000
c) Loss of production	6,000
d) Cost of defectives scraps. reworking	2,000
e) Other costs like tool & machine breakage etc.	2,000
<b>TOTAL</b>	<b>24,000</b>
<b>Total cost of labour turnover</b>	<b>1,24,000</b>

Average No. of employees = (1960 + 2040) divided by 2 = 2000

Cost per employee = Rs.124000 divided by 2000 = Rs. 62

Cost per replacement = Rs. 124000 divided by 160 = Rs. 775

**Treatment of Labour Turnover**

The cost of labour turnover is generally treated as overhead expenses. Expenses are collected as per standing order numbers and are charged to overheads expense. Sometimes replacement cost is identified as a departmental overhead if the replacement is made in a particular department. However, the normal practice is to collect the total cost of replacement and apportion on the basis of number of employees in each department.

**Control of Labour Turnover**

Labour turnover ratio should be watched closely by management. For this purpose labour turnover can be analysed by age group, by length of service and by sex. and the current rate should be compared with the industry ratio and local trend. A monthly report on the labour turnover should be presented to the management highlighting the causes for separation for which exit interview should invariably be taken with the person leaving the organisation. The report may be submitted as per following format:

**Labour turnover report**

<b>Department :</b> <i>Particulars</i>	<b>Period :</b>		
	<i>This month</i>	<i>Last month</i>	<i>Year to date</i> <i>This month Last month</i>
A. Number of employees at the beginning			
B. Number of employees at the end			
C. Average employees during the month.			
D. Number of separations			
E. Number of employees joined			
F. LABOUR TURNOVER RATIO (D divided by C)			

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## G. CAUSES OF SEPARATION

i) **Personal :**

- Dissatisfied with job
- Dissatisfied with pay
- Dissatisfied with hours of work
- Change for betterment .
- Retirement
- Death
- Total
- Percentage

ii) **Unavoidable causes :**

- Redundancy
- Shortage of material, power or finance
- Disciplinary action
- Total
- Percentage

iii) **Avoidable causes:**

- Unsuitable job
- Dissatisfied with remuneration
  - ” Working conditions
- Bad relationship with Superiors
- Lack of facilities
- Lack of amenities
- Total Percentage

REMARKS :

**4.0 DIRECT EXPENSE**

CIMA terminology defines *direct expense* as costs other than materials or wages, which are incurred for a specific product or saleable service. It includes cost of services provided to an undertaking and the notional cost of the use of owned assets. Thus, direct expenses are those expenses, which are directly chargeable to a job or a process and become a part of prime cost. It is also known as chargeable expense. Although direct expense enters into prime cost, it does not form any part of the product as does direct material. For example, if electricity consumption per unit of product can be identified and a meter is installed in the production department, it is possible to determine electricity cost per unit of product. Similarly, if a baking oven is heated by light diesel oil or LPG, and the baking time of each variety of biscuit is fixed, it is possible to identify baking fuel as direct expense.

### *Prime Cost*

Examples of some other direct expenses are given below:

- a) Payment of royalty and patent fees.
- b) Hire charges of special purpose tools and equipment.
- c) Subcontract or outside work, if Jobs are sent out for part processing or special processing
- d) Cost of special layout, design or drawings for a particular job.
- e) Insurance and freight charges for special materials
- f) Salesmen's commission, if based on the value of units sold.
- g) Architect's, surveyor's and consultant's fees.
- h) Expenses on travelling, etc. for a particular job.

In process industry, all costs are allocated with the processes as far as possible including chargeable expenses, and become part of product cost.

Items of expenses such as rent and rates, heating and lighting, etc. are sometimes considered direct in relation to some cost centres, so that such expenses are allocated directly to the service cost centres. Total service cost centre costs are then apportioned over production departments, and absorbed by cost units. These costs are, therefore, direct expense of the first cost centre, but indirect expense to the production cost centres as well as to the cost units, and will be charged as overheads, and not as prime cost.

### **Treatment in Accounts**

Direct expenses are incurred and charged to direct expense account in financial books. If the expense relates to job orders or process accounts, then a columnar register is maintained for analysis of the expense job order wise. In cost accounts, job or process account is debited with the expense, and direct expense account is credited. It is possible that a part of the expense like electricity bill, relates to direct expense, while the balance amount is chargeable to overheads.

## ◆ SPECIMEN QUESTIONS WITH ANSWERS — 3

### **Question 1:**

- (a) State some of the important features of a good wage system.
- (b) A company has its factories at two locations. Rowan plan is in use at location A and Halsey plan at location B. Standard time and basic rate of wages are same for a job which is similar and is carried out on similar machinery. Time allowed is 60 hours.

Job at location A is completed in 36 hours while at B. it has taken 48 hours. Conversion costs at respective places are Rs. 1,224 and Rs. 1,500. Overheads account for Rs. 20 per hour.

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*Required:*

- (a) To find out the normal wage rate, and
- (b) To compare respective conversion costs.

**Answer :**

- (a) A good wage system should have inter alia the following features:
  1. The system of wage payment should be fair to all
  2. The system should be acceptable to workers to avoid workers' dissatisfaction, work to rule, slow down tactics
  3. A guaranteed minimum wage should be assured to all workers
  4. The system should be simple, practical and flexible
  5. It should provide adequate incentives to workers
  6. Escalation clause providing for an automatic rise in wages is to be provided.
  7. Operational and administrative costs should be minimal
  8. It should conform to labour laws and local and national regulations.
- (b) (i) Let Rs. x per hour be the normal wage rate. Wage rate at location A will be Rs. 36 x and for location B it will be Rs. 48 x, on the basis of actual time taken, as against 60 hours permitted. For time saved, bonus will be payable as under

**Location A**

$$\begin{aligned} \text{Bonus under Rowan system} &= \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Hrs. worked} \times \text{Rate/hr.} \\ &= \frac{24}{60} \times \text{Rs. } 36 \times x = \text{Rs. } 14.4x \end{aligned}$$

Total wages = Rs. 36x + Rs. 14.4x = Rs. 50.4x

Overheads @ Rs. 20 per hour worked Rs. 720.

Therefore, total conversion cost is 50.4x + 720 = 1224

or x = Rs. 10

**Location B**

$$\begin{aligned} \text{Bonus under Halsey plan} &= 50\% \text{ of time saved} \times \text{rate per hour} \\ &= 50\% \text{ of } 12 \times x \\ &= \text{Rs. } 6x \end{aligned}$$

Total wages = 48x + Rs. 6x = Rs. 54 x

Overheads Rs. 20 per hour = Rs. 960

Total conversion cost is 54 x + 960 = 1500

or, x = 10.

*Prime Cost*

(ii)	<b>Comparative conversion cost</b>	
	<i>A (Rowan)</i>	<i>B(Halsey)</i>
	<i>Rs.</i>	<i>Rs.</i>
Wages @ Rs. 10 per hour	360	480
Bonus	144	60
Overheads	720	960
	1,224	1,500

**Question 2:**

- (a) Explain how the cost accountant can help to control labour costs in an organisation.
- (b) Describe the problems he or she is likely to face in controlling labour costs.

**[Notes to students:**

1. When explaining how the cost accountant can help to control labour costs in an organisation, think about planning, collating cost records and reporting of results.
2. When describing the problems faced in controlling labour costs, consider guaranteed minimum weekly wages, spare capacity, redundancy costs, uncontrollable and unavoidable variances, the timeliness of reports, the lack of detail in reports, managers' attitudes to labour cost reports and quality versus costs.]

**Answer :**

- (a) Control of costs

**Planning.**

- (i) Well before it is required, a production planning schedule should be prepared. This shows the timing and quantities for production in the future budget period. It is unlikely that this schedule would be prepared exclusively by the cost accountant, but his record of past production would certainly be used in its preparation.
- (ii) On the basis of the production planning, the cost accountant (among others) will be able to decide how best the labour force may be deployed. The cost accountant is useful at this stage, again because his records of previous years may be used as a basis for planning future periods.
- (iii) In the process of planning for labour any shortfall in labour will be foreseen and measures taken to deal with the problem; likewise any surplus capacity may also be foreseen.
- (iv) The principal objective of such detailed planning is to set a (realistic) yardstick for performance in the forthcoming period: against it may be set actual performance, and thus some measure of (relative) productivity achieved.
- (v) At the planning stages the cost accountant would also use projected hours to prepare a budget of labour costs.

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**Collating cost records.**

As labour costs are incurred during the budget period, the cost accountant is responsible for the accumulation and classification of all cost data, of which labour costs are a part.

Reporting for control —

- (i) Once labour costs are classified, the cost accountant can provide a comparison of labour costs incurred with those budgeted or expected. The difference between budget and actual may be analysed and reported to the managers responsible for controlling labour costs.
- (ii) The cost accountant will ensure that the differences are analysed as helpfully as possible; for example, a relatively high wage cost in the production department may be due to a higher wage rate than budgeted, or a slower production rate than expected (or a combination of the two).
- (iii) It is only by analysing all the differences between budget and actual that the efforts of management towards control can be properly directed.

**(b) Problems in controlling labour costs.**

The principal difficulties the cost accountant is likely to face are as follows.

- (i) Although on paper, fewer labour hours worked mean fewer labour hours paid for, in practice this is not the case; labour costs are often fixed with the work force earning a guaranteed minimum weekly wage, regardless of the hours actively worked. Control of idle time/efficiency is not readily possible when there is an excess work force.
- (ii) When the work force is larger than a production capacity warrants, labour costs cannot be controlled without senior management entering into lengthy redundancy negotiations with the employees' union representatives. It is not always practicable to make those not required redundant (this may prove more expensive than continuing to employ them).
- (iii) The cost accountant might need such a long time to prepare labour cost reports that by the time they reach the management concerned, the reports seem out of date and of little practical value for control purposes.
- (iv) Cost accounting reports can only show that labour costs are within acceptable limits or excessive, with broad indications of the cause of excess costs. They cannot be more specific about the reasons for excess labour costs, and so labour cost reports might be of limited value to managers who must investigate the reasons for excess costs.
- (v) Cost accountants provide information, but have no executive responsibilities. Unless they can get departmental managers to recognise the value of their labour cost reports, they will be unable to help in controlling labour costs.
- (vi) The cost accountant's wish to control labour cost might be opposed by the wish of departmental managers to maintain or improve the quality of work, even if this means some increase in costs.

*Prime Cost*

**Question 3:**

- (a) Identify the elements which could make up a direct operative's gross wage and for each element explain, with supporting reasons, whether it should be regarded as part of the prime cost of the components manufactured.
- (b) Describe the characteristics of factory direct and indirect labour cost and explain the treatment of factory overtime wages and holiday pay in cost accounting systems.

**Answer :**

[**Notes to students :**The problem of how to deal with overtime premium crops up frequently in examination questions. If you have trouble remembering how to deal with it, think how you would feel if the bar of chocolate you bought happened to cost Re 0.20 more than all others in the store simply because it was made after 5 p. m..]

- (a) Elements included in an operative's gross wage are as follows.
  - (i) **Basic wage** is remuneration for the operative's ordinary working hours. To the extent that these hours are occupied directly with manufacturing the related wage should be regarded as prime cost, since it can be directly related to particular components. Any wage in respect of idle time or time spent on non-manufacturing activities is not part of prime cost.
  - (ii) **Overtime earnings** frequently arise because a company is seeking to increase production. The amount of overtime premium should be spread over production generally rather than charged solely to those units produced during the overtime hours since it is unfair to charge a unit with an extra cost simply because it was produced during overtime hours. The basic wage earned during overtime hours should be treated as in (a) above, that is it should be regarded as prime cost if it is related to time spent on manufacturing activities. Overtime premium should only be allocated directly to a product if, for example, a customer required overtime to be worked on the product concerned.
  - (iii) **Shift premium** would not normally be related to specific units of production and so should not be regarded as prime cost. Even if it could be so related, the same argument as for overtime premium would suggest that it should be spread over all units produced.
  - (iv) **Bonus payments** arising under a piecework scheme can usually be related very easily to specific units of production and are therefore part of prime cost. Other bonus payments may not be traceable in the same way and should be regarded as overhead.
- (b) Factory direct labour cost is remuneration paid to employees who have worked directly on the product under consideration. Factory indirect labour cost is remuneration which cannot be directly allocated to a specific product but which must be shared out over several different products.

*Cost and Management Accounting*

Overtime payments would be classified as follows :-

**Overtime paid to direct workers.** The basic wages paid would be classified in the normal way as direct wages and allocated to the relevant production output. The overtime premium would usually be classified as indirect wages to be included in production overhead and absorbed into the cost of all units produced in the period, whether or not they were manufactured in overtime hours. However, if the overtime has been worked specifically for a particular cost unit, perhaps at the request of a customer, then the overtime premium would be classified as a direct cost of that unit.

**Overtime paid to indirect workers.** All of the overtime paid to indirect workers would be classified as indirect wages, to be included in production overheads and absorbed into the cost of all units.

**Holiday pay.** Holiday pay, both for direct and indirect workers, is normally treated as indirect wages since it is not possible to allocate it to specific production output.

**Question 4 :**

- (a) Distinguish between “Incentive to indirect workers” and “Indirect incentives to direct workers”.
- (b) XYZ Ltd. employs its workers for a single shift of 8 hours for 25 days in a month. The company has recently fixed the standard output for a mass production item and introduced an incentive scheme to boost output. Details of wages payable to the workers are as follows :
- (i) Basic wages/piece work wages @ Rs. 2 per unit subject to a guaranteed minimum wages of Rs. 60 per day.
  - (ii) Dearness allowance at Rs. 40 per day.
  - (iii) Incentive bonus :
 

Standard output per day per worker	:	40 units;
Incentive bonus up to 80% efficiency	:	Nil;
Incentive bonus for efficiency above 80%	:	Rs. 50 every 1% increase above 80%.

The details of performance of four workers for the month of April 1998 are as follows :

Worker	No of days worked	Output (units)
A	25	820
B	18	500
C	25	910
D	24	780

Calculate the total earnings of each of the workers.

*Prime Cost***Answer :**

- (a) One of the main conditions of the incentive systems is that the actual output and/or time taken in relation to standard set is determinable. In case of direct workers the measurement of performance does not involve any problem. But in case of indirect workers, whose performance cannot be directly measured (e.g. supervisors, machine maintenance staff, staff of stores, internal transport, etc.) introduction of an incentive system may appear to be difficult. Still it is essential to provide for incentives to the indirect workers for increasing their efficiency and promoting team spirit. Any discrimination in this respect between the direct and indirect workers would affect the morale and hence efficiency of the indirect workers/employees.

Examples of incentive schemes to indirect workers :—

- i) *Bonus to foremen and supervisors* – based on output of the department, savings in time or expenditure, improvement in quality of product, reduction in scrap and waste, reduction in labour turnover, etc.
- ii) *Bonus to repairs and maintenance staff for routine and repetitive maintenance* – a group bonus system can be established on the basis of reduction on the member of complaints or reduction in breakdown etc. Efficiency percentage can be evaluated for the payment of bonus.
- c) *Bonus to stores staff* – Bonus may be paid on the basis of value of materials handled or number of requisition.

Indirect incentives to direct workers:

Indirect monetary incentive —

- a) Profit sharing
- b) Copartnership or co-ownership scheme.

Indirect non-monetary schemes —

- a) Education and training for employees and their children.
- b) Health and safety
- c) General welfare - sports and recreation facilities, housing facilities, etc.
- d) Canteen - subsidised meals.
- e) Pensions – superannuation pension and life assurance schemes.
- f) Subsidies to sick and benevolent funds.

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(b)

**Statement showing the total earnings of each of the workings**

<i>Workers</i>	<i>Days worked</i>	<i>Output</i>	<i>Basic wages</i>	<i>Dearness Allowance</i>	<i>Incentive <sup>(2)</sup></i>	<i>Total earnings</i>
			<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
A	25	820 units	1,640	1,000	100	2,700
B	18	500 units	(1)1,080	720	—	1,800
C	25	910 units	1,820	1,000	550	3,370
D	24	780 units	1,560	960	50	2,570

Notes :

- (1) Guaranteed minimum wages @ Rs. 60 for 18 days, since piece work wage is only Rs. 1,000 (500 × Rs. 2).
- (2) Incentive is worked out as follows :

<i>Workers</i>	<i>Efficiency</i>	<i>Incentive @ Rs. 50 per 1% increase above 80%</i>
A	$820 \div (25 \times 40) = 82\%$	Rs. 100
B	$500 \div (18 \times 40) = 69\%$	—
C	$910 \div (25 \times 40) = 91\%$	Rs. 550
D	$780 \div (24 \times 40) = 81\%$	Rs. 50

**Question 5 :**

- (a) Discuss the essential features of a successful wage payment plan.
- (b) The employees in a plastic toy-making unit are paid wages at the rate of Rs. 7 per hour for an eight-hour shift. Each employee produces 5 units per hour. The overhead in this department is Rs. 10 per direct labour hour. Employees and the management are considering the following piece rate wage proposal :
- Up to 45 units per day of 8 hours, Rs. 1.30 per unit.  
 From 46 units to 50 units Rs. 1.60 per unit.  
 From 51 units to 55 units Rs. 1.65 per unit.  
 From 56 units to 60 units Rs. 1.70 per unit.  
 Above 60 units Rs. 1.75 per unit.
- The working hours are restricted to 8 hours per day. Overhead rate does not change with increased production.
- Prepare a statement indicating advantages to the employees as well as the management at production levels of 40, 45, 55 and 60 units.

*Prime Cost***Answer :****(a) Essential Features of a successful wage payment plan :**

- a) It should be based on scientific time and motion study to ensure a fair output and a fair remuneration.
- b) There should be a guaranteed minimum wages at a satisfactory level.
- c) The wages should be related to the effort put in by the employees. It should be fair to both the employees and employer.
- d) The scheme should be flexible to permit any necessary variations which may arise.
- e) There must be continuous flow of work.
- f) The scheme should aim at increasing the morale of the workers (i.e. minimising absenteeism, late attendance, etc.) and reducing labour turnover.
- g) Suitable incentive to the workers will be provided.
- h) The operating and administrative cost of the scheme be kept at a minimum.

**(b)****Present cost of making a toy.**

Wages per hour	Rs. 7
Overhead per hour	Rs. 10
Conversion cost per hour	Rs. 17
Conversion cost per unit =	$\frac{\text{Rs. } 17}{5} = \text{Rs. } 3.40$

**I. Statement showing advantages to employees on piece rate wage proposal.**

<i>Output (Units)</i>	<i>Time wages per day</i>	<i>Piece wages</i>		<i>Benefits to employees (d) – (b)</i>
(a)	(b)	<i>Per Unit</i>	<i>Per day</i>	(e)
	Rs.	Rs.	Rs.	Rs.
40	56.00	1.30	52.00	(4)
45	56.00	1.30	58.50	2.50
55	56.00	1.65	90.75	34.75
60	56.00	1.70	102.00	46.00

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**II. Statement showing advantages to the management :**

Output (Units)	Proposed price rate	Piece wages	Overhead	Proposed total cost	Total cost as per existing scheme @ Rs. 3.40	Saving per day
(a)	(b)	(c)	(d)	(e)	(f) – (e)	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
40	1.30	52.00	80.00	132.00	136.00	4.00
45	1.30	58.50	80.00	138.00	153.00	14.50
55	1.65	90.75	80.00	170.75	187.00	16.25
60	1.70	102.00	80.00	182.00	204.00	22.00

**Question 6 :**

- (a) Discuss the essential features of Differential Piece Rate System of Wage Payment. What are the advantages and disadvantages of this system?
- (b) In a manufacturing unit, a multiple piece rate plan is operated as under:
- (i) Basic piece rate up to 85% efficiency;
  - (ii) 115% basic piece rate between 90% and 100% efficiency;
  - (iii) 125% basic piece rate above 100% efficiency.

The workers are eligible for a "Guaranteed Day Rate" which is equal to 75% efficiency and the piece rate is Rs. 2.00 per piece.

Compute the labour cost per piece at 5% intervals between 65% and 125% efficiency, assuming that at 100% efficiency 60 pieces are produced per day.

**Answer :**

- (a) **Differential piece rate system of wage payment.** Under this scheme earnings vary at different stages in the range of output, sometimes proportionally more, sometimes less or sometimes in proportion to output, designed to reward efficient workers with the further object of encouraging the less efficient workers or a trainee to improve.

This scheme was first introduced in U.S.A. by F.W. Taylor, the father of scientific management and was subsequently modified by Merrick.

**Essential features are as under :**

- (i) Several piece rates are fixed on a slab scale for a job or operation.
- (ii) A definite task or standard of efficiency is set for each job or operation put on piecework.
- (iii) For different level
  - ranges of outturn below and above the standard, different piece rates are applicable.

*Prime Cost*

- A lower piece rate for those who failed to achieve the standard.
- A higher piece rate for those who achieved or exceed the performance standard.

Suppose, standard production = 100 units per day.

Piece rate

- (i) 10 pieces per unit for 100 units or more
- (ii) 8 pieces per unit for less than 100 units.

Therefore, a worker producing 100 units, will get Rs. 10 and one producing 110 units will get Rs. 11. On the other hand, a worker producing 90 units will get at the lower rate of 8 paise per unit i.e. Rs. 7.20.

- (iii) There is no guaranteed minimum wages.

**Advantages :**

- (i) It is simple to understand and operate.
- (ii) It attracts efficient workers for higher incentive.
- (iii) Where overheads are high, it is more beneficial as reduction of cost per unit of overhead cost more than compensates increased labour cost.
- (iv) It offers more inducement to the workers to increase productivity and earn higher wages.

**Disadvantages :**

- (i) It penalises very severely the slow or inefficient workers as a slight fall in production will considerably affect their earnings.
- (ii) It makes wide discrimination between efficient and inefficient workers and thus creates rivalry and disturbance among the workers.
- (iii) It does not guarantee the minimum day wages and this insecurity affects the morale of the workers.
- (iv) Labour cost will differ between two levels of performance because of two different rates.
- (v) An error in fixation of the higher or lower piece rate differential may cause a disastrous effect on employee morale and productivity.

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(b)

**Computation of labour cost per piece.**

<i>Efficiency %</i>	<i>Output per day (units)</i>	<i>Piece Wage @ Rs.2/piece</i>	<i>Guaranteed Time wages/day</i>	<i>15% Additional piece wage</i>	<i>25% Additional piece wage</i>	<i>Total Labour cost</i>	<i>Labour cost per piece</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
65	39	78	90	—	—	90.00	2.31
70	42	84	90	—	—	90.00	2.14
75	45	90	90	—	—	90.00	2.00
80	48	96	—	—	—	96.00	2.00
85	51	102	—	—	—	102.00	2.00
90	54	108	—	16.20	—	124.00	2.30
95	57	114	—	17.10	—	131.10	2.30
100	60	120	—	18.00	—	138.00	2.30
105	63	126	—	—	31.50	157.50	2.50
110	66	132	—	—	33.00	165.00	2.50
115	69	138	—	—	34.50	172.50	2.50
120	72	144	—	—	36.00	180.00	2.50
125	75	150	—	—	37.50	187.50	2.50

**NOTES :**

1. As guaranteed time wage is equal to 75% efficiency, the time wages of Rs. 90 per day is payable for efficiency up to 75%.
2. Normal piece wages are payable at 80% and 85% efficiency levels.
3. For efficiency levels between 90% and 100%, 15% of the piece wages have been added
4. For efficiency levels above 100%, 25% of the piece wages have been added.

## ◆ TEST YOURSELF

### I. Objective Type Questions

1. Which of the following statements are true ?
  - (a) Under present Indian condition, labour cost may be viewed as committed cost rather than discretionary cost.
  - (b) Continuous effort is made to convert indirect workers into direct one for easier control and analysis of wages.
  - (c) Time recording is not necessary for the piece-rate workers.

*Prime Cost*

- (d) Time-recording and time booking relate to attendance hour and time spent on job or process respectively.
  - (e) Attendance hours should be reconciled with time booked on various jobs or process.
  - (f) High wage plan ensures sustained high productivity of workers.
  - (g) A good incentive scheme helps to reduce conversion cost per unit of output.
  - (h) Taylor's differential piece-rate system guarantee minimum wages.
  - (a) Bonus under Rowan plan is more as compared to that under Halsey plan.
  - (j) Group bonus scheme is applicable where it is difficult to assess the performance of individual workers.
  - (k) Time and motion study is incomplete without method study.
  - (l) Job evaluation helps employer to explain why one job is worth more or less than the other.
  - (m) Merit rating is not different from job evaluation.
  - (n) Idle time caused by machine breakdown is normal, but excessive machine breakdown causes abnormal idle time.
  - (o) Labour cost should be inflated to cover normal idle time.
  - (p) Treatment of overtime premium in cost accounting depends on management policy and not on the cause of overtime working.
2. Fill in the blanks:
- (a) Time-booking refers to actual \_\_\_\_\_ of time
  - (b) Remuneration is the \_\_\_\_\_ for labour and service, while incentives are \_\_\_\_\_ for extra effort to perform.
  - (c) \_\_\_\_\_ rate method does not have any incentive to increase the output.
  - (d) In Emerson's efficiency scheme, \_\_\_\_\_ wages are guaranteed.
  - (e) Increase in productivity results in lower \_\_\_\_\_ cost.
  - (f) Group bonus scheme is applicable where the output depends on the \_\_\_\_\_ effort of the workers.
  - (g) Under \_\_\_\_\_ plan, employees receive a constant proportion of value added.
  - (h) Work study consists of \_\_\_\_\_ and \_\_\_\_\_ study in relation to the performance of a job or operation.
  - (i) Normal idle time cost should be charged to \_\_\_\_\_, while abnormal idle time cost should be debited to \_\_\_\_\_.
  - (j) Labour \_\_\_\_\_ is defined as the rate of change of labour force in an organisation during a specified period.

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**II. Descriptive Questions**

1. Discuss the main purposes of timekeeping at the entrance of the factory and time booking at the department under three headings :
    - (a) for payment of wages,
    - (b) for cost ascertainment and estimating, and
    - (c) for other reasons.
  2. A company recently purchased a running factory engaged on similar products. Time-booking system of that factory is not the same. In own factory, each operative books time to each job in the weekly cards, whereas in the new factory, each operative books his time in the card issued with the work, which accompanies it throughout its progress. Discuss with reasons which system you will prefer. To effect uniform costing, how would you change the procedure?
  3. What do you understand by 'payment by results'? Explain three different types of payment by results commonly in use.
  4. What are the steps to be taken for introducing straight piece-rate wages system in a manufacturing unit which is not satisfied with the existing day-rate wages system ? Discuss its merits and demerits.
  5. Describe briefly, with an illustration, any one system of payments by results, where workers earnings vary proportionately less than output. Discuss the circumstances where the particular system will be useful.
  6. Discuss fully the effect of high and low wages on output and productivity. Explain what you understand by high wages plan.
  7. Outline an incentive scheme suitable for indirect labour. What are the advantages to be derived from such a bonus system?
  8. What is Job evaluation? What functions other than those directly related to wages does such a scheme perform? Briefly outline job classification method of job evaluation.
  9. What internal checks would you suggest for avoiding frauds in the time recording preparation and payment of wages?
  10. What are the reasons for booking workers on idle time in a factory? How is idle time controlled? How is idle time treated in cost accounts?
  11. What is labour turnover? Describe the effect of high labour turnover on costs. What conclusions would you draw, if labour turnover is abnormally low?
  12. A job can be done in 15 minutes by an average worker. Give three different methods of payment by results, and show the cost per article by each method, if the job is done in 10 minutes (assume basic time rate of Re. 1 per hour).
-

## OVERHEADS

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### 5.0 SCOPE AND OBJECTIVES OF OVERHEAD

*Overhead* is the aggregate of indirect material, indirect labour and indirect expenses. It refers to any cost which is not directly attributable to a cost unit. The term 'indirect' means that which cannot be allocated, but which can be apportioned to or absorbed by cost centres or cost units. The distinction between direct and indirect material, labour and expenses have been explained earlier. The terms 'burden', 'on cost', 'Supplementary cost', 'Nonproductive cost', 'Loading', 'Indirect expenses', etc. are used interchangeably for 'overhead'.

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Overhead, in fact, consists of two parts. One, relating to the product, and the other relating to the facilities and services maintained for the running of the organisation. While the former is incurred when production is carried on (by way of indirect material labour and expenses), the latter is incurred even when production is not undertaken. The expenses incurred for maintaining a factory shed, office building, stores, machine shop, canteen, dispensary, generation room, boiler, etc. are all included in overheads as such facilities are required to keep the unit in readiness for production activities. By themselves, these services have no use. Similarly, expenses incurred for administration of manufacturing and selling and distribution of products are included

in overheads. If selling and distribution are undertaken by the organisation, then a sizeable amount of the expenses enter into overheads, since only a small portion of the expenses incurred can be identified as direct cost of the product.

Overhead cost is, therefore, a group of expenses, which are not identifiable with the cost unit, but are incurred generally for the manufacturing and selling activities of the organisation and can be apportioned to and absorbed by the cost units. It is a distinct element of cost, and needs different treatment in accounting and control compared to direct cost elements. Further, with automation and introduction of new technology, manufacturing activities are increasingly depending on machineries rather than human efforts. As a result, overhead expenses are increasing continuously. In a modern unit, overheads could be as high as material cost. That is why proper and effective accounting and control of overheads is so much needed today.

## 5.1 CLASSIFICATION OF OVERHEADS

In order to have a proper accounting and control, careful classification of overheads is necessary. Overhead can be classified as –

- (a) **Classification of overhead by elements or nature of expense.** All overhead expenses can be classified elementwise into indirect material, indirect labour and indirect expenses, as well as by nature of expense, e.g. consumable stores, repair-parts, salaries, maintenance, depreciation, etc. Even when overheads are classified functionally, the expenses are classified in the same order within each group as will be indicated below.
- (b) **Classification of overhead by functions.** A manufacturing organisation is normally divided into various functional divisions, such as manufacturing, selling, administration, etc. Overhead expenses relating to each of the functional divisions can be grouped as –
  - (i) Manufacturing or production or factory overhead,
  - (ii) Administration overhead,
  - (iii) Selling overhead,
  - (iv) Distribution overhead, and
  - (v) Research and development overhead.

*Manufacturing overhead* is the total indirect costs associated with manufacturing activities, the sequence of which begins with the procurement of materials and ends with the primary packing of the product. Examples are as follows: indirect materials such as lubricants, cotton waste, and other factory supplies, direct materials of small

### *Overheads*

individual value, repair parts, wages of indirect workers, supervisory salaries, salaries and wages relating to service cost centres, canteen and other welfare expenses, factory rent, rates, lighting and heating, power and fuel, depreciation of factory building, depreciation of plant and machinery and other equipments, expenses connected with the administration of factory.

*Administration overhead* is the total costs of formulating the policy, directing the organisation and controlling the operations of an undertaking which is not directly related to production, selling, distribution, research or development activity or function. Examples of such expenses are as follows:

Office supplies, printing and stationery, salaries to office staff, directors remuneration, office rent and rates, office lighting, heating and air conditioning, postage, telephone & courier service, depreciation, repair and maintenance of office building, equipments, furniture and office machines, audit fees, legal charges, bank charges and interest.

*Selling overhead* refers to those expenses which are associated with the marketing and selling activities. For example:

- Salaries and commission of salesmen, selling agents, etc.
- Travelling expenses, sales office expenses
- Advertisement and publicity
- Market research
- Bad debts
- Brokerage

*Distribution overhead* relates to total indirect cost associated with the distribution of finished products, beginning with the primary packed product available for despatch and ending with making reconditioned returnable empty container, if any, available for reuse. Examples are:

- Secondary packing materials.
- Packing charges.
- Salaries and wages of distribution staff.
- Carriage and freight outwards.
- Warehousing charges, insurance.
- Depreciation, repairs and maintenance, insurance and cost of operating distribution vehicles.

*Research and development overhead* is the total indirect costs incurred for the research and development activities undertaken by the organisation for the development of new products, improvement of existing products, substitution of material and methods, etc. If the total cost is not very sizeable and significant, it is often merged with manufacturing or administrative overheads.

- (c) **Classification of overhead according to their behaviour** with changes in the volume of production. Some of the overhead expenses tend to vary with the change in the level of activity or production, while some tend to remain practically unaltered whatever may

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be the volume of output. Some of the expenses remain partly variable with the production and partly unchanged with the change in activity. Overheads can therefore, be classified into —

- i) Fixed overhead,
- ii) Variable overhead,
- iii) Semi-fixed or semi-variable overhead.

The above classification is extremely important for cost control and decision making.

- (i) **Fixed overhead.** This represents overhead expenses which tend to remain unaffected by the fluctuations in the volume of production or sale within a relevant range and during a defined period of time. Examples are rent, rates, insurance, executive salaries, audit fees, etc. Fixed cost is also termed as period cost or policy cost, since most of the expenses are incurred over a period of time and arising out of the policy of the management. Fixed overheads remain unchanged within a relevant range of activity, because if the activity exceeds or recedes the range, expenses on certain items of fixed overheads may increase or decrease. Again, fixed overheads change with the change in price levels. For example, prices of indirect materials, executive and supervisory salaries, insurance premia, power tariff, etc. may change over a period of time, resulting in the change of fixed overheads. However, such changes do not occur in a short period, say, one year. Hence, fixed overheads are said to remain fixed within a short period of time. Total fixed overheads remain unchanged with the increase or decrease of output in a short period, but the fixed overhead cost per unit changes with the change in the activity level.
- (ii) **Variable overhead.** Variable overhead expenses tend to follow (in the short run) the level of activity. The variation may not always be in the same proportion as the production or sales volume changes, but, by and large, there is a linear relationship between the variable overheads and output. Examples of variable overheads are indirect material, indirect labour, power and fuel, lighting and heating expenses, salesmen's commission, etc. Although the amount of variable overhead changes, the cost per unit of output tends to remain constant at different levels of output. This is, again, true only within a limited range of output.

**Illustration :**

Range of output 3600–4800 units per month ; Variable Overheads Rs. 2 per unit.  
Fixed Overheads Rs. 14,400 per month.

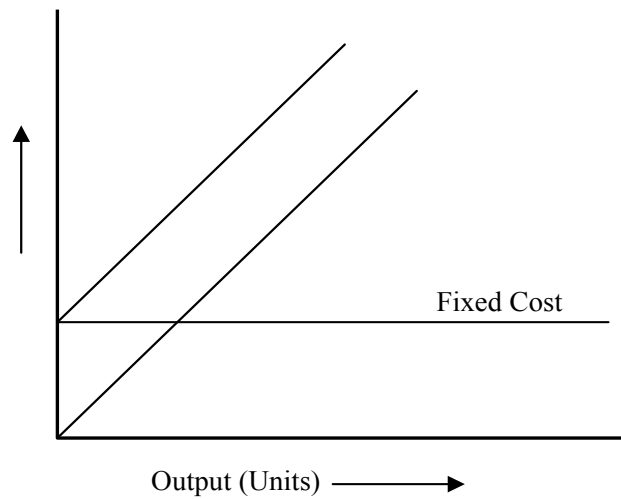
**Calculation of fixed and variable overheads (Rs.)**

Output units	Fixed overhead	Variable overhead	Total overhead	Overhead per unit (Rs.)		
				Fixed	Variable	Total
3600	14400	7200	21600	4.00	2.00	6.00
4000	14400	8000	22400	3.60	2.00	5.60
4500	14400	9000	23400	3.20	2.00	5.20
4800	14400	9600	24000	3.00	2.00	5.00

### Overheads

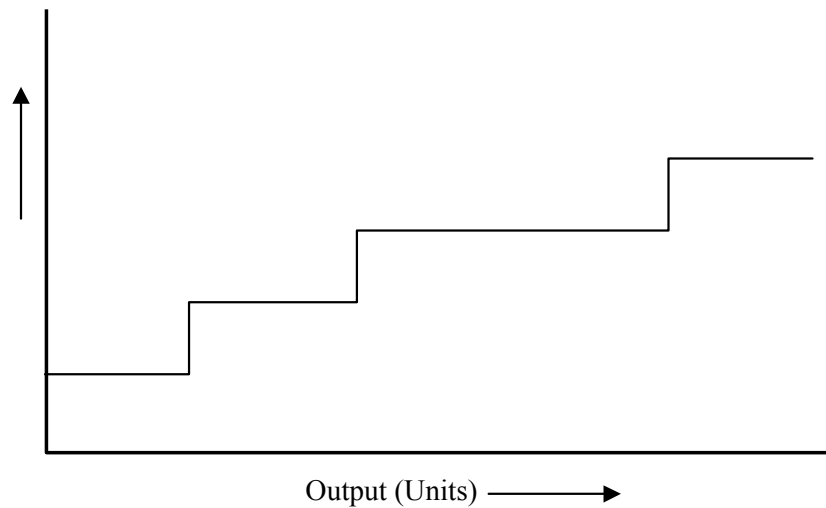
It may be observed that with the increase in output, the fixed overhead per unit decreases. Variable overheads, on the other hand, increases in amount with the increase in output, but the variable cost per unit remains constant.

Graphically, fixed, variable and total cost can be presented in the following way :



**Fig. Fixed and Variable costs**

A semi-variable cost (step up type) is as follows :-



**FIG.: Semi-variable costs**

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- (iii) **Semi-fixed or semi-variable overheads.** This represents partly fixed and partly variable overhead. There are certain expenses which neither remain fixed for all levels of activity nor vary in sympathy with the change of output. For example, repairs and maintenance expenses remain fixed, if production does not fluctuate widely. But if production increases beyond the relevant range, additional expenditure on maintenance may be necessary, which may not vary directly with production. There could be expenses, like telephone charges, where there is a fixed charge as rental, and variable charge per unit for actual number of calls. There are still another type of expenses which increases in steps. That is, it remains constant upto a level, and then jumps and remains constant upto the next level Supervisory salary is the most appropriate example of step cost. Suppose, three supervisors are managing 30 workers, and six more workers are added to cope up with additional production. A fourth supervisor has to be recruited, and he will be able to cover further recruitment of 4 workers. Supervisory salary will increase but shall remain constant upto a limit of 40 workers. Graphically, semi-variable costs can be presented in the following way:

### Segregation of Semi-Variable cost into Fixed and Variable

In order to study the cost behaviour and cost ascertainment for various purposes, overheads expenses are required to be grouped under fixed and variable overheads. Therefore, semi-variable or semi-fixed overhead expenses are required to be classified either as fixed overhead or as variable overheads by inspection of the item in accounts. Alternatively, each of such expenses are to be divided into two parts, i.e. fixed and variable, and add to the fixed and variable overheads. Such a segregation will need careful analysis and application of techniques which are discussed below:

- (a) **Graphical method or scatter diagram.** Semi-variable overheads at various levels of activity are plotted on a graph paper, with outputs at various levels as abscissa and corresponding semi-variable expenses as ordinate as shown below :

Month	Output in units	Semi variable expenses (Rs.)
January	250	1250
February	300	1400
March	350	1550
April	470	1910
May	370	1610
June	440	1820
July	450	1850
August	420	1760
September	400	1700
October	430	1790
November	380	1640
December	270	1310

## Overheads

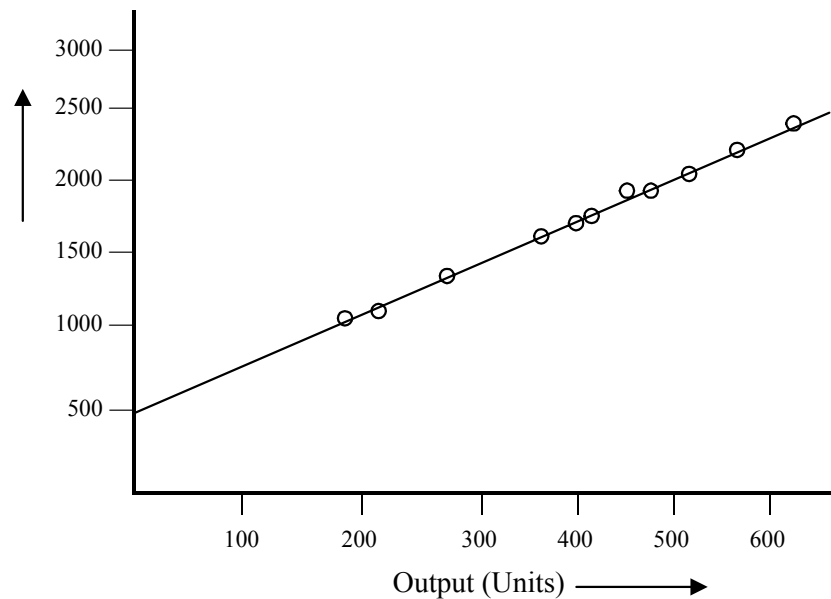


FIG.: Scatter Diagram

Then, by judgement a line of best fit, which passes through all or most of the points is drawn. The point at which it touches the ordinate indicate the fixed overhead element in the semi-variable cost. In the above graph, fixed overhead is shown as Rs. 500. The slope of the regression line i.e. the line of best fit will indicate the degree of variability. If all the plotted points fall on the regression line, it will indicate perfect correlation or perfectly variable cost above the fixed cost line. In practice, this method is widely used.

- (b) **Simultaneous equation method.** The straight-line equation of  $Y = mX + C$  is used where  $Y =$  total cost,  $X =$  output volume.  $m =$  variable overheads per unit of output and  $C =$  fixed overhead. With the help of simultaneous equations data from any two months can be used to segregate fixed and variable overheads. For example,

January	$1250 = m.250 + C$
September	$1700 = m.400 + C$
Subtracting	$450 = m.150$
or,	$m = 450 \text{ divided by } 150 = 3$

Substituting value of  $m$  in first equation,

	$1250 = 3.250 + C$
or,	$1250 = 750 + C$
or,	$C = 1250 - 750 = 500$
Hence, Fixed overhead	$= \text{Rs. } 500 \text{ and}$
Variable overhead	$= \text{Rs. } 3 \text{ per unit.}$

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**(c) High-low method or range method**

The levels of highest and lowest expenses are compared with one another and related to the output attained in those periods. Since, fixed portion of the cost is expected to remain fixed during those two periods, it becomes clear that the change in expense due to change in output relates to variable portion of the expense. Variable overheads per unit will be obtained by dividing change in expense level by the change in output level. For example, in the data given under (a), if we compare data of April (highest) with January (lowest), we get:

	<b>Output</b> <i>(Units)</i>	<b>Expense</b> <i>Rs.</i>
Highest	470	1910
Lowest	250	1250
Change	220	660

Since, variable cost will only change, the variable overheads per unit will be (660 divided by 220) i.e. Rs. 3 per unit.

Therefore, fixed overhead will be:  $1910 - (470 \times 3) = 1910 - 1410 = \text{Rs. } 500$

**(d) Average method.** The method is same as High and Low method with the difference that instead of highest and lowest figures, average of two selected groups are taken.

For example,

	<i>Average output</i> <i>Units</i>	<i>Average expense</i> <i>Rs.</i>
Average of Jan. to Mar.	300	1400
Average of Oct. to Dec.	360	1580
Change	60	180

Variable overheads =  $180/6 = \text{Rs. } 3/\text{unit}$ . Fixed Ovd. =  $\text{Rs. } 1400 - (300 \times 3) = \text{Rs. } 500$ .

**(e) Least square method.** In the scatter diagram, the line of regression was determined by visual inspection. However, the line of regression may be determined more accurately by statistical method of least square or simple regression analysis.

For example, let us take the following data from earlier example:

<b>Period</b>	<b>Output (units)</b>	<b>Expenses (Rs.)</b>
1	250	1250
2	300	1400
3	350	1550
4	470	1910
5	370	1610
6	420	1760
Total	2160	9480

Mean (2160 divided by 6) = 360 (9480 divided by 6) = 1580

### Overheads

First, the mean of output and expenses are computed. Then the deviations of volume in each period from the mean volume and deviation of expense in each period from mean expense are calculated as  $x$  and  $y$ , respectively. The line of regression will be  $y$  divide by  $x$  i.e. the slope of variable overheads, and can be calculated by dividing  $xy$  by  $x^2$ , as per the following table:

Period	Output Units	Expense Rs.	Deviation of output from mean ( $x$ )	Deviation of expense from mean ( $y$ )	( $xy$ )	( $x^2$ )
1	250	1250	-110	-330	36300	12100
2	300	1400	-60	-180	10800	3600
3	350	1550	-10	-30	300	100
4	470	1910	+110	+ 330	36300	12100
5	370	1610	+ 10	+ 30	300	100
6	420	1760	+ 60	+ 180	10800	3600
Total	2160	9480	0	0	94800	31600

Variable overheads will be =  $xy/x^2 = 94800/31600 = \text{Rs.}3$  per unit of output

Fixed overheads =  $1250 - (250 \times 3) = \text{Rs. } 500$

### Need for classification of cost into fixed and variable

The necessity for classification of cost into fixed and variable arises from the following considerations:

- (a) **Cost control** : One of the main objectives of cost accounting is cost control, which is achieved by classifying costs into fixed and variable. Fixed costs are mostly in the nature of policy cost or discretionary cost arising out of the decisions to create facilities, and are, therefore, not controllable at the lower level of management. Variable cost, on the other hand, is controllable at the shopfloor level. Hence, a classification of cost into fixed and variable helps to fix responsibility for cost control at the appropriate level of management.
- (b) **Decision making** : Management needs to know the effect of changes in the levels of activity. Cost information will be of no use, unless fixed and variable costs are segregated.
- (c) **Marginal costing and Break-even analysis** : Marginal costing techniques are based on the separation of fixed and variable costs, which is essential for the cost-volume-profit relationship and the preparation of Break-even charts and profit graphs.
- (d) **Flexible budget** : Budgets are prepared for different activity levels to make comparison between actual and budget meaningful. Flexible budget cannot be established without segregation of costs into fixed and variable ones.

## 5.2 COLLECTION OF OVERHEAD

For proper accounting and effective control, overhead expenses are classified into a number of suitable account heads for each type of expenditure. Similar expenses are then grouped under a major account head. Such account headings are given code numbers, which could either be alphabetical or numerical or a combination of both. However, for the purpose of mechanised accounting or computerisation, numerical coding structure is more useful. (See a complete chart of accounts in ).

For collection of overhead expenses, it is necessary to relate each item of expense to the cost centre where the expense has been incurred. Therefore, code numbers should be allotted to cost centres also with division into major, minor and detail heading. Expense code numbers allotted to factory overheads are known as 'Standing Order Numbers', whereas those allotted to administration, selling and distribution expenses are termed as 'Cost Account Numbers'. The method of compilation is, however, same for both types of code numbers. While preparing code structure, it should be borne in mind that

- (a) each code should be clearly defined, leaving no room for confusion or ambiguity, and
- (b) the structure should be flexible enough for inclusion of items in future.

The allocation of code numbers can be done in a number of ways, using alphabetic or numerical methods. Each organisation will have its own method depending on the needs of the accounting system. A few methods of codification are as follows:

- (a) **Mnemonic method:** This method uses alphabets to help identifying the expense, viz.

AD – for Administration  
RE – for Repairs  
MA – for Maintenance.

The letters may be used in conjunction with numbers.

- (b) **Straight numbering method:** Under this method, each type of expenditure is allotted a fixed number. For example,

S.O. No. 10 – Indirect material  
S.O. No. 11 – Indirect labour.

- (c) **Combination of symbol and numbers:** Under this method, a combination of alphabet and a number is used to represent an account code. Here, the alphabet stands for the main head of expenditure, while the number indicates detail heads. For example,

R1 Repair – for building  
R2 Repair – for plant & machinery,

where R stands for Repairs, and 1 and 2 represents 'Building' and 'Plant & Machinery' respectively.

- (d) **Numerical or decimal method:** Under this method, numerical codes are allotted to various expenses classifying into major, minor and detail account heads as shown below:

### *Overheads*

A five digit account code may be structured with first digit showing functional classification, second digit showing major expense heads and last three digits showing detail expense heads.

First digit – Functional –	1.	Manufacturing
	2.	Administration
	3.	Selling
	4.	Distribution
	5.	Research
	6.	Development
	7 – 9.	Blank
Second digit – Major head –	1.	Capital
	2.	Operating revenue
	3.	Non-operating surplus
	4.	Operating expenses.
Third to fifth digit —	1.00	Indirect materials
Detail accounts head –	1.01	Consumable stores
	1.02	Loose tools
	1.03	Lubricants
	A.04	
	1.05	
	2.00	Salaries & wages
	2.10	Management salary
	2.11	Basic salary
	2.12	Dearness allowance

### **5.3 DOCUMENTS FOR COLLECTION OF OVERHEADS**

The main sources from which overhead expenses are collected are as follows — (i) Stores requisition, (ii) Invoices, (iii) Cash book, (iv) Wages analysis, (v) Other registers and reports, (vi) Journal entries.

- i) Stores requisition.** Indirect materials like soap, oil, cotton waste, grease, brushes, brooms, etc. are issued from stores on the basis of stores requisition notes which are priced and charged to the cost centre which used them.
- ii) Invoices.** Invoices for material and services are entered in purchase journal with proper accounts code and cost centre codes before making payments. Purchase Journal, if manually maintained, contains separate columns for materials and overhead expenses along with advance payment and accrued charges. Under computerised accounting, the correct code number must be noted on all such documents for correct accounting.

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- iii) **Cash book.** Where cash transactions occur for the procurement of material and services, cash book is analysed and indirect expenses are collected under account code and cost centre codewise.
- iv) **Wages analysis book.** Wages analysis indicate overheads control accounts to which salaries and wages are to be booked.
- v) **Other registers and reports.** For collection of depreciation amount, plant or fixed assets register has to be scrutinised. Similarly, for scrap, waste and spoiled work or idle facilities, relevant reports have to be referred.
- vi) **Journal entries.** Monthly apportionments from payments in advance like insurance and tax, accruals for unpaid salaries and wages or rent, notional charges for rent, interest, etc. are all collected from Journal entries.

## 6.0 PRODUCTION OVERHEAD

### 6.1 INTRODUCTION

The objective of overhead accounting is to charge an equitable portion of overhead expenses to each of the cost units, so that cost of production can be ascertained. (Cost of production = Prime cost + Production overheads) The following steps are involved in the accounting of production overheads —

- (a) Departmentalisation.
- (b) Classification and collection of overhead.
- (c) Allocation and apportionment of overhead.
- (d) Distribution of overhead to production and service cost centres.
- (e) Redistribution of service cost centre expenses to the departments using the services till all expenses are distributed over production cost centres.
- (f) Absorption of overhead by production units.

#### (a) Departmentalisation.

As explained earlier, departmentalisation is the complete division of the factory into production and service cost centres, where expenses are incurred. All documents, as explained in para 5.4, shall contain cost centre reference for correct collection of cost.

#### (b) Classification and collection of overhead.

Classification and collection of overhead have already been explained in detail earlier in Para 5.0 and 6.0.

### *Overheads*

#### **(c) Allocation and apportionment of overheads.**

*Allocation* is the process of identification of overheads with cost centres. Expenses which cannot be identified with product or cost unit can be allocated to a specific cost centre, if latter can be identified. For example, wages to indirect workers depreciation and insurance of plant and machinery, fuel oil for boilers, etc. are instances of expenses which can be directly allocated to the cost centres. However, indirect expenses, such as rent, rates, electricity, telephone charges, factory manager's salary, etc. incurred for the entire factory cannot be allocated to any particular cost centres, but requires to be apportioned to more than one cost centres on some suitable basis for benefits received. *Apportionment* is defined as "the allotment of two or more cost centres of proportions of the common items of cost on the estimated basis of benefit received" (CIMA official terminology). The basis should be selected carefully, so that the proportion of allotment represents the proportion of benefit received.

The following are some of the common basis of apportionment of overheads:

<i>Basis of apportionment</i>	<i>Items of expenditure</i>
1. Floor area or cubic content	Rent, rates, taxes, maintenance of building, depreciation and insurance of building, lighting and heating, electricity.
2. Number of employees	Expenses associated with workmen such as supervision, canteen expense, recreation expense, timekeeping, ESIC, etc.
3. Capital value	Depreciation and insurance of plant and machinery equipments and furniture.
4. Value of materials	Material handling.
5. Horse-power hours, Kwh	Power
6. No. of material requisitions	Storekeeping expenses
7. Direct machine hour, direct labour hr., direct wages	Other overhead expenses

**\*\* Students are advised to prepare a chart with as many bases available from various books particularly from Chapter 11 "Cost Accounting Methods and Problems" by B. K. Bhar.**

#### **(d) Distribution of overhead.**

**Primary distribution.** A departmental distribution summary of overhead expenses is prepared by allocation of directly identifiable expenses and apportionment of common items on some suitable basis, so that all expenses are distributed over production and service cost centres. This is called primary distribution. Let us take an example:

##### **Illustration:**

Dyonara Ltd. has three production departments mixing, making and packing and two service departments stores and canteen. The following expenses were incurred in January, 2002.

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Items	Amount (Rs.)
Rent and rates	10000
Lighting and electricity	1200
Indirect wages	3000
Power	3000
Depreciation of machines	20000
Other expenses	20000

The following further details are available:

Particulars	Total	Mixing	Making	Packing	Stores	Canteen
Floor space (sq. mtr.)	10000	2000	2500	3000	2000	500
Lighting points (No.)	120	20	30	40	20	10
Direct wages (Rs.)	20000	6000	4000	6000	3000	1000
H.P. of machines	300	120	60	100	20	—
Cost of machinery (Rs. '000)	100	24	32	40	2	2

**Solution :**

**DEPARTMENTAL DISTRIBUTION SUMMARY**

Expense Items Rs.	Basis of appor- tionment	Total	Mixing Rs.	Making Rs.	Packing Rs.	Stores Rs.	Canteen Rs.
1. Rent & rates	Floor area	10000	2000	2500	3000	2000	500
2. Lighting & elec.	Light points	1200	200	300	400	200	100
3. Indirect wages	Direct wages	3000	900	600	900	450	150
4. Power	H.P.	3000	1200	600	1000	200	—
5. Depreciation	Cost of mcy.	20000	4800	6400	8000	400	400
6. Other expenses	Direct wages	20000	6000	4000	6000	3000	1000
7. Direct wages of stores & canteen	Allocated	4000	—	—	—	3000	1000
<b>TOTAL</b>		<b>61200</b>	<b>15100</b>	<b>14400</b>	<b>19300</b>	<b>9250</b>	<b>3150</b>

When entire factory overheads are distributed in the above manner, it will be seen that some of the expenses are charged to service cost centres, which again have to be redistributed over the production cost centre. This is called secondary distribution. This is necessary for relating overheads expenses ultimately to the production units, processes or work orders. Like primary distribution, secondary distribution is also done through reapportionment of total service cost centre expenses on some suitable basis as indicated below:

## Overheads

<b>Basis</b>	<b>Cost centres</b>
1. No. of employees	Canteen. Time office office, Recreation centre, Welfare department.
2. Value of materials or no. of requisitions	Stores, Material handling, Internal transport.
3. Capital value or hours worked	Maintenance
4. Floor area	Building service.
5. Technical estimate	Tool room.

In the previous example, the following further information is added for reapportionment of service cost centres:

	<b>Mixing</b>	<b>Making</b>	<b>Packing</b>	<b>Store</b>	<b>Canteen</b>
No. of employees	10	3	10	2	6
No. of requisitions	12	59	210	—	—

With the above information, secondary distribution can be made as follows :

**SECONDARY DISTRIBUTION SUMMARY**

<b>Particulars</b>	<b>Total</b>	<b>Mixing</b>	<b>Making</b>	<b>Packing</b>	<b>Stores</b>	<b>Canteen</b>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Allocated & apportioned	61200	15100	14400	19300	3150	9250
Reapportionment of Canteen (10 :3:10: 2)		3700	1110	3700	740	(9250)
Reapportionment of Store (120 :59: 210)		1200	590	2100	(3890)	
<b>TOTAL</b>	<b>61200</b>	<b>20000</b>	<b>16100</b>	<b>25100</b>	<b>NIL</b>	<b>NIL</b>

It is clear from the above that the primary distribution summary is prepared for apportionment of common overhead expenses of the entire factory, while secondary distribution summary is prepared for reapportioning service costs to the production cost centres. The redistribution of service department cost can be done by one of the following three methods, when one service cost centre renders service to the other service cost centres:

- (a) Under **direct distribution method**, service department costs are apportioned directly to production departments only, ignoring the services rendered by one service department to the other. This is a simple but inaccurate method.
- (b) Under **Step method**, a sequence of apportionment is chosen. The sequence begins with the apportionment of the department that renders service to the maximum number of other service departments, and continues step by step with other service departments till the sequence ends with the apportionment of the department that renders service to the least number of service department. In the illustration under Para 6.1.7, it may be observed that canteen cost has been apportioned to Stores, before the latter being apportioned to production department. Similarly, if there are four or five such departments which can be arranged step by step, it is possible to apportion cost of all service departments to the production departments including share of service department costs.

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**Illustration :** A manufacturing company has two production departments Making and Packing, and three service departments Timekeeping, Stores and Machine shop. The Departmental Distribution Summary for January, 2002 showed the following expenses —

Production departments	— Making	Rs.12000
	— Packing	Rs.8000
Service departments	— Timekeeping	Rs.2000
	— Stores	Rs.2500
	— Machine shop	Rs.1500
	<b>TOTAL</b>	<b>Rs.26000</b>

Other information for apportionment of expenses are:

	Making	Packing	Time-keeping	Store	Machine shop
No. of employees	20	15	8	10	5
No. of stores requisitions	120	100	—	—	30
Machine hours	1200	800	—	—	—

**Solution :**

**SECONDARY DISTRIBUTION SUMMARY**

Particulars	Total <i>Rs.</i>	Making <i>Rs.</i>	Packing <i>Rs.</i>	Timekeeping <i>Rs.</i>	Store <i>Rs.</i>	Machine shop <i>(Rs.)</i>
Allocated & apportioned	26000	12000	8000	2000	2500	1500
Reapportionment of Timekeeping (20 : 15 : 10 : 5)		800	600	(2000)	400	200
Apportionment of stores (12 : 10 : 3)		1392	1160		(2900)	348
Reapportionment of Machine shop (12 : 8)		1229	819			(2048)
<b>Total</b>	<b>26000</b>	<b>15421</b>	<b>10579</b>	<b>NIL</b>	<b>NIL</b>	<b>NIL</b>

- (c) **Reciprocal services method.** Two methods are available for dealing with reciprocal services, viz. Repeated distribution and Simultaneous Equations method.

Under repeated distribution method, the overhead expenses as per primary distribution summary are first noted by departments. Then expenses of one service department is distributed over the production as well as the other service departments, and then the other service department cost is distributed till the value of the service departments costs become 'nil' or 'negligible'. Let us take an illustration :

**Illustration :**

A manufacturing company has three production departments and two service departments. primary distribution summary of January, 2002 is given below :

## Overheads

		Rs.
Production departments	– A	5000
	– B	4000
	– C	3000
Service departments	– X	2000
	– Y	3000
	Total	17000

Service Department expenses are apportioned on the basis of following percentages —

Service Department H	Production departments			Service departments	
	A	B	C	X	Y
Dept.X	25	30	35	—	10
Dept.Y	30	25	25	20	—

**Solution : Secondary Distribution Summary**

Particulars	Production departments			Service departments	
	A	B	C	X	Y
As per summary	5000	4000	3000	2000	3000
Service dept.X	500	600	700	(2000)	200
					(3200)
Service dept.Y	960	800	800	640	—
Service dept.X	160	192	224	(640)	64
Service dept.Y	19	16	16	13	(64)
Service dept.X	3	4	5	(13)	—
	6642	5612	4745		

Alternatively, the above method can be applied by considering repeated distribution of service department expenses only as per percentage basis of apportionment given, and then the totals of each service cost centres be applied to the production cost centres as per basis given. Using the same data, we can solve the problem as follows :

Statement showing expenses of service department on the basis of reciprocal service

	X	Y
As per Primary Summary	2000	3000
Y — 10% of X	(200)	200
X — 20% of Y	640	(3200)
Y — 10% of X	(640)	64
X — 20% of Y	13	(64)
Y — 10% of X	(13)	1
	2653	3265

*Cost and Management Accounting***SECONDARY DISTRIBUTION SUMMARY**

<i>Departments</i>		<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
As per Summary		5000	4000	3000	2000	3000
Service Department	X	663	796	929	(2653)	265
” ”	Y	979	816	816	653	(3265)
TOTAL		6642	5612	4745	NIL	NIL

Under simultaneous equations method, the true costs of Service departments are ascertained first with the help of simultaneous equations, and then they are redistributed to production departments on the basis of given percentages. The principle is illustrated with the help of the same data used in the previous illustration.

**Illustration :**

Let  $x$  = total overhead expenses of X department  
 $y$  = total overhead expenses of Y department,  
 then  $x$  =  $2000 + 20\%$  of  $y$   
 $y$  =  $3000 + 10\%$  of  $x$  or  
 $x$  =  $2000 + .2y$   
 $y$  =  $3000 + .1x$

Multiplying both the equations by 10 to eliminate decimal,

$$\begin{aligned}
 10x &= 20000 + 2y \\
 \text{or } 10x - 2y &= 20000 \\
 10y &= 30000 + x \\
 \text{or } -x + 10y &= 30000 \\
 \text{or } 50x - 10y &= 100000 \text{ (Multiplying by 5)} \\
 -x + 10y &= 30000 \\
 \text{or } 49 &= 130000 \text{ (By adding)}
 \end{aligned}$$

$$\text{or } x = 130000 \text{ divide by } 49 = 2653$$

Putting value of  $x$  in second equation,  $y = 3000 + .1x = 3000 + 265 = 3265$

Having obtained the true values of X and Y departments, Secondary Distribution Summary can be done in the same way as done in the previous illustration.

**Limitation of Apportioned Overheads**

At this stage, it is pertinent to point out that most of the overhead expense items are common costs, and whatever logical or suitable basis is adopted to apportion the cost on the production and service cost centres, the ultimate result is bound to be arbitrary, and depending on the judgment of the persons selecting the basic and attitude of the management. Thus, the primary and secondary distribution will lead to an approximate, and not exact cost of the production department during the period. Such an approximation can neither help cost ascertainment and

### *Overheads*

cost control, nor decision making. It is because of this reason that under marginal cost technique, overhead expenses are regarded as period cost and are charged off to profit and loss account. Only variable costs are considered for product cost and inventory valuation.

## **6.2 ABSORPTION OF OVERHEADS BY PRODUCTS**

The object of absorption of overheads is to charge an equitable proportion of the total factory overheads to each unit of production. The total factory overheads are distributed to the production cost centres (a) by allocating departmental expenses, (b) by apportioning common costs along with service department expenses, and (c) by redistributing service department cost to the production cost centres. The total overhead of each production cost centre will be absorbed or recovered by the output of the department concerned. For this, a suitable base, such as, production unit, direct labour hour, machine hour, direct wages, etc. is to be determined, and the total departmental overheads are to be divided by the base to arrive at recovery or absorption rate at which the expenses are to be applied to the production units. The rate may be actual or predetermined. Again, the rate may be a single or blanket rate to the entire factory or separate rates for each production departments or cost centres.

### **Actual vs. Pre-determined Rate**

Actual overhead recovery rate is computed by dividing actual overheads cost by actual base in a particular period. It is obvious that one has to wait till the close of the accounting period for calculating actual rate.

Predetermined overhead recovery rate, on the other hand, is determined before the commencement of the period during which the same will be used. The rate is computed with reference to the budgeted overhead cost for the year and a predetermined quantity of the base (say, labour hour) for the year, which will be used as a denominator.

When historical cost ascertainment is the sole objective, actual overhead rate may lead to desired result. Otherwise, considerable delay will occur in arriving at the production using actual overhead rate. Even if the actual rate is calculated on a monthly basis, it will not serve the purpose due to the following reasons:

- a) Some of the expenses are not evenly incurred throughout the year. Examples are repairs and maintenance, lighting and heating, etc.
- b) Production volume fluctuates month to month due to more or less working days in a month or seasonal nature of product. As a result monthly overhead rates will fluctuate and consequently, production cost will vary from month to month, when such fluctuating rates will be applied to products in busy seasons, the cost will be low, while in slack season, the cost will be higher.

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Predetermined overhead absorption rates, on the other hand, have the following advantages:

- a) Product cost can be worked out promptly.
- b) Product cost can be estimated prior to commencement of production and can help the management in price quotation and fixing selling price well in advance.
- c) Product costs are not affected unnecessarily due to the vagaries of the calendar or seasonal fluctuations.
- d) Use of predetermined rate will provide data available for cost control as well as decision making.
- e) By using normal capacity as base while determining rate, losses due to idle capacity is highlighted and real cost of production is reflected.

In the light of above discussion, the method of predetermined overheads absorption rate appears to be more useful.

### Blanket vs. Multiple Rate

Overheads recovery rate may be one for the entire factory, or different rates for each production department. When a single rate is used for the entire factory, it is known as single or blanket rate. In a small firm or where only a single product is manufactured or all products are identical and pass through all the cost centres uniformly, blanket rate may be applied. But where disproportionate costs are incurred in different departments producing different products, through widely different processes, a blanket rate will lead to disastrous result. In all such cases, departmental or multiple recover rates are used. A product passing through each department will be charged with the overhead rate of that department. The following example will clarify the difference:

#### Illustration :

Cost centre	Machine hour	Overheads Rs.	Overhead recovery rate Rs./machine hour
Leaf processing	2000	200000	100
Cigarette making	8000	400000	50
Cigarette packing	10000	300000	30
Total	20000	900000	

Instead of the departmental recovery rates, a blanket rate of Rs. 45 per machine hour can be computed as Rs. 900000 divided by 20000 = Rs. 45. But what will be the effect? Cigarettes vary in tobacco blends (which require different processing time), size and brands (medium, magnum & king size) and packing (shell & slide, pouch & hinge lid}. As a result, each brand and pack of cigarette takes different time for processing, making and packing, and total overheads applicable will vary considerably. Again, consider the price : Cigarettes sell @ Rs. 2 per 10's to Rs. 50 per 20's. If blanket rate is applied, it will be too much load on cheap cigarettes, and too little on the expensive ones, although expensive cigarettes require more time for blending and packing. Consequently, cheap cigarettes will not be able to cover its overheads, while expensive cigarettes will have high margins.

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Other disadvantages in using blanket rates are that the performance of individual cost centres cannot be evaluated, and work in progress valuation may be incorrect. Hence, multiple rates should be used wherever difference in product, process and expense of the departments exists.

## 6.3 METHODS OF ABSORPTION

Selecting a base or denominator is the next important step towards absorption of overheads. The cost accountant should consider, while selecting the base, various factors such as the nature of the products which pass through the cost centres, factors which mainly cause incurrence of overheads and variations in time spent by various products. Lastly, the base which is most economical should be selected. The following bases are used for overhead absorption:

### (a) Production unit method

The absorption rate, which could be actual or predetermined, is calculated by dividing the cost to be absorbed by the number of cost units produced or expected to be produced. Rate per unit is also calculated by dividing 'estimated overheads for the Budget period' by the 'estimated units of production at normal capacity'. This is the simplest and the most direct method of applying factory overheads to production units. However, its usefulness is limited to those situations where there is only one product or if there are two or more products, all of them can be reduced to an equivalent production unit.

#### Problem :

Products manufactured	<i>X</i>	<i>Y</i>	<i>Z</i>
Normal capacity units	2000	1000	3000
Unit weight kgs.	2	3	5
Factory overheads for the period Rs. 2,20,000			

#### Solution :

	<i>X</i>	<i>Y</i>	<i>Z</i>
Estimated total weight kgs	$2 \times 2000$	$3 \times 1000$	$5 \times 3000$
	= 4000	+ 3000	+ 15000
	= 22000Kgs.		

Absorption rate will be Rs. 220000 divided by 22000 Kgs. = Rs. 10 per Kg.

Applying the rate to the products, the absorption rates will be:

$$\begin{aligned} X &= \text{Rs. } 10 \times 2 = \text{Rs. } 20 \text{ per unit} \\ Y &= \text{Rs. } 10 \times 3 = \text{Rs. } 30 \text{ per unit} \\ Z &= \text{Rs. } 10 \times 5 = \text{Rs. } 50 \text{ per unit} \end{aligned}$$

*Cost and Management Accounting***(b) Percentage on direct wages method**

When direct labour cost is used as a basis for absorbing overheads, the rate is expressed as a percentage of direct wages as follows:

$(\text{Estimated or budgeted overheads for the period} / \text{Estimated or budgeted direct wages for normal output}) \times 100$

The advantages of the method are as follows :-

- i) The method is simple and easy to apply.
- ii) It is suitable where production is uniform, and labour-oriented, and all the workers earn more or less the same hourly rate.
- iii) It recognises the fact that a large proportion of overhead expenses vary with time, and longer a job takes to complete, the higher it absorbs the overheads.
- iv) Labour rates fluctuate less frequently than material cost.

However, this method suffers from the following disadvantages :

- i) It ignores the difference in the rates of pay for different types of workers. An experienced and skilled worker is paid at a higher rate, and at the same time, his output may be higher than others. He takes less time to complete which means less incurrence of overhead, but the absorption on the basis of high wages will be higher than is applicable.
- ii) Overtime payments create further anomaly because many of the overheads do not increase with overtime work.
- iii) It does not make any distinction between manual and machine production, as well as using expensive and cheap machines. Expensive automatic machines use power, costly lubricants, maintenance besides high depreciation, but if absorption is made on the basis of attendant's wages, the recovery of overheads will be inequitable.

**(c) Percentage on direct material cost**

This method is similar to the previous one except that the material cost is taken as base for calculating absorption rate. This method is seldom used because it is very difficult to establish relationship between direct material costs and factory overheads. The method suffers from the following weaknesses :-

- (a) Material prices are subject to constant fluctuations, and this will lead to charging high or low overheads even though there may be no change in overhead expense.
- (b) Most of the overhead expense items vary with time, such as, rent, rates, taxes, insurance premium, supervisory and managerial salaries, etc. but this method completely ignores the fact.

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#### **(d) Percentage on prime cost method**

The method is also very simple, but is subject to the same weaknesses as those mentioned in case of direct wages and direct materials. The only circumstances in which this rate could be used, would be when a standard product is made, material prices are stable, labour rates are steady and machine and equipments remain unchanged.

#### **(e) Direct labour hour rate**

The direct labour hour rate is computed by dividing 'estimated overhead expenses to be absorbed' by 'estimated direct labour hours available 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 group of workers or each department. This method is superior to any of the earlier methods discussed because the majority of overhead expenses vary with time, and this method relates overhead absorption rates with time. This rate is most appropriate for cost centres where manual operation are predominant. Obviously, the method is not suitable for cost centres where operations are mostly mechanised.

#### **(f) Machine hour rate**

In factories or departments, where production is largely by machinery, this method gives greater accuracy than any of the other methods discussed earlier. The terminology defines a machine hour rate as "a rate calculated by dividing the budgeted or estimated overhead or labour and overhead cost attributable to a machine or group of similar machines by the appropriate number of machine hours. The hours may be the number of hours for which the machine or group is expected to be operated, the number of hours which would relate to normal working for the factory, or full capacity". In a highly mechanised cost centre, majority of the overhead expenses are incurred on account of using the machine, such as, depreciation, power, repairs and maintenance, insurance, etc. Machine hour rate, therefore, provides the most equitable basis for absorption of overheads in machine intensive cost centres.

#### **Computation of Machine Hour rate**

The overhead expenses are to be departmentalised first. Then, each machine or a group of machines within the department shall be treated as a cost centre, and all the items of expenses are allocated to the machine cost centres on some suitable basis. A machine hour rate is then computed by dividing the total overhead for the machine cost centre by the anticipated machine hours. For example, in the cigarette making department, there are twenty machines of which eight machines manufacture filter cigarettes, five machines plain medium cigarettes, and seven machines produce magnum size cigarettes. In such a situation, three different machine hour rates are to be computed for three groups of machines.

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Machine hour rate can be bifurcated into variable or running expenses and standing or fixed expenses in order to differentiate between expenses being incurred while running the machine compared to when it remains idle. For example, power, oil, grease and cotton waste, repairs and maintenance expenses are running or variable, while depreciation, rent and taxes, lighting and heating, insurance and supervision are included under standing or fixed charges.

Lastly, a machine hour rate may include the wages of the machine operator and attendance, if they become part of the complements. For example, in cigarette making machine, the operator and two catchers become part of the machine, because as long as the machine operates, they have to attend the machine and gain the same speed, say 2000 cigarettes per minute, as the machine produces. Such rate is called comprehensive machine hour rate. Needless to mention that operators wages shall be included as variable overhead expenses.

**Illustration :** From the following details, compute a comprehensive machine hour rate:

1. Cost of the machine - Rs. 4 lakhs, having a scrap value of Rs. 40000 at the end of 10 years of life.
2. Machine will run in two shifts of 7 hours duration for 33 working days ; 200 hours will be lost for repairs, maintenance and idle time.
3. Other details :
  - (a) Wages of two operators @ Rs. 4000 for each.
  - (b) Rent and rates of the machine shop accommodating four identical machine – Rs. 2400 per year.
  - (c) General lighting charges of the department – Rs. 300 per month.
  - (d) Insurance premium for the machine – Rs. 200 per quarter.
  - (e) Cost of repairs and maintenance per machine per month – Rs. 2500
  - (f) Supervisor's salary – Rs. 6000 per month.
  - (g) Power consumption – 20 units per hour @ rate Rs. 1.75 per unit.
  - (h) Other factory overheads – Rs. 13200 p.a.

There are four machines in the department and the supervisor devotes one-fifth of his time for each machine.

**Computation of Machine Hour Rate**

Department :	Machine No.	
Machine description :	Effective life: 10 years	
	Estimated working hours	
	$(300 \times 7 \times 2) - 200 = 4000$ Hrs.	
<b>1. Running Expenses :</b>	Per year	Per hour
Wages $(4000 \times 2 \times 12)$	96000	24.00
Power 20 Units @ 1.75	140000	35.00
Repairs & maintenance $(2500 \times 12)$	30000	7.50
Subtotal	266000	66.50

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**2. Fixed expenses :**

Depreciation(Rs.400000/40000) divide by10)	36000	
Rent & rates 2400 divide by 4	600	
General lighting (300 divide by 4) × 12	900	
Insurance Rs. 200 × 4	800	
Supervisor's salary (6000 × 12) / 5	14400	
Other overheads 13200 divided by 4	300	
Subtotal	56000	14.00
<b>TOTAL</b>	<b>322000</b>	<b>80.50</b>

Comprehensive machine hour rate = Rs. 80.50 per machine hour.

#### 6.4 OVER- AND UNDER- ABSORPTION OF OVERHEADS

When predetermined rate is used for absorption of overheads, there is likely to arise a difference between overheads absorbed and actual overheads incurred during the period. This may happen due to one or more of the following reasons:

- (a) Any error or omission at the time of computation of predetermined rates in estimating expenses or adopting the basis of recovery.
- (b) Actual overhead expenses are more or less than the estimates.
- (c) Actual hours or output differs from the budget or estimated figures.

Overabsorption of overhead arises when more overhead expenses are applied to products compared to actuals incurred. Under absorption of overhead arises under reverse condition. For example,

	Production Overhead <i>Rs.</i>	Administration Overhead <i>Rs.</i>	Selling & Dist. Overhead <i>Rs.</i>
Recovered by applying			
Predetermined rates	20000	10000	10000
Actual overhead expenses incurred	19000	12000	9500
Overabsorbed	1000	–	500
Underabsorbed	–	2000	–

The various reasons of over- and under- absorption may be analysed. Apart from the causes mentioned earlier, the difference may be caused by seasonal fluctuations, changes in the production methods affecting overheads, all expenses not properly accounted for, etc.

#### Treatment of Under- or Over- Absorbed Overheads

The under- or over-absorbed overheads may be disposed off in any one of the following ways:

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- i) Write off to costing profit and loss account.
- ii) Carry forward to next accounting period.
- iii) Use of supplementary rate.

**i) Write off to costing profit and loss Account.** Under-absorbed and over-absorbed overheads are first collected in a control account and then the net balance is debited or credited to the costing profit and loss account. This method is applicable when the amount of under- or over-absorbed overhead is not significant in relation to the total overheads. A typical overhead adjustment account is illustrated below:

<b>Overhead Adjustment A/c</b> ( <i>figures in Rs.</i> )			
		<i>Rs.</i>	<i>Rs.</i>
To	Administration overheads control a/c (Underabsorbed)	2000	
		2000	
			By Production overheads control a/c (Overabsorbed) 1000
			By Selling and Distrn. ovds. control a/c (Overabsorbed) 500
			By Costing profit & loss a/c transfer 500
			2000

- ii) Carry forward to next accounting period.** Under this method, under or over-absorbed overhead is transferred to a suspense or reserve account, and is carried over to the next accounting period as deferred charges or deferred credit on the assumption that it has occurred due to seasonal fluctuations and business cycle which extends over more than a year, and shall be evened out in the subsequent accounting period. This may also happen during the earlier part of a new project.
- iii) Use of supplementary rates.** If the under- or over-absorbed overheads are significant and has arisen due to error at the time of computation of rate, a supplementary rate has to be developed and applied to the cost of sales, finished stock and work-in-progress. The supplementary rate may be computed either as rates per hour or as a percentage of overheads already absorbed.

**Illustration :**

	<i>Rs.</i>
Overhead incurred	2,50,000
Overhead recovered	2,00,000
Cost of sales	30,00,000
Closing finished stock	12,00,000
Closing work-in-progress	8,00,000

**Solution :**

Total value of cost of sales,

Finished stock and work-in-progress	=	Rs. 50,00,000
Overhead underapplied	=	Rs. 50,000
Supplementary rate = 50000 divided by 5000000	=	Re.0.01 i.e 1 Paise per Rupee.

*Overheads*

Accounts will be debited as under:

Cost of sales a/c	Rs. 3000000 × 0.01	=	Rs. 30,000
Finished stock a/c	Rs. 1200000 × 0.01	=	Rs. 12,000
Work-in-process a/c	Rs. 800000 × 0.01	=	Rs. 8,000
Total			Rs. 50,000

As a result of the above adjustment, profit for the period will be reduced by Rs. 30,000, while profit of the subsequent period will be affected by Rs. 20000, when finished stock and work-in-process will be used.

## 6.5 CAPACITY COSTS

In computing a predetermined overhead rate regard must be had to determination of level of activity. Such a predetermined rate will vary according to different capacities, e.g., maximum, practical, normal. Thus if the estimated expenditure be Rs. 1,000 and maximum and practical capacities be 500 and 400 labour hours respectively, the predetermined rates are: .

1. Rate based on maximum capacity =  $\text{Rs.}1000/500 = \text{Rs. } 2.00$  per labour-hour.
2. Rate based on practical capacity =  $\text{Rs.}1000/400 = \text{Rs. } 2.50$  per labour-hour.

### (1) Maximum capacity:

Maximum capacity is the maximum productive capacity of a plant or department. Some losses are bound to occur in actual practice, but as such losses are not considered in determining maximum capacity, it is also called ideal or theoretical capacity. It is equal to the rated capacity specified by the manufacturers that may be achieved provided no operating time is lost. This maximum capacity is thus rarely achieved and is seldom used.

### (2) Practical capacity:

Practical or operating capacity is the maximum capacity less inevitable interruption, such as, time lost for breakdown, repairs, set up, normal delays, sundays and holidays, inventory taking etc. Practical capacity does not consider the external factors, such as, lack of orders from customers, unbalanced capacity, etc. Although the nature and extent of inevitable interruptions would depend on the type of plant, nature of product and other circumstances, practical capacity may be taken as 80 to 90% of the maximum capacity. Predetermined overhead rate is sometimes based on practical capacity. Determination of overhead rates based on practical capacity has the following advantages:

- (i) Practical capacity can be assessed accurately and overhead rates based on practical capacity relatively accurate.
- (ii) Idle capacity cost is indicated in the form of under-absorption of fixed overhead. This assists in the control of volume variance.
- (iii) Variations in volume can be reasonably explained.

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- (iv) Costs are not disturbed by variation in sales volume, stocks are correctly valued, and profits are accurately calculated.

**(3) Capacity based on sales expectancy:**

This is the capacity based on expected sales and is determined after a careful study of the market conditions. In most cases this capacity is less than the operating capacity because of lack of orders from customers. Predetermined overhead rate is sometimes computed based on sales expectancy. Determination of overhead rate on the basis of capacity at sales expectancy has the following advantages:

- (i) The amount of fixed overhead charged to the cost of production bears the same ratio to the total fixed overhead as the actual capacity bears the capacity based on expected sales.
- (ii) Overhead is recovered in production in full.
- (iii) The units cost becomes a basis for taking decision on price fixation and for integration in the budgetary plan.

**(4) Actual capacity:**

This is the volume of production achieved in a particular period. Actual capacity depends on various factors prevailing in the organisation and may be below or above the practical capacity and capacity based on sales expectancy.

**(5) Normal capacity:**

Normal capacity is generally the long term average capacity based on sales expectancy. But opinions differ as to what should be regarded as the normal capacity and accordingly normal capacity may be the practical or operating capacity and in rare cases the maximum capacity. In determining the normal capacity, the rated capacity of a plant and the sales potential are not so important as its physical capacity and long-term average sales expectancy. While determining normal capacity, machinery and equipment purchased should be excluded.

The advantages and consequently the objectives of establishing normal capacity are –

- (i) Establishment of budgets by determining the normal plant capacity.
- (ii) Computation of overhead rates based on normal capacity so as to remove under-or over-absorption to a great extent. It is extensively used in seasonal factories.
- (iii) Establishment of sales prices.
- (iv) Setting up of standards for materials, labour and overhead and reporting the variances.
- (v) Control as well as reduction of costs.
- (vi) Basis for scheduling production and fixation of operating schedule.
- (vii) Valuation of inventory.
- (viii) Determination of Break-even point.

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**6.6 OVERHEAD RATES BASED ON NORMAL CAPACITY**

As already mentioned normal capacity may represent capacity based on expected sales or maximum and practical operation capacity. The determination of normal capacity is very difficult and opinions may vary among the technical persons while fixing normal capacity. Some may give more emphasis on expected sales volume. Others may give emphasis on practical capacity attained while in extreme cases maximum capacity may be the normal capacity. The choice of normal capacity thus vary according to the different circumstances prevailing in an organisation. The overhead rate will differ accordingly and the amount of under- or over-absorption will differ if actual capacity differs from the normal capacity. This will be evident from the following illustration.

**Illustration 15 :**

From the following data calculate overhead rates based on –

- Maximum capacity,
- Practical capacity, and
- Capacity based on expected sales.

	<i>Maximum capacity (100%)</i>	<i>Practical capacity (80%)</i>	<i>Capacity on expected sales (75%)</i>
Direct labour hours	20,000	16,000	15,000
Fixed overhead (Rs.)	60,000	60,000	60,000
Variable overhead (Rs.)	40,000	32,000	30,000

- If the actual capacity utilised be 14,000 labour-hours, calculate amount of under-or over-recovery of fixed overhead on the basis of each of above capacities.

**Solution :** Computation of overhead rates based on –

	<i>(a) Maximum capacity (100%) (a)</i>	<i>(b) Practical capacity (80%) (b)</i>	<i>(c) Capacity on expected sales (75%) (c)</i>
(i) Direct labour-hours	20,000	16,000	15,000
(ii) Variable overhead (Rs.)	40,000	32,000	30,000
(iii) Fixed overhead (Rs.)	60,000	60,000	60,000
Variable overhead rate (ii)/(i)	Rs. 2.00	Rs. 2.00	Rs. 2.00
Fixed overhead rate (iii)/(i)	Rs. 3.00	Rs. 3.75	Rs. 4.00

Thus variable overhead rate remains constant at all levels and fixed overhead rate varies and depends on the particular capacity selected.

- If the actual capacity utilised be 14,000 labour-hours, the amount of under-absorption will be as follows :

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<i>Normal capacity based on –</i>	<i>Fixed overhead rate per labour-hour as shown earlier</i> Rs.	<i>Overhead absorbed on actual capacity (14,000 labour-hrs.)</i> Rs.	<i>Under-absorption of overhead (Rs. 60,000 - absorbed amount)</i> Rs.
(a) Maximum capacity	3.00	42,000	18,000
(b) Practical capacity	3.75	52,500	7,500
(c) Expected sales capacity	4.00	56,000	4,000

**Comments :**

- (1) Under-absorption in (a) represent idle capacity cost inclusive of all interruption.
- (2) Under-absorption in (b) represents the cost of capacity utilised due to lack of sales provided that no amount of the under-absorbed amount is attributable to other causes, e.g., change in expenditure, difference between predetermined and actual overhead rates are.
- (3) Under-absorption in (c) represents the cost utilised capacity due to expected sales not materialised.

**(6) Idle capacity and expected capacity :**

*Idle capacity* is the practical capacity less capacity based on sales expectancy or the actual capacity. Excess capacity is the retention of large production capacity than what can be expected to be used. Excess capacity also arises due to unbalanced machines and equipments in the departments. The distinction between idle capacity and expected capacity is that idle capacity refers to temporary idleness because of slowing down of production due to lack of orders or due to other causes. As soon as the difficulties in achieving production are removed, on the other hand, arises due to retention of larger production capacity or due to unbalanced machines and equipments within the departments. While the overhead rate may include cost of idle capacity, the costs incurred for keeping excess capacity should be excluded in computing overhead rates and charged to costing profit and loss account.

Idle capacity cost represented mostly by the fixed charges which remain unabsorbed due to underutilisation of services and plant capacity. Idle capacity should be reduced as far as possible by proper planning and establishment of an effective system of budgetary control. Excess capacity arising out of imbalance or bottlenecks in certain departments may be reduced or eliminated by working overtime, running double shift, temporary off-loading to departments having spare capacity, subcontracting the excess work and purchase of additional equipment. Where excess capacity arises due to other causes, it would be a prudent policy to dispose of the assets which cause excess capacity.

Idle time is often distinguished from idle capacity, and its cost is separated in the accounts. Idle time is lost time men or machines arising from lack of business or of material, breakdown, faulty supervision or other similar causes whether or not avoidable. Idle capacity is the difference between practical capacity and the actual capacity achieved and represents the unused productive potential.

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### 6.7 REPORTS FOR CONTROL OF OVERHEAD

Reporting system for control of overhead shall be so designed as to make a person responsible for the incurrence of the expenses. Expenses are collected departmentwise and function wise. They can be further classified into two parts, viz., (a) Apportioned expenses, which are transferred to the department by other cost centres or head office, and the department having no control over such expenses, and (b) departments own expenses. The incharge of the department is accountable for the use of the former, but the incurrence of the latter. Thus, a format of responsibility accounting can be drawn with estimated or budgeted expenses comparing actual and past results in the following way :

<b>Responsibility Accounting Statement</b>			
<b>Department :</b>	<b>Month :</b>		
<b>Expense Items</b>	<b>This month amount</b>	<b>Estimated budget</b>	<b>This month last year</b>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
(a) Departmental expenses			
(i)			
(ii)			
etc.			
(b) Apportioned expenses			
(i)			
(ii)			
etc.			
Total			

The aforesaid report shall be prepared in detail at the lowest level of management, and will be discussed in the monthly departmental meeting. A summary of the same shall be prepared by the Departmental Head with the reasons for variations to be forwarded to the top management.

Overhead expenses can be controlled by relating expenses with actual activity level by preparing a Flexible Budget for different activity levels. Reporting system depends on the individual requirements of each organisation.

### 7.0 ADMINISTRATION, SELLING AND DISTRIBUTION OVERHEAD

Analysis, accounting and control of administration overhead begin with the classification and collection of administration expenses in the same way as is done for factory overheads. Administration overhead is the total of all expenses associated with the administration functions like formulating the policy, directing the organisation and controlling the operations of the organisation. These expenses have no direct relation with production, selling, distribution, research or development activity or function. Administration expenses cover the activities

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such as secretarial, accounting, financing, legal, personnel, audit, etc., and include the following expenses classified under the aforesaid activities: salaries to office staff, office rent, rates and taxes, depreciation, repair and maintenance of office building and equipments, travelling expenses, conveyance, postage, telephone and telex, courier service, law charges, audit fees, subscriptions and donations, interest and general office expenses. Like factory overheads, these expenses are collected under cost account numbers.

## 7.1 ACCOUNTING OF ADMINISTRATION OVERHEAD

There are three distinct methods of accounting administrative overheads, viz,

### (a) Apportioning between production and selling and distribution function:

According to this method, total administration overhead are apportioned between the production and sales departments on some equitable basis, on the premise that manufacturing and selling are the two main functions of the organisation and administrative expenses are incurred mainly for these two functions. Hence, all expenses pertaining to administrative function should be proportionately charged to production and selling departments, and absorbed by the products as part of production and selling and distribution overheads. Identity of administration overheads, thereby, is lost.

The main problem in the method is to select an equitable basis to apportion administration expenses between manufacturing and selling and distribution activities.

Usually, the basis is arbitrary, and the result is unsatisfactory.

### (b) Transfer to profit and loss account

This method recognises the fact that the items of administration expenses are of fixed nature, having no direct relationship with production and sales activities. They should therefore, be treated as period cost and be written off to costing profit and loss account in the period in which they are incurred.

### (c) Treating administration overhead as separate addition to cost of productions sales

In this method, administration overhead is treated as a separate function, and administrative overhead appears as a separate element of cost of goods sold. However, the most difficult problem arises in selecting an equitable base for recovery or absorption. The following base are normally used for determining the rate of application:

- Factory cost
- Gross profit
- Net sales value
- Number of units sold or manufactured

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Each one of the above basis has relative merits and demerits, but generally factory cost is adopted for product cost oriented products, while one of the last three bases is used where selling and distribution cost is predominant. However, it should be emphasised that although administration overhead will be added to cost of sales, the same should not be loaded with inventory of finished goods or work-in-process.

#### **Control of Administrative Overhead**

Administrative overhead expenses are of fixed nature, arising out of management policies. Control of such expenses requires collection under correct cost account numbers for each administrative department. For the purpose of control, overheads collected for an accounting period are compared with similar figures of the previous period. Such a comparison will reveal efficiency or inefficiency of the concerned department. However, this method gives a limited degree of control, if the level of activity is not constant during the two periods under comparison. Again, past year's data may not provide the right evaluation criteria, because it incorporates inefficiencies of the past year and fails to consider intervening changes.

A better method of control is the preparation and use of budget for each item of expenses classified departmentwise. The budget figures based on anticipated activity level are compared against actual performance, and the variances are analysed and responsibility is assigned to the department concerned for control purposes.

A still better method of controlling administration overhead is the use of standards for each function or activity and comparing the actuals against the standard set. However, not all tasks can be standardised, and therefore, standards shall have limited application.

## **7.2 SELLING AND DISTRIBUTION OVERHEAD**

Selling overhead relates to the expenses incurred for promoting the marketing of the products, securing and executing the orders. Examples are salaries, commission and travelling expenses of salesmen, sales office expenses, advertisement and publicity, cost of price lists and catalogues, market research expenses, bad debts, etc.

Distribution overhead is the cost of delivery and despatch of finished products from the factory to warehouse and from warehouse to customers, and includes the cost of bringing returnable containers, if any, to the factory till they are ready for reuse. Examples are carriage and freight, depreciation of delivery vans, repairs and maintenance and insurance of delivery vans, warehouse rent and expenses, transit insurance of finished goods.

Selling and Distribution, are therefore, two distinct functions, but in most of the organisations, they are grouped together as selling and distribution expenses for the purpose of accounting and control. With the increase in advertisement and sales promotional activities, widening of sales territories and direct handling of distribution, the importance of these costs has grown up considerably.

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### Accounting of Selling and Distribution Overhead

Accounting of selling and distribution overhead start with the collection of expenses under clearly defined cost account numbers. These expenses are, thereafter, allocated and apportioned to various functions which may be grouped under the following headings:

- i) Advertisement and sales promotion
- ii) Direct selling
- iii) Transportation
- iv) Warehousing and storage
- v) Credit and collection

Each of the above functions can be further divided into various territories, such as North, South, East, West, etc. and expenses can be allocated and apportioned to each of these territories for accounting and control. Some of the expenses such as sales commission, travelling expenses of the salesmen, shipping cost, direct selling expenses are identifiable and therefore, can be allocated directly to the function and territories. Other expenses can be apportioned on some suitable basis. Ultimately, all expenses shall be absorbed or recovered by products or group of product sold (in the same way as factory overheads are charged to products). The bases of absorption may be one of the following:

- i) Sales value
- ii) Cost of goods sold
- iii) Gross profit on sales
- iv) No. of units sold

Sales value or number of units sold appears to be the most suitable basis as it is easier to relate selling & distribution expenses to these bases. The rate may be computed as

$$\frac{\text{Selling and distribution overheads}}{\text{Sales value}} \times 100$$

Selling and Distribution expenses can be further analysed by customers, by products or product lines, by channels of distribution for assessing profitability and exercising control.

Selling and Distribution overhead may be classified under fixed, semi-variable and variable overheads. Variable costs are incurred only when an unit is sold, such as, commission or carriage and freight, and therefore, they represent a definite sum per unit of products sold. Under marginal cost techniques, such variable expenses are deducted along with variable cost of manufacturing to arrive at contribution per unit. Such classification is essential for effective control and decision making.

### Control of Selling and Distribution Overhead

Control of selling and distribution overhead is a difficult task because of the nature of expenses. The incidence of such expenses mainly depends on external factors, such as market location and competition, customers behaviour, prevailing terms of sales, etc. on which management

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has no control. Sales promotional effort differs widely between products, customers and territories. It is often difficult to match the cost with results. For example, advertisement expenses is incurred for sales, but the latter is influenced by price, quality, competition, credit policy, etc. along with advertisement and sales promotional activities. Hence, it is difficult to assess how much sales has been effected out of advertisement.

In spite of the aforesaid difficulties, the following methods may be used for controlling them –

- (a) **Comparison with past results.** Selling and distribution overhead are compared with the previous period figures. If there is significant change in volume between the two periods, then the expenses may be expressed as a percentage of sales, and the percentages may be compared between the two periods.
- (b) **Use of budget.** A budget is prepared for Selling and distribution expenses on the basis of anticipated sales. The expenses are classified into fixed and variable expenses. If necessary, a flexible budget can be prepared using different levels of sales. Actual expenses are compared against budget, and deviations are analysed and discussed for corrective action.
- (c) **Use of standard.** Standards may be set up in relation to standard sales volume for salesmen, territories, products, etc., and actuals are compared with standards. Variances are analysed and corrective measures are taken.

## **7.3 RESEARCH AND DEVELOPMENT COST**

"Research is original and planned investigation undertaken with the hope of gaining new scientific or technical knowledge and understanding". Development is the translation of research findings or other knowledge into a plan or design for the production of new or substantially improved materials, devices, products, processes, systems or services prior to the commencement of commercial production". Development thus starts where research ends. The result of research cannot be put directly to commercial use. Feasibility study, identification of practical difficulties, etc. are required before, and these are included in development cost.

Research and development cost includes the following:

- (a) Salaries, wages and other expenses of personnel engaged in the activities.
- (b) Cost of materials and services consumed.
- (c) Depreciation of equipments and facilities used for research and development.
- (d) Rent, rates, taxes, insurance and other expenses relating to the building or floor space used.
- (e) Other costs.

Research and development costs are likely to be fixed in nature. Research and development expenses should always be charged to Profit & Loss account in the year in which incurred. Development costs, however, can be deferred only if they can be identified with particular product or process, which will be successfully used during the next period. When research has been undertaken at the instance of the customer, the entire expenses can be accumulated and charged to the customer.

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The accounting and control of research and development expenses depend on the size of the activities. It can be small and part of the factory unit, or it could be an independent unit with full management and authority.

#### **7.4 DEPRECIATION AND OBSOLESCENCE**

Depreciation is defined as the diminution in the value of a fixed asset due to use and/ or lapse of time. That means, depreciation of assets takes place due to the wear and tear of the asset for using as well as for lapse of time. Depreciation may be regarded as fixed, variable or semi-variable depending on the importance given to usage and time factors. Strictly speaking, depreciation is a semi-variable expense.

In financial accounts, depreciation is provided for the purpose of replacement of the asset at the end of its useful life. In cost accounts, the depreciation is considered as a charge to production for utilising assets such as, machinery and equipment. The cost of production will be understated, and profit overstated, if depreciation is not charged for the use of plant and machinery and other assets. Excess profit will be distributed to shareholders, while sufficient funds may not be available for replacement of machinery when required.

There are several methods of calculating depreciation, of which two methods are very common, viz. straight line method and diminishing balance method. Under straight line method, the original cost of the asset as reduced by scrap value at the end of the effective life is divided by the assumed life of the asset, and charged equally every year. For example, if an asset is valued at Rs.12,000, and the scrap value at the end of its effective life of 10 years is Rs.2,000, then during the 10 year period, depreciation will be charged @ Rs.1,000 per year i.e. (12000 - 2000) divided by 10 years.

Reducing balance method of depreciation is calculated as a constant proportion of the balance of the value of asset after deducting the amount previously employed. For example, if cost of the asset is Rs. 12000, and depreciation percentage is fixed at 10%, then in the first year 10% of Rs. 12000 i.e. Rs. 1200 will be provided. In the second year, 10% will be applied on the reduced balance of the asset i.e. Rs.10,800 (Rs. 12000 less Rs. 1200), and depreciation of Rs. 1080 will be provided. Other methods of depreciation are as follows:

- (a) **Production unit method.** Depreciation is provided by means of a fixed rate per unit of production calculated by dividing the value of the asset by the estimated number of units to be produced during its life.
- (b) **Production hour method.** Depreciation is provided by means of a fixed rate per hour of production calculated by dividing the value of asset by the estimated number of working hours of its life.
- (c) **Repair provision method.** Depreciation along with maintenance cost is provided by means of periodic charges each of which is a constant proportion of the aggregate of the cost of asset depreciated and the expected maintenance cost during its life.

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- (d) **Annuity method.** Depreciation is provided by means of periodic charges, each of which is a constant proportion of the aggregate of the cost of the asset depreciated and interest at a given rate per period on the written down value of the asset at the beginning of each period.
- (e) **Sinking fund method.** Depreciation is provided by means of fixed periodic charges which, aggregated with compound interest over the life of the asset, would equal the cost of that asset. Simultaneously, with each periodic charge an investment of the same amount would be made in fixed interest security which would accumulate at compound interest to provide, at the end of life of the asset, a sum equal to its cost.
- (f) **Endowment policy method.** Depreciation is provided by means of fixed periodic charges equivalent to the premia or an endowment policy for the amount required to provide, at the end of the life of the asset, a sum equal its cost.
- (g) **Revaluation method.** Depreciation is provided by means of periodic charges each of which is equivalent to the difference between the value assigned to the asset at the beginning and at the end of the period.
- (h) **Sum of the digits method.** Depreciation is provided by means of differing periodic rates computed according to the following formula. If “n” is the estimated life of the asset, the rate is calculated each period as a fraction in which the denominator is always the sum of the series 1, 2, 3 .....n and the numerator for the first period is n, for the second n - 1, and so on.

**\*\* Students are advised to study in details and work out problems under each of the above methods from the text books viz. “Cost Accounting Methods and Problems” by B. K. Bhar and Wheldon’s “Cost Accounting”.**

### **Obsolescence**

*Obsolescence* refers to a sudden loss in the value of an assets, because it has to be discarded before the expiry of its normal life, due to one or more of the following reasons:

- i) Change in technology.
- ii) Discontinuance of the product line which uses the asset.
- iii) Introducing a new and high yielding machine in replacement of existing one for higher productivity and lower cost.
- iv) Changes in product specification resulting in change in method.

When obsolescence occurs, the written down value of the asset has to be charged off to costing profit & loss account, as the same will have no relevance with the current production. However, if the amount is too heavy, it can be deferred over next few years. An alternative method is to create an obsolescence reserve by funding every year, and to utilise the same for writing off losses arising out of obsolescence of assets.

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## 7.5 INTEREST ON CAPITAL

There is a controversy whether interest on capital employed should be included in the cost accounts or not. Those who are in favour of including interest in cost account justify on the following points:

- (a) Interest is the return for use of capital, as much as labour for wages. If wages are included in cost, why not interest?
- (b) Computation of total cost is not possible unless interest which is also an element of cost, is not included. This is specially important, where raw materials like timber, tobacco, etc. require maturing time, and the interest on capital blocked over the period is a significant cost. If it is not considered, then cost of raw timber or tobacco will not match with higher priced matured timber or tobacco.
- (c) Interest is required to be included for taking correct managerial decision. For example, if a manual operation is replaced by a very expensive machine, and interest paid on borrowed funds is not included in the comparative cost calculation, will it bring out correct comparison?
- (d) Comparison of jobs taking significantly different times or inventory lying in stores for varying period will also cost differently, unless interest is included.

As against the above, the following arguments are given by those who are against inclusion of interest in cost accounts —

- (a) The argument of interest being the reward of capital is in economics, not in costing.
- (b) Payment of interest depends on the financing policy. A concern can use its own fund or borrowed fund, but that will alter his business profit, not cost of production.
- (c) If interest is included in manufactured stock, it has to be written back for balances sheet purpose.
- (d) Charging interest to jobs or process is unnecessarily complicated, while comparisons involving interest can be best done by preparing separate statements.

Thus the consensus of opinion is against including interest on capital in the cost accounts.

## 7.6 TREATMENT OF SOME EXPENSES

### General Principles

The general principle for treatment of expenses is that costs which can be identified specifically to a product unit or cost centre should be charged directly. Otherwise, the expenses should be apportioned on some suitable basis. Normal losses are borne by good production, but abnormal losses or expenses are kept outside the perview of cost accounts and charged to profit and loss account. For example, drawing and design office expenses may be collected as a service cost centre and apportioned to the production cost centres on the basis of number of drawings made or man-hour spent for each production order, or any other technical estimate. Drawing

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and designs prepared for a specific production of non-repetition type can be charged as 'direct expense'. Similarly, drawing and designs to be enclosed with sales tenders may be treated as selling overheads.

#### **Royalties**

Royalties payable is in the nature of rent which is paid for the right to make use of a patent, process or component in the course of manufacture and for the right to sell the finished product. In either case, payment is made to the owner of the patent right. Whether it will be included under production or selling expenses will depend on the fact of the case. However, it could be regarded also as direct expense, which should be considered first before charging to factory overheads.

#### **Carriage and Freight**

The cost of carriage and freight paid for the transportation of raw materials is allocated directly and forms a part of the cost of such materials. When this is not practicable, the expense is treated as factory overheads and collected under standing order number. However, carriage and freight paid for bringing materials to be used for capital work order shall be charged to capital asset concerned.

Carriage outwards is incurred for transporting finished goods, and the cost is therefore, chargeable to distribution expense. If the same transport is used to distribute finished product, and to bring raw materials on its return journey, the expenses shall be apportioned between the two functions and recovered on a suitable basis, such as truck-hour, truck-kilometre, etc.

#### **Material Handling Expenses**

Material handling expenses normally include all expenses for handling raw materials and supplies, work-in-process, and finished stock. It may include weighing of materials at various points, as well as movement of materials within the factory. Material handling expenses may be apportioned on the basis of value, weight or volume of materials or number of material requisitions handled.

#### **Dismantling and Reinstallation of Plant**

Machinery and equipment may sometimes require to be relocated for various reasons. If the rearrangement arises out of faulty planning and adds no value to the asset, the expenses may be collected under a Standing Order number and charged to Profit & Loss account. However, if it is done for improvement in production method, the expenses may be charged to overheads. When original cost of installation relating to the asset is known, the cost of dismantling and reinstallation cost may be added to the asset value to the extent of the differential between the reinstallation cost and original installation cost. The balance may be transferred to factory overhead.

*Cost and Management Accounting***Rent charged for premises owned**

In such case, actually rent is not payable, but a charge is made to overhead by crediting accrued charges account. At the end of the year, the total of rent accrued would be transferred to the credit of costing profit & loss account.

**Tool Setting Time**

If the setting is for a specific order, it may be conveniently charged to that order directly. However, when a number of orders are dealt with on a machine with one setting only, the expense is naturally included in the overhead rate for the machine or department concerned.

**Training Expense**

Progressive organisations today spend a sizeable amount towards training and development of staff and workmen, apprentices to executives. The cost of such training comprises salaries and wages of the trainees, pay and allowances of teaching staff, fees for outside training institutes, training materials, etc. All these expenses are collected under standing order numbers under training cost centre. The total cost of training cost centre is then apportioned between production, administration and selling & distribution overhead on the basis of the number of trainees in each cost centre. If the trainees perform some productive work in course of training programme, the estimated cost of that benefit is passed on to the training cost centre for deduction from total cost of training.

**Lighting, heating, ventilation, air conditioning expenses**

The expenses incurred on lighting, heating ventilation, air conditioning, etc., are booked under suitable standing order members. Where the services rendered to different cost centres are metered or can otherwise, be measured the expenses are allocated to cost centres. Otherwise, the expenses involved are apportioned on the basis of wattage, number of electric points, floor area, cubic capacity, tonnage of air conditioning, machines run, etc.

**Repairs and maintenance costs**

The main function of the maintenance department is to keep the plant and machinery in good and running condition without affecting the normal flow of production. Costs of regular and routine maintenance or preventive maintenance costs should be collected under standing order numbers as part of production overhead. Repairs and maintenance department is treated as a service cost centre and all costs collected under this service cost centre are apportioned to other cost centres on the basis of machine hours, value of machines hours worked, services rendered, etc.

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### Market research

Market research is the systematic study of the market condition and ascertainment of market potentiality. Market research is an item of selling overhead and is generally prorated to all products on the basis of sales. Where market research is incurred for a particular product, the cost can be charged directly to the product during the current year or may be treated as an item of deferred revenue expenditure to be charged in subsequent years when production and sales are fully established.

### Bad debts

When bad debt is within the normal limit it may be reasonably included under selling overhead. When the bad debt is exceptional or abnormal it is better to exclude it from cost accounts.

### Advertisement cost

Advertisement cost includes expenses incurred for advertisement in the trade journals, newspapers, bulletins, or use of handbills, posters, sign plates, cinema slides, etc. Showroom expenses for exhibiting products and attracting customers, expenses in connection with trade fairs and exhibitions, free samples of the product in the case of medicines, “gifts” along with

the sales pack are also advertisement expenses. Advertisement cost is a part of selling overhead and may be specific or general. Cost of specific advertisement may be charged directly to the product or department concerned. Cost of general advertisement is prorated to all products on the basis of sales values. When advertisement expenses are heavy and the benefit of such advertisement will be obtained in subsequent years, the expenses, may be treated as a deferred revenue expenditure and be charged in three or four years when production and sales are fully established.

**\*\* Students are advised to make in-depth study of this portion, and then concentrate on Chapters 4 & 5 of N. K. Prasad’s Principle and Practice of Cost Accounting. After being thorough with the subject, B. K. Bhar’s book “Cost Accounting Methods and Problems” may be referred to..**

— Solve as many problems as possible on overheads distribution, absorption, cost ascertainment and idle time.

## ◆ SPECIMEN QUESTIONS WITH ANSWERS

### Question 1:

- (a) What is machine hour rate ? Explain briefly the circumstances in which a machine hour rate may be suitably used in cost accounting.
- (b) The following data pertains to the machine shop of an engineering company, relating to the year 19X4. The machine shop has 3 cost centres A, B, C each having 3 distinct set of machines.

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	<i>A</i>	<i>B</i>	<i>C</i>	<i>Total</i>
1. No. of workers	400	400	800	1,600
2. No. of machine hours	50,000	50,000	60,000	1,60,000
3. Percentage of HP	40	25	35	100
4. Value of assets (Rs. in lakhs)	20	35	30	85.00
5. Direct wages (Rs. in lakhs)	16	20	24	60.00
6. Indirect wages (Rs. in lakhs)				18.00
7. Supervisory salaries (Rs. in lakhs)				7.00
8. Depreciation (Rs. in lakhs)				8.50
9. Insurance (Rs. in lakhs)				4.25
10. Electricity charges (Rs. in lakhs)				12.00
11. Welfare expenses (Rs. in lakhs)				9.00
12. Office & other expenses (Rs. in lakhs)				16.00

Work out a composite machine hour rate for each of the cost centres, showing the basis of apportionment of expenses amongst the cost centres.

**Answer :**

- (a) Machine hour rate means the cost or expenses incurred in running a machine for one hour. It is on the basis of this rate that a charge is made to the jobs for the overheads depending upon the number of hours for which a machine has worked on that job. It is obtained by dividing the total factory overheads concerning a machine by the number of machine hours e.g. overheads of machine M Rs. 5 lakhs, number of machine hours 25,000; MHR is Rs. 20 per hour. For a job requiring 15 machine hours Rs. 300 would be the overheads chargeable. CIMA, London has defined machine hour rate as an “actual or predetermined rate of cost apportionment or overhead absorption, which is calculated by dividing the cost to be apportioned or absorbed by a number of hours for which a machine or machines are operated or expected to be operated”. This is one of the most scientific methods for the absorption of factory overheads.

**(b) Computation of composite machine hour rate**

<i>Items</i>	<i>Basis of apportionment</i>	<i>Total (Rs.in lakhs)</i>	<i>Cost centres (Rs. in lakhs)</i>		
			<i>A</i>	<i>B</i>	<i>C</i>
Direct wages	Actual	60.00	16.00	20.00	24.00
Depreciation	Value of assets	8.50	2.00	3.50	3.00
Indirect wages	Direct wages	18.00	4.80	6.00	7.20
Supervisory salary	No. of workers	7.00	1.75	1.75	3.50
Insurance	Value of assets	4.25	1.00	1.75	1.50
Electricity charges	H.P. percentage	12.00	4.80	3.00	4.20
Welfare expenses	No. of workers	9.00	2.25	2.25	4.50
Office & other exp.	Machine hours	16.00	5.00	5.00	6.00
	<b>Total</b>	134.75	37.60	43.25	53.90
No. of machine hrs. (lakh of hrs)		1.60	0.50	0.50	0.60
Machine hour rate (Rs.)			75.20	86.50	89.83

*Overheads*

Composite machine hour rate inclusive of direct wages for cost centres A, B, C are Rs. 75.20, Rs. 86.50 and Rs. 89.83 respectively.

**Question 2 :**

A company has 3 production departments A, B and C and two service departments X and Y. The following data are extracted from the records of the company for a particular given period:

A.	<i>Rs.</i>
(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, departmentwise**

	<i>Total</i>	<i>Departments</i>				
		<i>A</i>	<i>B</i>	<i>C</i>	<i>X</i>	<i>Y</i>
Direct wages (Rs.)	50,000	15,000	10,000	15,000	7,500	2,500
Horse power of machines used	150	60	30	50	10	–
Cost of machinery (Rs.)	12,50,000	3,00,000	4,00,000	5,00,000	25,000	25,000
Production hours worked	–	6,225	4,028	4,066	–	–
Floor space used (sq. mtr.)	10,000	2,000	2,500	3,000	2,000	500
Lighting points (nos.)	60	10	15	20	10	5

**C. Service departments' expenses allocation**

	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>X</i>	<i>Y</i>
<i>X</i>	20%	30%	40%	–	10%	
<i>Y</i>	40%	20%	30%	10%	–	

You are required to :

- (a) compute the overhead rate of production departments using the repeated distribution method; and
- (b) hence, determine the total cost of a product whose direct material cost and direct labour cost are respectively Rs. 250 and Rs. 150 and which would consume 4 hours, 5 hours in departments A, B and C respectively.

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**Answer :**

**(a) Statement of distribution of overheads and overhead rates.**

Items	Basis of apportionment	Total Rs.	Production Depts.			Service Depts.	
			A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
Direct wages	Actual (only service depts.)	10,000	—	—	—	7,500	2,500
Rent and rates	Floor space @ Rs.2.5 per m <sup>2</sup>	25,000	5,000	6,250	7,500	5,000	1,250
General lighting	Lighting points @ Rs. 50 per point	3,000	500	750	1,000	500	250
Indirect wages	Direct wages (15%)	7,500	2,250	1,500	2,250	1,125	375
Power	Horse power @ Rs.. 50	7,500	3,000	1,500	2,500	500	—
Depreciation on machine	Cost of machine 4% of cost of machine	50,000	12,000	16,000	20,000	1,000	1,000
Sundries	Direct wages @ Re. 1	50,000	15,000	10,000	15,000	7,500	2,500
Total (i)		1,53,000	37,750	36,000	48,250	23,125	7,875

**Redistribution of service departments expenses is as follows –**

	Rs.	Rs.	Rs.	Rs.	Rs.
Dept. X overhead apportioned to A, B, C & Y in (20 : 30 : 40 : 10)	4,625	6,937	9,250	(23,125)	2,313
Dept. Y overhead apportioned to A, B, C & X in ( 40 :20: 30 : 10)	4,075	2,038	3,056	1,019	(10,188)
Dept. X overhead apportioned to A, B, C & Y in (20 : 30 : 40 : 10)	204	306	407	(1,019)	102
Dept. Y overhead apportioned to A, B, C & X in ( 40 :20: 30 : 10)	41	20	31	10	(102)
Dept. X overhead apportioned to A, B, C & Y in (20 : 30 : 40 : 10)	2	3	5	(10)	—
Sub-total (ii)	8,947	9,304	12,749	—	—
(1) Grand Total (i) + (ii) Rs. 1,53,000	46,697	45,304	60,999	—	—
(2) Hours worked on production (Hrs.)	6,226	4,028	4,066	—	—
Overhead rate per hour (1/2) (Rs. )	7.50	11.25	15.00		

*Overheads*

Hence, overhead rates per hour for production Depts. A,B and C are as follows:

<i>Departments</i>	<i>Rate per hour (Rs.)</i>
A	7.50
B	11.25
C	15.00

(b) **Statement showing determination of total cost of a product**

<i>Particulars</i>	<i>Amount</i>		
	<i>Rs.</i>	<i>Rs.</i>	
Direct material cost (as given)	250		
Direct labour cost (as given)	150		
Prime cost		400	
Overhead cost:			
<i>Depts.</i>	<i>Hours consumed</i>	<i>Rate</i>	<i>Rs.</i>
A	4	7.50	30.00
B	5	11.25	56.25
C	3	15.00	45.00
Total production cost			131.25
			531.25

**Question 3 :**

M/s. SISTAS & Co. manufacture product A at the rate of 80 pieces per hour. The company has been producing and selling 1,60,000 units annually during the period 1991 to 1995. However, during the year 1996 the company was able to produce 1,46,000 units only. The company's annual fixed overhead for 1996 amounted to Rs. 5,84,000. The company works on single shift only at 8 hours per day and 6 days a week. The company had declared 13 holidays during the year 1996. The quarterly preventive maintenance and repairs work involved 77 hours.

You are required to :

- (a) calculate the maximum, practical, normal and actual capacities in 1996, in terms of hours;
- (b) compute the idle capacity and hourly rate for recovery of overhead rates for each of the capacities computed at (a) above; and
- (c) prepare a statement showing idle capacity cost assuming that the overhead rates of recovery are based on various capacities arrived at (a) above.

*Cost and Management Accounting*

**Answer :**

**(a) Computation of maximum, practical, normal and actual capacities in 1996.**

**Maximum capacity :**

Total days in 1996 × Single eight hours shift	= 366 × 8	<i>Hours.</i> 2,928
<b>Practical capacity:</b>		<i>Hours.</i>
<b>Maximum capacity :</b>		2,928

*Less :* Idle capacity due to various reasons :

Idle capacity due to

Sundays 52 × 8 = 416 hrs.

Holidays 13 × 8 = 104 hrs.

Quarterly preventive

maintenance & repairs 77 × 4 = 308 hrs. 828      2,100

**Normal capacity:**

(Normal production and sales expected)/ Rate of  
production per hour= (1,60,000/80 units) 2,000

**Actual capacity :**

Actual capacity utilised :

(Total production/Hourly rate of production) = 1,46,000 ÷ 80 1,825

**(b) Statement showing idle capacity and hourly recovery rates of overhead rates.**

<i>Base</i>	<i>Base capacity (hours)</i>	<i>Capacity utilised (hours)</i>	<i>Idle capacity (hours)</i>	<i>Hourly rate of recovery for fixed O.H. (Rs.)</i>
Maximum capacity	2,928	1,825	1,103	199.45
Production capacity	2,100	1,825	275	278.10
Normal capacity	2,000	1,825	175	292.00
Normal capacity	1,825	1,825	—	320.00

**Working Notes :**

Hourly rate of recovery for fixed overhead = Total fixed overhead/Base capacity

1)  $5,84,000/2,928 = 199.45$

2)  $584,000/2,100 = 278.10$

3)  $5,84,000/2,000 = 292.00$

4)  $5,84,000/ 1,825 = 320.00$

## Overheads

## (c) Statement showing the idle capacity cost

Base capacity	Overhead absorption rate per hour Rs.	Applied fixed overhead		Idle capacity cost	
		Hours.	Amount Rs.	Hours	Amount Rs.
Maximum	199.45	1,825	3,64,003	1,103	2,19,997
Practical	278.10	1,825	5,07,524	275	76,476
Normal	292.00	1,825	5,32,900	175	51,100
Actual	320.00	1,825	5,84,000	—	—

**Question 4 :**

ABC Ltd. is preparing its departmental budgets and product cost estimates for the year ending 31 December 19X5. The company has three manufacturing departments – machining, assembly and finishing – together with a production maintenance department.

The following costs and related data have been estimated for the year to 31 December 19X5.

## Costs

	Machining Rs. '000	Assembly Rs. '000	Finishing Rs. '000	Maintenance Rs. '000	Total Rs. '000
Direct wages	60	32	72	—	164
Indirect wages	10	6	8	30	54
Direct materials	80	10	4	—	94
Indirect materials is	4	8	20	47	
Power					102
Light and heat					10
Depreciation					7
Rent and rates					25
Personnel					63
Other data					
Direct labour hours	12,000	8,000	16,000	6,000	42,000
Machine hours	40,000	5,000	6,000	—	51,000
Employees	6	4	8	3	21
Floor area (sq.m.)	1,000	400	300	300	2,000
Net book value of fixed assets	20,000	8,000	3,000	4,000	35,000

The maintenance department is expected to spend 60% of its time working for the machining department, with remainder of its time being shares equally between assembly and finishing.

*Cost and Management Accounting**Required*

- (a) Prepare an overhead analysis sheet for ABC Ltd. for its year ending 31 December 19X5.
- (b) Calculate appropriate overhead absorption rates for the machining, assembly and finishing departments.
- (c) Prepare a cost estimate, based on the following data, for a product which is to be manufactured in January 19X5.

	<i>Machining</i>	<i>Assembly</i>	<i>Finishing</i>
Direct material Rs.	2,500	400	200
Direct labour hours	800	350	140
Machine hours	1,400	100	80

- (d) Prepare the fixed production overhead control account for the machining department, assuming that :
  - (i) all the overhead costs budgeted are fixed costs;
  - (ii) the actual fixed overhead costs incurred amounted to Rs. 1,28,000;
  - (iii) the actual direct labour and machine hours were 10,500 and 39,000 respectively.

**Answer :**

[*Notes to students* : Remember that you should not include direct costs in an overhead analysis sheet, only indirect costs. It is vital that you are able to complete this question successfully as it is indicative of the type of question set on absorption costing. Comment. The examiner very helpfully suggested the following approach to the question —

- (1) Identify the indirect costs from those given.
- (2) Draw up an overhead analysis sheet and insert those indirect costs which can be allocated to a particular cost centre.
- (3) Identify an appropriate apportionment basis for each of the remaining indirect costs and apportion them between the relevant cost centres.
- (4) Total the costs of each centre.
- (5) Apportion the maintenance cost centre amongst the productive cost centres.
- (6) Total the costs of each productive cost centre.
- (7) Select an appropriate measure of output for each productive cost centre and calculate an absorption rate for each.
- (8) Use the absorption rates to attribute overhead costs to the cost unit.
- (9) Prepare the overhead control account for the machining department and calculate the over under-absorption which arises.]
- (a) Overhead analysis for ABC Ltd for year ending 31. 12.X5

## Overheads

	<i>Machining</i> <i>Rs. '000</i>	<i>Assembly</i> <i>Rs. '000</i>	<i>Finishing</i> <i>Rs. '000</i>	<i>Maintenance</i> <i>Rs. '000</i>	<i>Total</i> <i>Rs. '000</i>	<i>Basis</i>
Indirect wages	10.00	6.00	8.00	30.00	54	Allocation
Indirect materials	15.00	4.00	8.00	20.00	47	Allocation
Power	80.00	10.00	12.00	–	102	Machine hrs.
Light and heat	5.00	2.00	1.50	1.50	10	Area
Depreciation	4.00	1.60	0.60	0.80	7	Book value
Rent and rates	12.50	5.00	3.75	3.75	25	Area
Personnel	18.00	12.00	24.00	9.00	63	Employees.
	144.50	40.60	57.85	65.05	308	
Reapportionment of maintenance department overheads (6:2:2)	39.03	13.01	13.01	(65.05)	–	
	183.53	53.61	70.86	—	308	

- (b) Machining : Rs. 1,83,530/40,000 = Rs. 4.59 per machine hour (rounded)  
 Assembly : Rs. 53,610/8,000 = Rs. 6.70 per direct labour hour (rounded)  
 Finishing : Rs. 70,860/16,000 = Rs. 4.43 per direct labour hour (rounded)

- (c) Cost estimate

	<i>Rs.</i>	<i>Rs.</i>
Direct material [Rs. 2,500 + 400 + 200]		3,100.00
Direct labour		
Machining Rs. (60,000 × 800/12,000) =	4,000	
Assembly Rs. (32,000 × 350/8,000) =	1,400	
Finishing Rs. (72,000 × 140/16,000) =	630	6,030.00
Production overheads		
Machining Rs. 4.59 × 1,400 =	6,426.00	
Assembly Rs. 6.70 × 350 =	2,345.00	
Finishing Rs. 4.43 × 140 =	620.20	9,391.20
		18,521.20

- (d) Fixed production overhead control account – machining

	<i>Rs.</i>		<i>Rs.</i>
Creditors/cash	1,28,000	Overheads absorbed	1,79,010
Profit and loss account (over-absorbed overhead)	51,010	(39,000 × Rs. 4.59)	
	1,79,010		1,79,010

**Question 5 :**

The following data have been extracted from the budgets and standard costs of ABC Limited, a company which manufactures and sells a single product.

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	<i>Rs. per unit</i>
Selling price	45.00
Direct materials cost	10.00
Direct wages cost	4.00
Variable overhead cost	2.50

Fixed production overhead costs are budgeted at Rs. 4,00,000 per annum. Normal production levels are thought to be 3,20,000 units per annum.

Budgeted selling and distribution costs are as follows :

Variable	Rs. 1.50 per unit sold
Fixed	Rs. 80,000 per annum.

Budgeted administration costs are Rs. 1,20,000 per annum.

The following patterns of sales and production are expected during the first six months of 19X3.

	January - March	April - June
Sales (units)	60,000	90,000
Production (units)	70,000	100,000

There is no stock on January 1, 19X3.

Prepare profit statement for each of the two quarters, in a columnar format, using – (a) marginal costing, (b) absorption costing.

**Answer :**

(a) Marginal costing :

	<i>January - March</i>		<i>April - June</i>	
	Rs. '000	Rs.'000	Rs. '000	Rs.'000
Sales (W1)		2700		4050
Opening stock (W4)	—		165	
Variable production costs (W2)	1,155		1,650	
Closing stock (W4)	(165)	(990)	(330)	(1,485)
Cost of sales		1,170		2,565
Variable selling cost (W5)		(90)		(135)
Contribution		1,620		2,430
Fixed production overhead (per quarter)		(100)		(100)
Fixed selling costs (per quarter)		(20)		(20)
Administration costs (per quarter)		(30)		(30)
Budgeted profit		1,470		2,280

## Overheads

(b) Absorption costing (Figures in Rs.'000)	January - March	April - June
Sales (W4)	2,700.0	4,050.0
Opening stock (W4)	—	177.5
Production costs (w2)	1,242.5	1,775.0
Closing stock (W4)	(177.5)	(355.0)
	1,065.0	1,597.5
	1,635.0	2,452.5
(Under-)/over-absorbed overheads (W6)	(12.5)	25.0
	1,622.5	2,477.5
Variable selling costs	(90.0)	(135.0)
Fixed selling costs (per quarter)	(20.0)	(20.0)
Administration costs (per quarter)	(30.0)	(30.0)
Budgeted profit	1,482.5	2,292.5

**Workings :** 1. Sales are 60,000 or 90,000 × Rs. 45

2. **Production costs are calculated as follows :**

	Per unit Rs. '000	70,000 units Rs. '000	1,00,000 units Rs. '000
Direct materials	10.00		
Direct wages	4.00		
Variable overhead	2.50		
Variable production cost	16.50	1,155.00	1,650.00
Variable production cost	16.50	1,155.00	1,650.00
Fixed production overhead (W3)	1.25	87.50	125.00
Total production cost	17.75	1,242.50	1,775.00

3. **Fixed production overhead per unit**

Total cost/Total absorption basis = Rs. 400,000/320,000 units = Rs. 1.25

Fixed production overheads are absorbed on a per unit basis in the absence of alternative instructions.

4. **Closing stock**

	Units	Marginal costing Rs. '000	Absorption costing Rs. '000
January-March			
Opening stock	—	—	—
Production (January- March)	70,000		
Sales	60,000		
Closing stock - March (W2)	10,000	165	177.5
Production (April - June)	1,00,000		
	1,10,000		
Sales	90,000		
Closing stock - June (W2)	20,000	330	355

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<b>5. Variable selling costs</b>	<i>January - March</i>	<i>April - June</i>
	Rs. '000	Rs. '000
60,000 × Rs. 1.50	90	
90,000 × Rs. 1.50		135

**6. Under/over-absorbed fixed production overheads**

Budgeted production per quarter =  $320,000/4 = 80,000$  units

January - March (70,000 – 80,000) × Rs. 1.25(W3)                      Rs. (12,500)

April - June (100,000 – 80,000) × Rs. 1.25 (W3)                      Rs. 25,000

Note : If overheads are underabsorbed, too little overhead is charged to product and *vice versa*. The profit statement must be adjusted accordingly. The effect of the adjustment is to make total production costs equal whether marginal costing or absorption costing is used.

	<i>Marginal costing</i>			<i>Absorption costing</i>	
	Rs. '000	Rs.. '000		Rs. '000	Rs. '000
Variable cost	(1,155)	(1,650)	Production cost	(1,242.5)	(1,775.0)
Fixed cost	(100)	(100)	Under- over- absorbed	(12.5)	25.0
	(1,255)	(1,750)		(1,255.0)	(1,750.0)

**Question 6 :**

- (a) Explain the term “applied factory overheads”. What causes it to differ from “actual factory overheads”? How will you account for the difference between “applied factory overheads” and “actual factory overheads” in costing ?
- (b) Examine the different methods of accounting and controlling of administrative overheads 8+8

**Answer :**

**(a) Applied factory overheads :**

This is the amount of factory overhead charged to the job or product. The total overhead of the production department is to be ultimately absorbed in the job or product on suitable bases or at predetermined rate so that each job or product gets a due share of such overhead as and when it passes through that department. The suitable bases of predetermined rates may be direct material cost percentage rate, direct wages percentage rate, machine hour rate, labour hour rate, etc.

When predetermined rate is used for absorption of overhead there is likely to be some difference between the amount of overhead absorbed and the amount of overhead actually incurred. This difference is termed as under- or over- absorption of overhead.

Over-absorption : Overhead absorbed > Actual Overhead incurred

Under-absorption : Overhead absorbed < Actual overhead incurred.

### *Overheads*

*Causes of over-recovery :*

- 1) When actual overhead incurred is less than budgeted overhead.
- 2) When the output or hours worked exceed the estimate.

*Causes of under-recovery :*

- 1) the total overhead incurred exceeds the estimated or budgeted overhead.
- 2) the output or hours worked are less than the estimate or budget.

*Treatment of under or over-absorbed overhead :*

- a) to be transferred to an overhead reserve or suspense account for being carried forward to the next period's account for absorption on the assumption that it may be counterbalanced next time.
- b) to be written off to the costing profit and loss account.
- c) to be adjusted to work-in-progress, finished goods and cost of sales at supplementary rate.

- (b) Administrative overhead** is the cost incurred in formulating policies, planning and controlling the functions and motivating the personnel of an organisation towards attainment of its objectives. The cost is of general nature and is not directly related to the other functions namely production, sales, distribution, research and development.

There are three methods of accounting for administrative overhead —

- 1) *As a separate item of cost* – In this method administration costs are treated as separate functional costs and charged to the products completed and sold in the period. The bases normally used for this purpose are cost of goods sold, sales, number of units sold, or gross profit on sales. The rate of absorption is determined by dividing the total administration costs by the base. The rate is applied to the products sold during the period to determine the administration cost chargeable to them.
- 2) *Apportionment between production, selling and distribution functions*: Under this method administrative overhead is divided between production and selling and distribution divisions on some suitable bases. When administration costs are apportioned to the production function these are included in the factory overhead and charged to all the cost centres on appropriate bases which are ultimately absorbed in the products completed or in the progress. Administration costs apportioned to the selling and distribution functions are transferred to the Selling and Distribution Overhead Account. The amount so transferred is treated in the same way as other items of selling and distribution expenses are treated in accounts.
- 3) *Transfer to Profit and Loss Account*: According to this method whole of this administration expenses are treated as period or fixed costs and written off to Costing Profit & Loss Account. The idea behind the method is that the amount of this type of cost is very small in relation to others and that these expenses have no direct bearing with production or sales.

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**Control of Administration Overhead :**

For exercising proper control any of the following methods may be adopted —

- i) *By means of classification and analysis of overheads:* Expenses incurred against each class under a Cost Account Number should be collected for each of the administrative departments. Corresponding data for the past period should also be collected. Different levels of activities and the corresponding costs for the previous period should be compared with the present figures. The absorption rates should also be compared from period to period. The cost of any service department should be compared with the cost of similar service available from outside.
- ii) *By means of introducing budgetary control:* In this method control is made through comparing present data with the past data. Control may be initiated with the introduction of budgets. In this method budgets of overhead for individual sections should be prepared and actual expenses should be compared with the budgets, the difference should be calculated and analysed. The people in charge of respective departments should report to the higher authority showing the causes of variances.
- iii) *Control through standards:* Under this method suitable standards for each types of expenses are fixed and actual administration expenses are measured in terms of such standards. The performance of individual sections in terms of standards speak of efficiency of the respective departments.

**Question 7 :**

- (a) A factory has three production departments ( $P_1$ ,  $P_2$  and  $P_3$ ) and two service departments ( $S_1$  and  $S_2$ ). Budgeted overheads for the next year have been allocated/apportioned by the cost department among the five departments. The secondary distribution of service department overheads is pending and the following details are given to you :

Department	Overheads apportioned/ allocated	Estimated level of activity
$P_1$	Rs. 48,000	5,000 labour hours
$P_2$	Rs. 1,12,000	12,000 machine hours
$P_3$	Rs. 52,000	6,000 labour hours
<u>Apportionment of service department costs</u>		
$S_1$	Rs. 16,000	$P_1$ (20%), $P_2$ (40%), $P_3$ (20%), $S_2$ (20%)
$S_2$	Rs. 24,000	$P_1$ (10%), $P_2$ (60%), $P_3$ (20%), $S_1$ (10%)

Calculate the overhead rate of each production department after completing the distribution of service department costs.

*Overheads*

- (b) State six sources from which overhead expenses may be collected.  
 (c) Distinguish between standing order numbers and cost account numbers.

**Answer :**

- (a) Let  $X_1$  be the total overhead costs of  $S_1$  and  $X_2$  that of  $S_2$ . Then we get the simultaneous equations:

$$X_1 = 16,000 + 0.1 X_2$$

$$X_2 = 24,000 + 0.2 X_1$$

Solving these equations we get :

$$X_1 = 18,775$$

$$X_2 = 27,755.$$

The allocation/apportionment of overheads to the three production departments would be as follows :

Production Departments	$P_1$ Rs.	$P_2$ Rs.	$P_3$ Rs.
Direct allocation	48,000	1,12,000	52,000
Apportionment of overhead cost of $S_1$	(20%) 3,755	(40%) 7,510	(20%) 3,755
Apportionment of overhead cost of $S_2$	(10%) 2,776	(60%) 16,653	(20%) 5,551
Total :	54,531	1,36,163	61,306
Budgeted capacity	5,000	12,000	6,000
	labour hrs.	machine hrs.	labour hrs.
Overhead cost per hour	Rs. 10.91	Rs. 11.35	Rs. 10.22

- (b) Six sources from which overhead expenses are collected are as follows :

- i) Stores requisition
- ii) Invoices
- iii) Cash Book
- iv) Wages analysis sheet
- v) Other registers and reports
- vi) Journal.

Stores requisition is used for indirect materials issued from stores : The total of stores drawn are debited to production Overhead Control Account and credited to Stores Ledger Control Account.

Invoices received for stores received or services rendered are entered in the Purchase Journal maintained for the purpose of cost collection.

Cash Book should be scrutinised and payment for indirect expenses should be properly collected against standing order number and for each department.

*Cost and Management Accounting*

Wages analysis sheet is used for indirect wages payable for each standing order number and for each department.

Other registers and reports are for the items which do not result in cash outlay e.g. depreciation (Plant Register) scrap, waste, idle facilities etc. (relevant reports/records).

Journal entries – accrual for unpaid salaries, rent or wages, notional charges for rent or interest etc. are all collected from journal entries.

**(c) Standing Order Numbers and Cost Account Numbers :**

For systematising the control of overhead and to ensure proper grouping of like items it is necessary to derive a system of accounting headings suitably coded. The headings should be selected in such a way that they should be clear and should not be confused with one another.

It should be clearly remembered that Standing Order Numbers are conventionally applied to factory expenses headings.

Cost Account Numbers are customarily applied to administrative and distribution expense headings. Letters, symbols or decimal arrangement or mixture of the two may be used for the coding purpose.

**Question 8 :**

Atlas Engineering Ltd. accepts a variety of jobs which require both manual and machine operations. The budgeted Profit and Loss Account for the period 1996-97 is as follows :

		(In lakhs of rupees)
Sales		75
Cost :		
Direct materials	10	
Direct labour	5	
Prime Cost	15	
Production Overhead	30	
Production Cost	45	
Administrative, Selling and Distrn. Ovd.	15	60
Profit		15
Other budgeted data :		
Labour hours for, the period	2,500	
Machine hours for the period	1,500	
No. of jobs for the period	300	

An enquiry has been received recently from a customer and the production department has prepared the following estimate of the prime cost required for the job :

Direct material	Rs. 2,500
Direct labour	2,000
Prime Cost	4,500
Labour hours required =	80
Machine hours required =	50

## Overheads

You are required to :-

- Calculate by different methods, six overhead absorption rates for absorption of production overhead and comment on the suitability of each.
- Calculate the production overhead cost of the order based on each of the above rates.
- Give your recommendation to the company. 9+3+4

**Answer :**

(a) **ATLAS ENGINEERING LTD.**

**Statement showing computation of overhead absorption rates for absorption of production on overhead under different methods.**

Sl. No.	Absorption rates	(Rs. in lakhs)	Overhead absorption rate.
1.	Direct Labour Hour : $\frac{A}{LH}$		Rs. 120
2.	Machine Hour Rate :		Rs. 200
3.	Percentage of direct material cost :	$\frac{Rs. 30}{10} \times 100$	300 %
4.	Percentage of direct wages cost : $\frac{A}{DL} \times \frac{Rs. 30}{100} \times 100$	$\frac{Rs. 30}{5} \times 100$	600 %
5.	Percentage of Prime Cost : $\frac{A}{PP} \times 100$	$\frac{Rs. 30}{Rs. 15} \times 100$	200%
6.	Production Unit (JOB) : $\frac{A}{J}$		Rs. 10,000

**Note :**

Production overhead to be absorbed	=	A
Labour hours required for production	=	LH
Number of machine hour for the period	=	MH
Direct material cost incurred	=	DM
Direct labour cost incurred	=	DL
Prime cost of production	=	PP
No. of jobs for the period	=	J

*Cost and Management Accounting*

(b) **Statement showing the production overhead cost of the order (for the job) under different methods.**

<i>Methods</i>		<i>Production overhead cost for the job (Rs.)</i>
1. Direct Labour hour rate	80 Hrs. × 120	9600
2. Machine hour rate	50 Hrs. × 200	10000
3. Percentage of direct material cost	300% of Rs. 2500	7500
4. Percentage of Direct Labour Cost	600% of Rs. 2000	12000
5. Percentage of Prime cost	200% of Rs. 4500	9000
6. Production Unit/Job	1 × Rs. 10000	10000

**Comments :**

- (a) For labour hour rate and Machine hour rate, the rates are based on time and hence generally considered equitable as most overheads vary with time.
  - (b) In case of percentage of Direct material Cost, it may be suitable only if all the jobs use the same materials and labour, and machine time does not significantly.
  - (c) If wage rates vary, percentage of direct wages cost may cause distortion.
  - (d) Percentage of prime cost is simple but has the disadvantages of percentage of Direct Material Cost and percentage of Direct Labour Cost.
  - (e) In case of production unit (job) method, it is very simple and acceptable if all the jobs are same. If they are different, this method is not appropriate for charging overhead.
- (c) **Recommendation to the Company.** Separate overhead rates based on Labour hours and Machine hours for absorption of labour related overhead and Machine related overheads respectively, is the ideal solution. However, if the degree of mechanisation is very high in the factory, the Management wants a single rate for simplicity, the machine hour rate may be used for absorption of production overheads.

◆ **TEST YOURSELF**

**1. Objective Type**

**1. Which of the following statements are true**

- (a) Overhead refers to any cost which is indirectly attributable to cost unit.
- (b) Some materials, apparently indirect in nature, are treated as direct material.
- (c) Variable overheads vary with time.
- (d) If cost of materials are not inflated to cover stores overhead and material handling charges, these are treated as factory overheads.

*Overheads*

- (e) When actual overheads are more than absorbed overheads, it is known as over-absorption.
- (f) A blanket overhead rate is a single overhead rate computed for the entire factory.
- (g) Apportionment of the overheads is the allotment of whole items of cost to cost centre.
- (h) Under-absorption of overheads results in understatement of cost.
- (i) The application of predetermined overhead rates is a reason for difference between costing and financial profit.
- (j) Semi-variable and Semi-fixed overheads are the same.
- (k) The terms depreciation and obsolescence are synonymous.
- (l) It is well established fact that interest on capital should be included in cost accounts.

**2. Fill in the blanks:**

- (a) If an expense can be identified with a specific cost unit, it is treated as \_\_\_\_\_
- (b) Fixed costs remain fixed so long as the activity level is within the \_\_\_\_ range.
- (c) \_\_\_\_\_ diagram is a method of segregating semi-variable expenses into fixed and variable ones.
- (d) Under or over-absorption of overheads arises only when \_\_\_\_\_ rates are used for recovery.
- (e) \_\_\_\_\_ is the allotment of proportion of items of cost to cost centre or cost units.
- (f) Canteen cost is apportioned over various departments on the basis of \_\_\_\_\_.
- (g) Salary of a foreman should be classified as \_\_\_\_\_ overheads.
- (h) \_\_\_\_\_ refers to sudden loss in value of an asset due to change in technology.

**3. Tick the most appropriate statements in the following multiple choice questions:**

- A. Overheads is the total of:
  - (a) Cost of indirect material and indirect labour.
  - (b) Cost of indirect material, indirect labour and indirect expenses.
  - (c) Cost of indirect expenses and indirect labour
- B. Fixed costs remain fixed:
  - (a) Over a short period,
  - (b) Over a long period, and within relevant range,
  - (c) Over a short period and within a relevant range.
- C. Which of the following is service department?
  - (a) Refining department
  - (b) Making and packing department
  - (c) Machine shop.
- D. When the under or over-absorbed overheads amount is significant, it should be disposed off by:
  - (a) Transferring to costing profit and loss a/c.
  - (b) Using a supplementary rate
  - (c) Carry over to next year.

*Cost and Management Accounting*

- E. When the amount of overheads absorbed is less than the amount of overheads incurred, it is called:
- (a) Under-absorption of overheads
  - (b) Overabsorption of overheads
  - (c) Proper absorption of overheads.
- F. Cost of research undertaken at the request of the customer should be:
- (a) Charged to costing profit and loss a/c
  - (b) Charged to selling overheads
  - (c) Recovered from the customer

**II. Descriptive Questions**

1. What do you understand by departmentalisation of overheads? Why is this done? How would you departmentalise the following expenses?
  - (a) Consumable stores,
  - (b) Power,
  - (c) Repairs and maintenance,
  - (d) Depreciation, and
  - (e) Material handling expense.
2. A manufacturing company has four producing and four service departments. Illustrate in a tabular form with proforma figures the collection and apportionment of a few of the major items of indirect expenses enumerating the basis of apportionment and final absorption in the output.
3. Briefly describe two ways of dealing with the problem of apportioning service department costs amongst service departments which, in addition to serving the main operating departments, also serve one another.
4. How would you deal with the following in a rapidly expanding business —
  - (a) Treatment of increased overheads,
  - (b) Control of expenses incurred in the installation of new machines.
5. Distinguish between —
  - (a) Cost allocation and cost apportionment
  - (b) Depreciation and obsolescence
  - (c) Fixed cost and variable cost.
6.
  - (a) Why is a system of department absorption rate superior to blanket overhead absorption rate?
  - (b) Under what circumstances would you recommend the use of the following absorption methods —
    - (i) Labour hour rate,
    - (ii) Machine hour rate,
    - (iii) Units of output rate ?

*Overheads*

7. What do you understand by under-absorption and over-absorption of overheads? What are the causes of such under over-absorption of overheads? How are they treated in cost accounts?
8. A manufacturing company absorbs overhead into the cost of its four productive departments by means of predetermined rates per direct labour hour. In view of a large difference between overhead incurred and overhead absorbed for the year, you are asked to investigate. You discover the following information for the year :

Deptt.	Overhead incurred	Actual direct labour hrs. worked	Estimated departmental rate used	Total overheads absorbed	Direct labour hours contained in	
	Rs.		Rs. /Lab hr.	Rs.	Work in progress	Finished goods
1	10160	25400	0.50	12700	3300	7480
2	46530	84600	0.35	29610	14480	8320
3	20430	45400	0.40	18160	6920	4160
4	18700	7400	0.60	22420	6560	2920

You are required to calculate :

- (a) for each department, the direct labour rates of overhead incurred, and
- (b) the extent to which the value of the year end Work-in-process and finishes goods should be adjusted for each department for the year in view of the corrected overhead rates?
9. India Enterprise collects overhead expenses under three Production cost centres P1, P2 & P3 and two service cost centres C (Canteen) and S (Stores). The following expense figures are extracted from accounts : (figures in Rs.)

Rent and rates	5000
General lighting	900
Power	1500
Indirect wages	2000
Welfare expenses	2200
Depreciation machines	8000
Other expenses	4400

The following details are also available —

Departments	Units	P1	P2	P3	C	S
Floor space	Sq. Mtr.	200	300	250	200	50
Light points	No.	20	30	20	20	10
Direct wages	Rs. 000	60	40	60	30	10
Machine horse power		100	60	90	—	—
Cost of machines	Rs. 000	24	32	40	2	2
No. of employees		25	30	35	12	8
Working hours		1800	2000	2600		

The expenses of service departments are allocated as per following percentages

*Cost and Management Accounting*

	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>C</b>	<b>S</b>
C	20	30	40	—	10
S	35	20	30	15	—

Find out the total cost of product XY with material cost Rs.600, and direct labour cost of Rs. 400, which is processed for manufacture in departments P1, P2 and P3 for 1 a 12 and 3 hours respectively.

10. What are administrative overheads? Administrative expenses are generally apportioned to product either as a percentage on production cost or as a percentage on conversion cost. Which of the two methods will you recommend for an engineering concern manufacturing a variety of products to customer's specification in both ferrous and nonferrous metals? Give reasons why you consider the method recommended by you as the more equitable one?
11. Your company directors feel that the administrative costs are high and are still increasing. Prepare a suitable tabulation to bring out increase in cost in each function under administration and draft a report to the directors suggesting measures for the adequate control of administration cost.
12. In order to control selling and distribution expenses, it is necessary to analyse them under various methods. Examine the fundamental methods and state which method you consider to be the most effective for cost control.
13. Enumerate any three methods of calculating depreciate. Illustrate your answer with examples.
14. Distinguish between research and development cost. How they should be treated in cost accounts?
15. "Interest is a factor which cannot be disregarded by management". Comment on this statement.
16. How are the following expenses are generally treated in the cost accounts ?
  - a) Expenses on design and development
  - b) Mechanised tabulation expenses
  - c) Finished stock waste and loss
  - d) Warehouse expenses
  - e) Insurance for finished product in transit
  - f) Bad debts
  - g) Moving and a refixing of existing plant
  - h) Royalties paid.
  - i) Rectification expenses after sales during warranty period.
17. What types of monthly statements can be prepared to inform management of distribution costs and profit and loss for territories, salesmen and products ?
18. What method would you recommend for the absorption of administration costs in product cost ? Point out the virtue and defects, if any, of the method suggested.

## COST ACCOUNTING RECORDS

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### 8.0 RELATIONSHIP WITH FINANCIAL ACCOUNTS

In Study Note I, the basic difference between financial and cost accounting has been elaborately discussed. We have seen that financial accounting is oriented towards external reporting and aims at providing information to shareholders, investors, Government and other outside agencies. All transactions, such as purchase, sales, receipts and payments pass through financial accounts. Cost Accounting, on the other hand, is concerned with internal reporting, and aims at providing elaborate information for planning, control and decision-making. Cost accounting information is for internal use. It is essentially utilisation accounting. For example, material is purchased from supplier. The two transactions i.e. 'receiving materials from the supplier' and 'payment to supplier' pass through financial accounts, viz.

(a)	Purchases a/c <u>To Sundry creditors a/c</u>	Dr. Cr.
(b)	Sundry creditors a/c <u>To Bank a/c</u>	Dr. Cr.

### *Cost and Management Accounting*

The above transactions result in outflow of cash and inflow of materials in stores. When materials are issued from stores for production on the authority of material requisition note, no financial accounting is involved, but cost accounting starts from that point giving details of utilisation of materials. If use of materials can be recorded in cost accounts, how to account for it under double entry bookkeeping system? How can 'use' be accounted for, when 'receipt' is not in cost accounts? Through the purchase journal entry, material has entered in the stores, but there is no stores or material account as such in financial accounts. Hence, for storage and utilisation of material, a material account has to be created for internal control.

In cost accounts, a material control account is necessary, which will be debited with the receipt and credited with issue of material. If this is done, double entry bookkeeping will be complete. But how to debit with store receipt value? It has already been accounted for in financial books. The only way is to create a link between financial account and cost accounts with the help of a cost ledger control account in financial books and general ledger adjustment account in the cost ledger. Various inputs such as material, labour and expenses which are paid for and accounted in financial books will enter into cost accounting system through general ledger adjustment account, pass through the manufacturing process i.e. work-in-process account, and produce finished goods, the value of which will be transferred to financial account through cost of goods sold account.

If costing profit and loss is to be ascertained, then cost of goods sold account shall be included in cost ledger and sales value shall be collected through general ledger adjustment account. The net profit or loss will then be transferred to financial account through general ledger adjustment account.

#### **Use of Control Accounts**

Control accounts are the total accounts which summarises the totals of individual accounts. For example, when materials are purchased, the entry is made in the voucher register, debiting materials and crediting accounts payable. The total of materials column is posted at the end of the period in the material control a/c, while individual items purchased are entered in the subsidiary ledger i.e. stores ledger cards. The total of the balances of individual stores ledger cards shall agree with the balance in the material control account in the cost ledger. Control accounts, thus, act as a double check on the accuracy of the balances. In cost accounts, subsidiary ledgers are maintained in respect of material, work-in-progress and finished *goods* in the same way as debtors and creditors ledgers are maintained in the financial accounts.

#### **Interlocking Accounts**

Under the integrated system, financial and cost accounting departments operate using only one set of books. Under nonintegrated accounts, two separate sets of books are maintained by financial accounts and cost accounts departments. When separate sets of accounts are maintained, they are required to be interlocked so that periodical reconciliation is possible. Interlocking accounting system is, therefore, defined as 'a system in which the cost accounts are distinct from the financial accounts, the two sets of accounts being kept continuously in

### *Cost Accounting Records*

agreement by the use of control accounts or made readily reconcilable by other means'. It is pertinent to note that with the use of computer, two separate sets of books can be easily avoided. A suitable programming can take care of any type of reporting that is necessary for the internal as well as external requirements. However, before taking up integrated accounts, let us discuss about *cost control accounts* under non-integrated accounting system.

## 8.1 COST CONTROL ACCOUNTS

The following important ledgers are usually maintained in the cost department :-

- (a) **Cost ledger** : This is the principal ledger and records nominal accounts and to some extent real accounts.
- (b) **Stores ledger** : This is a subsidiary ledger and records store accounts – maintaining a separate account for each item in the store.
- (c) **Work-in-progress ledger** : This is a subsidiary ledger and records cost incurred and value of output produced during a period. Each job, unit, process or batch is assigned a job or work order number, and all expenses and production are recorded separately for each one of them.
- (d) **Finished goods ledger** : This is a subsidiary ledger and records the receipt and issue of completely finished products. A separate account is opened for each type of product.

Each of the above four ledgers are made self-balancing by maintaining general ledger adjustment account in cost ledger and control accounts of subsidiary ledgers. In the cost ledger, the control accounts of the subsidiary ledger will appear along with the following important control accounts, which are generally maintained :

### (I) GENERAL LEDGER ADJUSTMENT ACCOUNT

This is also termed as cost ledger control account or financial ledger control account. This account maintains the link with financial account, and completes the double entry. For input items such as, material, labour and expenses, this account is credited and respective control account debited. For example, for purchase of materials, in financial books, the entries will be :

Purchases a/c	Dr. Rs. 1000
Cost ledger control a/c	(Dr. Rs. 1000) (Memorandum entry only)
To Sundry creditors a/c	Cr. Rs. 1000

In the COST books, the entries will be :-

Stores ledger control a/c	Dr. Rs. 1000
To General Ledger adjustment a/c	Cr. Rs. 1000

*Cost and Management Accounting*

Similarly, for incorporating payment of wages in the cost books, the entries will be :-

Wages control a/c	Dr.	Rs. 1000
To General ledger adjustment a/c	Cr.	Rs. 1000

Any transfer from cost books to financial books for transactions such as, return of materials from stores, transfer of capital work performed by the factory, transfer of costing profit and loss, etc. is entered in this account.

It should be noted that cost ledger control account in financial book is a memorandum account only, and does not form a part of the double entry accounting. It is clear from the above that 'general ledger adjustment account' in cost ledger and "cost ledger control account" in financial ledger make the system interlocking or self-balancing.

### (II) STORES LEDGER CONTROL ACCOUNT

This account is debited for receipt of materials as per goods received *note and* credited for issue of materials as per *material requisition note*. The balance of the account indicates the stock value of materials lying in the stores, and agrees with the total balances of individual store accounts.

### (III) Work-in-progress CONTROL ACCOUNT

This account is debited with the cost of production i.e. direct material, direct wages, direct expenses, and production overheads recovered, and credited with the value of finished goods completed and transferred to finished goods control a/c. The balance of this account indicates the value of incomplete jobs or other cost units. At the end of a period, aggregate of balances in individual job or work order accounts in subsidiary ledger must agree with the balance of this account.

### (IV) FINISHED GOODS LEDGER CONTROL ACCOUNT

This account is debited with the cost of completed units and credited with the costs of units sold. The balance in this account represents the costs of finished goods at any given time.

### (V) WAGES CONTROL ACCOUNT

Gross wages paid is debited to this account. Direct wages are then transferred to work-in-progress account, while indirect wages are transferred to respective overheads control accounts, viz. production, administration, selling and distribution and research and development. Since whatever amount of wages debited to this account is distributed between work-in-progress account and overheads accounts, this account indicates 'nil' balance. This account is in effect a 'clearance' account, and not a control account as it does not control a subsidiary ledger.

*Cost Accounting Records***(VI) PRODUCTION/FACTORY OVERHEAD ACCOUNT**

This account is debited with the cost of indirect material, indirect labour and indirect expenses incurred, and is credited with the amount of overheads applied or recovered. The debit balance at the end of accounting period indicates under-recovery, and credit balance shows over-recovery. The balance is transferred to overheads adjustment account for further accounting of under- or over-absorbed overheads.

**(VII) ADMINISTRATION OVERHEAD ACCOUNT**

This account is debited with all administrative expenses and credited with overheads recovered from finished goods. The difference in this account, if any, is transferred to overheads adjustment account as is done in case of production overheads.

**(VIII) SELLING AND DISTRIBUTION OVERHEADS ACCOUNT**

All selling and distribution expenses are debited to this account. The account is credited with overheads recovered from cost of goods sold. Difference, if any, is transferred to overhead adjustment account.

**(IX) COST OF SALES ACCOUNT**

Cost of goods sold and selling and distribution overheads are debited to this account. The account is closed by transferring to costing profit and loss account.

**(X) OVERHEADS ADJUSTMENT ACCOUNT**

Under-absorbed or over-absorbed overheads are debited or credited to this account from respective overheads control accounts. Depending upon the method of disposal adopted, any balance in the account is transferred either, (a) to costing profit and loss account for writeoff, or (b) to overheads suspense accounts for carry over to the next period.

**(Xi) COSTING PROFIT AND LOSS ACCOUNT**

This account is debited with the cost of sales, under-recovery of overheads, abnormal losses, etc. and credited with sales, value of goods sold, over-absorbed overheads, abnormal gains, etc. The balance represents net profit or loss, and is transferred to general ledger adjustment account. This profit or loss shall be reconciled with the financial profit or loss.

## 8.2 SPECIMEN BOOK-KEEPING ENTRIES

### TRANSACTIONS RELATING TO MATERIAL

- (a) Material amounting to Rs. 58,300 of which Rs.1,700 relate to a special job, are purchased on credit.

#### IN FINANCIAL BOOKS

Purchases a/c	Dr.	58300	
Cost ledger control a/c (Memorandum)	(Dr.	58300)	
To Sundry Creditors	Cr.		58300

---

#### IN COST BOOKS

Stores ledger control a/c	Dr.	56600	
Work-in-progress control a/c	Dr.	1700	
To General ledger adjustment a/c	Cr.		58300

---

**Note :** Cost ledger records transaction on usage basis. Special job account in work-in-progress ledger gets direct debit for Rs. 1700, while balance amount is debited to stores ledger control account.

- (b) Return to supplier Rs. 200

#### IN FINANCIAL BOOKS

Sundry creditors a/c	Dr.	200	
To Purchases return a/c	Cr.	200	
To Cost ledger Control a/c (Memorandum)(Cr.		200)	

---

#### IN COST BOOKS

General ledger adjustment a/c	Dr.	200	
To Stores ledger control a/c	Cr.		200

---

- (c) Cash Purchase of Rs. 1000

#### IN FINANCIAL BOOKS

Purchase a/c	Dr.	1000	
Cost ledger control a/c (Memorandum)}	(Dr.	1000)	
To Cash	Cr.		1000

---

*Cost Accounting Records***IN COST BOOKS**

Stores ledger control a/c	Dr.	1000	
To General ledger adjustment a/c	Cr.		1000

---

- (d) Stores issued to production Rs. 54700

**IN FINANCIAL BOOKS**

No entry.

**IN COST BOOKS**

Work-in-progress ledger control a/c	Dr.	54700	
To Stores ledger control a/c	Cr.		54700

---

**Note:** Individual job order number will be debited with the amounts as mentioned in the material requisition notes summary, and individual stores accounts will be credited from the materialwise summary of the MRN.

- (e) Stores issued to maintenance account Rs. 2500

**IN FINANCIAL BOOKS**

No entry.

**IN COST BOOKS**

Production overheads control a/c	Dr.	2500	
To Stores ledger control a/c	Cr.		2500

---

- (f) Materials returned from production or service cost centres to stores, or material transfers from one job to another will have no effect in financial book, as no financial transaction is involved. Similarly, when sundry creditors are paid for the supplies, no entry is made in the cost ledger, as it does not involve any use of materials, but is a pure financial transaction.

**8.2.1 TRANSACTIONS RELATING TO LABOUR**

- (a) Salaries and wages amounting to Rs. 62100 gross are earned by the employees, and deductions of Rs. 5400 as provident fund. Rs. 2400 as ESIC and Rs. 4300 as Income Tax are made from the gross amount:

*Cost and Management Accounting***IN FINANCIAL BOOKS**

Salaries and wages a/c	Dr.	62100	
Cost ledger control a/c (Memorandum)	(Dr.	62100)	
To Provident fund a/c	Cr.		5400
To E.S.I.C. a/c	Cr.		2400
To Income-tax a/c	Cr.		4300
To Cash a/c	Cr.		50000

**IN COST BOOKS**

Salaries and wages control a/c	Dr.	62100	
To General ledger adjustment a/c	Cr.		62100

**Note:** in cost ledger, gross salaries and wages amount is only adopted. It has nothing to do with the deductions.

- (b) Salaries and wages analysis book indicates the following breakup:

Direct wages	Rs.	38600
Indirect factory wages	Rs.	9500
Administrative salaries	Rs.	9700
Selling and distribution salaries	Rs.	4300

**IN FINANCIAL BOOKS**

No entry.

**IN COST BOOKS**

Work-in-progress ledger control a/c	Dr.	38600	
Production overheads control a/c	Dr.	9500	
Administrative overheads control a/c	Dr.	9700	
Selling and distribution overheads control a/c	Dr.	4300	
To Salaries and wages control a/c	Cr.		62100

**Note :** In Work-in-progress ledger, individual job cards will be debited with direct wages. Salaries and wages control account acts as a clearance account.

**TRANSACTIONS RELATING TO OVERHEADS**

- a) Expenses to the extent of Rs. 25400 were incurred on credit for various services obtained as follows: manufacturing Rs. 12000, administrative Rs. 8000 and selling and distribution Rs. 5400:

*Cost Accounting Records***IN FINANCIAL BOOKS**

Sundry expenses	Dr.	25400	
Cost ledger control a/c (Memorandum)	(Dr.)	25400)	
To Sundry creditors a/c	Cr.		25400

**IN COST BOOKS**

Production overheads control a/c	Dr.	12000	
Administrative overheads control a/c	Dr.	8000	
Selling and distribution overhead control a/c	Dr.	5400	
To General ledger adjustment a/c	Cr.		25400

- (b) Rs. 900 paid cash for services rendered to factory Rs. 400 and office Rs. 500

**IN FINANCIAL BOOKS**

Expenses a/c	Dr.	900	
Cost ledger control a/c (Memorandum)	(Dr.)	900)	
To Cash a/c	Cr.		900

**IN COST BOOKS**

Production overheads control a/c	Dr.	400	
Administrative overhead control a/c	Dr.	500	
To General ledger adjustment a/c	Cr.		900

- (c) Rs. 24000 paid to creditors for services.

**IN FINANCIAL BOOKS**

Sundry creditors a/c	Dr.	24000	
To Cash a/c	Cr.		24000

**IN COST BOOKS**

No entry required.

Regarding absorption of overheads, and transfer of under-or over-absorbed overheads, no entry needs to be passed in the financial account. In cost ledger, each of the overhead control account will be credited with overhead applied, and the difference between actual overheads expenses incurred and applied overheads will be transferred to overhead adjustment account

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at the end of the period. The net balance will be transferred to costing profit and loss account, or carried over to next accounting period or applied on cost of sales, finished good inventory and work-in-progress inventory by using a supplementary rate, depending on which decision is taken by the management.

### 8.3 COST LEDGER ACCOUNTS

To illustrate cost ledger accounts, let us take up the following problem .

**Illustration 1 :** Midland Engineering Co's cost ledger indicates the following opening balance as on 1.1.2001:

	<i>Rs.</i>	<i>Rs.</i>
General ledger adjustment account		15200
Stores ledger control account	8700	
Work-in-progress ledger control account	4300	
Finished goods ledger control account	2200	
	15200	15200
At the year-end, the following information is obtained:		
Purchase for stores		57600
Purchase for special jobs		1700
Direct wages	38600	
Indirect factory wages	9500	
Administration salaries	9700	
Selling and distribution salaries	4300	
		62100
Production expenses		12400
Administration expenses		8500
Selling and distribution expenses		5400
Stores issued to production		54700
Stores issued to maintenance		2500
Returns to supplier		200
Production overheads absorbed by production		24500
Administration overheads absorbed by finished goods		15200
Selling and distribution overheads recovered on sales		9600
Products finished during the year		117700
Finished goods sold at cost		132300
Sales		150000

You are required to record the entries in the cost ledger for the year and prepare a Trial balance.

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**Solution 1 :**

**COST LEDGER**

<b>Dr.</b>		<b>General ledger adjustment account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Dec. 31	To Stores ledger		Jan. 1	By Balance b/d	15200
	Cont. a/c returns	200	Dec. 31	By Stores ledger	
„ 31	To Costing profit & loss a/c – sales	150000		control a/c	57600
„ 31	To Balance c/d	17800	„ 31	By Work-in-progress	
				control a/c – special job	1700
			„ 31	By Salaries and wages	
				control a/c	62100
			„ 31	By Production overhead a/c	12400
			„ 31	By Administration	
				overhead a/c	8500
			„ 31	By Selling and distribution	
				overhead a/c	5400
			„ 31	By Costing profit & loss a/c	5100
		168000			168000
			2002		
			Jan.1	By Balance	17800

<b>Dr.</b>		<b>Stores ledger control account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Jan. 1	To Balance c/d	8700	Dec. 31	By Work-in-progress	
„ 31	To General ledger			ledger cont. a/c	54700
	adjustment a/c	57600	„ 31	By General ledger	
				adj. a/c – returns	200
			„ 31	By Production overhead a/c	2500
			„ 31	By Balance c/d	8900
		66300			66300
2002					
Jan. 1	To Balance b/d	8900			

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<b>Dr.</b>	<b>Salaries and wages control account</b>		<b>Cr.</b>		
<i>2001</i>	<i>Rs.</i>	<i>2001</i>	<i>Rs.</i>		
Dec. 31	To General ledger adjustment a/c	62100	Dec. 31	By Work-in-progress ledger control a/c	38600
			” 31	By Production overhead a/c	9500
			” 31	By Admn. overhead a/c	9700
			” 31	By S and D overhead a/c	4300
		62100			62100

<b>Dr.</b>	<b>Work-in-progress ledger control account</b>		<b>Cr.</b>		
<i>2001</i>	<i>Rs.</i>	<i>2001</i>	<i>Rs.</i>		
Jan. 1	To Balance b/d	4300	Dec. 31	By Finished goods ledger cont. a/c	117700
Dec. 31	To Gen. led. adj. a/c	1700	Dec. 31	By Balance c/d	6100
Dec. 31	To Stores led. cont. a/c	54700			
Dec. 31	To Sal. and wages control a/c	38600			
Dec. 31	To Prod. overhead a/c	24500			
		123800			123800
<i>2002</i>					
Jan. 1	To Balance b/d	6100			

<b>Dr.</b>	<b>Finished goods ledger control account</b>		<b>Cr.</b>		
<i>2001</i>	<i>Rs.</i>	<i>2001</i>	<i>Rs.</i>		
Jan. 1	To Balance b/d	2200	Dec. 31	By Cost of sales	132300
Dec. 31	To Administration overheads a/c	15200	Dec. 31	By Balance c/d	2800
Dec. 31	To Work-in-progress ledger control a/c	117700			
		135100			135100
<i>2002</i>					
Jan. 1	To Balance b/d	2800			

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<b>Dr.</b>		<b>Production overhead account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Dec. 31	To General ledger adjustment a/c	12400	Dec. 31	By Work-in-progress ledge control a/c	24500
Dec. 31	To Stores ledger control a/c	2500			
Dec. 31	To Sal. and wages control a/c	9500			
Dec. 31	To Overhead adjustment a/c	100			.
		24500			24500
<b>2002</b>					
Jan. 1	To Balance b/d	2800			

<b>Dr.</b>		<b>Administration overhead account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Dec. 31	To General ledger adjustment a/c	8500	Dec. 31	By Finished goods ledge control a/c	15200
Dec. 31	To Sal. and wages	9700	Dec. 31	By Overhead adjt. a/c	3000
		18200			18200

<b>Dr.</b>		<b>Selling and distribution account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Dec. 31	To General ledger adjustment a/c	5400	Dec. 31	By Cost of sales a/c	9600
Dec. 31	To Sal. and wages control a/c	4300	Dec. 31	By Overhead adjustment a/c	100
		9700			9700

<b>Dr.</b>		<b>Cost of sales account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Dec. 31	To Selling and distrn. overhead a/c	9600	Dec. 31	By Costing profit & loss account transfer	141900
Dec. 31	To Finished goods ledge control a/c	132300			.
		141900			141900

<b>Dr.</b>		<b>Overhead adjustment account</b>		<b>Cr.</b>	
<i>2001</i>		<i>Rs.</i>	<i>2001</i>		<i>Rs.</i>
Dec. 31	To Administration over a/c – under abs.	3000	Dec. 31	By Production overhead account over absorbed	100
Dec. 31	To Selling and distrn. overheads a/c – under	100	Dec. 31	By Costing P & L a/c trns.	3000
		3100			3100

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Dr.	Costing profit and loss account				Cr.
2001		Rs.	2001		Rs.
Dec. 31	To Cost of sales a/c	141900	Dec. 31	By General ledger	
Dec. 31	To Overhead adjust.	3000		adjustment – sales	150000
Dec. 31	To General ledger				
	adj. a/c – profit	5100			.
		150000			150000

**Trial balance as on December 31, 2001**

	Debit Rs.	Credit Rs.
General ledger adjustment account		17800
Stores ledger control account	8900	
W-I-P ledger control account	6100	
Finished goods ledger control account	2800	
	17800	17800

### CAPITAL ORDER REPAIR ORDER

In a manufacturing organisation, improvement to existing plant, machinery, tools building, etc. are frequently carried on by the factory's own staff and workmen. Totally new equipment, machinery or building are also fabricated by own people. These are all in the nature of capital expenditure. Hence, a capital work order is normally raised and all expenses are collected under the capital work order number. On completion of the project, expenses are transferred from work-in-progress through the following journal entry :

<i>Capital work order a/c</i>	Dr.
<i>To Work-in-progress ledger control a/c</i>	Cr.

At the end of the period, the asset will be transferred from cost accounts to financial account by means of the following entry:

<i>General ledger adjustment a/c</i>	Dr.
<i>To Capital order a/c</i>	Cr.

Normally, material, labour and direct expenses are debited to capital work order. Overheads are not charged to capital assets unless specifically incurred for the Capital work order.

Similarly, special repair and maintenance work is undertaken by the factory. A repair order is issued, in which is recorded all expenditure incurred on that special job. When the repair is completed, the repair work order will be closed by transferring from Work-in-progress Ledger means of the following journal entry :

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Special repair and maintenance a/c	Dr.
To Work-in-progress ledger control a/c	Cr.

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If the special repair has been undertaken for factory and offices, the total expenses can be distributed accordingly, such as,

Production overheads a/c	Dr.
Administration overhead a/c	Dr.
To Special repairs and maintenance a/c	Cr.

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## 8.4 RECONCILIATION OF COST AND FINANCIAL ACCOUNTS

Where accounts are maintained on the integral accounts system, there are no separate cost accounts and financial accounts. Hence, the question of reconciliation of cost and financial accounts does not arise. However, where separate sets of books are maintained for cost accounting and financial accounting system, it is imperative that periodically the two accounts are reconciled. A memorandum of reconciliation is prepared, indicating the reasons for difference between the results disclosed by each system.

The difference between the two sets of accounts arises because of the following reasons :

**(a) Items included only in financial accounts**

There are number of items which appear only in financial accounts, and not in cost accounts, since they do not relate to the manufacturing activities, such as,

- (i) Purely financial charges, reducing financial profit
  - Losses on capital assets
  - Stamp duty and expenses on issue and transfer of stock, shares and bonds
  - Loss on investments.
  - Discount on debentures, bonds, etc.
  - Fines and penalties,
  - Interest on bank loans.
- (ii) Purely financial income, increasing financial profit
  - Rent received
  - Profit on sale of assets
  - Share transfer fee
  - Share premium
  - Interest on investment, bank deposits.
  - Dividends received.
- (iii) Appropriation of profit – donations and charities.

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**(b) Items included only in the cost accounts**

There are very few items which appear in cost accounts, but not in financial accounts. Because, all expenditure incurred, whether for cash or credit, passes through the financial accounts, and only relevant expenses are incorporated in cost accounts. Hence, only item which can appear in cost accounts but not in financial accounts is a notional charge, such as, (i) interest on capital, which is not paid but included in cost accounts

to show the notional cost of employing capital, or (ii) rent i.e. charging a notional rent of premises owned by the proprietor.

**(c) Items accounted for differently in cost accounting and financial accounting**

**i. Overhead** – In cost accounts, overheads are applied to cost units at predetermined rates based on estimates, and the amount recovered may differ from actual expenses incurred. If such under-or over-recovery of overheads are not charged off to costing profit and loss account, the profits on two sets of books will differ.

**ii. Stock valuation** – In financial accounts, stock is valued at lower of cost or market value. In cost accounts, stock is valued at cost adoption one of the methods, such as FIFO, LIFO, average etc., which is suitable to the unit. Thus, there may be difference in stock valuation, which will reflect difference in profit between the two sets of books.

**iii. Depreciation** – If different basis is adopted for charging depreciation in cost accounts as compared to financial accounts, the profits will vary.

**Illustration 2 : A. Nilesh & Co.**  
**Trading and profit and loss account for the year ending 31st. December, 2001. (In Rupees)**

To	Opening stock :		By	Sales (5000 units)	50000
	– Raw materials	2700	By	Closing stock	
	– Work-in-progress	3500		– Raw materials	2400
	– Finished goods	4600		– Work-in-progress	4100
		10800		– Finished stock	3600
					10100
To	Purchases	14200			
To	Direct wages	11800			
To	Factory expenses	8500			
To	Gross profit c/d	14800			
		60100			60100
To	Office expenses	1200	By	Gross profit b/d	14800
To	Office salaries	2400	By	Dividend received	900
To	Salesmen's salaries	2100	By	Interest on deposit	200
To	Selling expenses	1600	By	Share transfer fees	200
To	Distribution expenses	1200	By	Discount received	400
To	Loss on sale of assets	500	By	Rent received	400
To	Fines	200			
To	Interest on mortgage	600			
To	Net profit	7100			
		16900			16900

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The cost account reveals a profit of Rs. 5780.

Reconcile the financial and cost profits using the following information :

- (a) In cost accounts, opening stock is valued at Rs. 10,260 and closing stock as Rs. 94,900.  
 (b) Depreciation in cost accounts is Rs.600 as against Rs.520 taken in financial a/c  
 (c) Overhead recovery rates are as follows :

Production overhead : @ 75% of direct wages

Office overhead : @ 100% of factory cost

Selling and distribution overhead : @ Re.1 per unit sold.

**Solution :**

**Reconciliation statement**

	Rs.	Rs.	Rs.
Profit as per cost accounts			5780
<i>Add :</i> i) <i>Income not taken in cost a/cs:</i>			
Dividend received	900		
Interest on deposit	200		
Share transfer fees	200		
Discount received	400		
Rent received	400	2100	
ii) <i>Difference in stock valuation:</i>			
Opening: (10800 – 10260)	540		
Closing stock: (10100 – 9490)	610	70	
iii) <i>Difference in depreciation:</i>			
Charged: (600 – 520)		80	
iv) <i>Overabsorption of overhead :</i>			
Production applied – 75% of 11800	8850		
Actual expenses	8500	350	
Selling and distribution overhead applied @ Re.1 of 5000 units	5000		
Actual expenses	4900	100	2700
			8480
<i>Less :</i> i) <i>Items not charged in cost a/cs :</i>			
Loss on sale of assets	500		
Fines	200		
Interest on mortgage	600	1300	
ii) <i>Under-absorption of office overheads:</i>			
Applied @ 10% on 35200	3520		
Actual expenses	3600	80	1380
Profit as per financial profit and loss a/c			7100

## 8.5 INTEGRATED ACCOUNTS

In the present age of computerisation the maintenance of two sets of books for cost accounting and financial accounting separately by two sections is dispensed with. Instead, integral or integrated accounts is being adopted, wherein only one set of books is operated, recording both financial and cost accounts. This eliminates the necessity of operating cost ledger control account in financial ledger, and general ledger adjustment account in cost ledger. The usual personal accounts and real accounts are maintained, but under the system, the nominal accounts follow the principles of cost accounting system.

The fundamental principle is to eliminate duplicate entries and to maintain the essentials of the transactions. For examples, "purchase of raw materials of Rs.1000 on credit". The above transaction would appear in financial and cost ledger **under nonintegrated accounts** as follows :-

### IN FINANCIAL BOOKS

Purchases a/c	Dr.	Rs. 1000	
Cost ledger control a/c (Memorandum)	(Dr.)	Rs. 1000)	
To Creditors a/c	Cr.		Rs. 1000

### IN COST BOOKS

Stores ledger control a/c	Dr.	Rs.1000	
To General ledger adjustment a/c	Cr.		Rs.1000

**Under integrated accounts**, the transaction will appear as:

Stores ledger control a/c	Dr.	Rs. 1000	
To Creditors a/c	Cr.		Rs. 1000

It will be observed that the essential elements of the transaction such as receipt of material and liability to pay to the creditor are accounted for. Similarly "payment of wages Rs. 5000", shall be recorded under integrated accounts as –

Wages Control a/c	Dr.	Rs. 5000	
To Cash/bank a/c	Cr.		Rs. 5000

Instead of the following entries under nonintegrated accounts:

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**In financial books –**

Wages a/c	Dr.	Rs. 5000	
Cost ledger control a/c (Memorandum)	(Dr.	Rs. 5000)	
To Cash/bank a/c	Cr.		Rs. 5000

---

**In cost books –**

Wages control a/c	Dr.	Rs. 5000	
To General ledger adj. a/c	Cr.		Rs. 5000

---

The **advantages** of the integrated accounts are as follows :-

- (a) As there is only one set of accounts the need for reconciliation between cost and financial books does not arise. This will save a lot of clerical cost.
- (b) There is no duplication of recording and effort. Hence, the system is economical.
- (c) There is automatic check on the correctness of cost data. Hence, this will generate more confidence in cost records and information.
- (d) As cost accounts are posted straight from the books of original entry, there is no delay in obtaining cost data.
- (e) Centralised accounting under integrated system results in economy. It also widens the outlook of the accountant and his staff, who can have a better perspective than before.

Let us take an illustration of integrated accounts.

**Illustration 3 :** ABC Co Ltd. operates a system of integrated accounting. At the beginning of the year the balances in the integrated ledger are as follows :

	Dr. (Rs.)	Cr. (Rs.)
Fixed assets	2,00,000	
Issued share capital		3,00,000
Profit and loss		80,000
Depreciation provision		30,000
Debtors control	50,000	
Trade creditors control		20,000
Expense creditors control		15,000
Bank	25,000	
Stores control	95,000	
W.I.P control	35,000	
Finished goods control	40,000	
	4,45,000	4,45,000

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During the year transactions were as follows :-

Stores purchased		4,00,000
Stores returned to suppliers		10,000
Stores issued to production		3,20,000
Stores issued to production maintenance		30,000
Wages and salaries paid –		
Production wages : direct	1,50,000	
Indirect	35,000	
Production salaries	20,000	
Administration salaries and wages	80,000	
Sales department salaries	60,000	
Distribution department salaries and wages	30,000	3,75,000
Production wages : direct, accrued		2,500
Indirect, accrued		500
Paid to expense creditors		1,70,000
Production expenses	65,000	
Direct expenses	5,000	
Administration expenses	60,000	
Selling expenses	30,000	
Distribution expenses	20,000	
Administration expenses prepaid	5,000	
Depreciation provision (charge to production) 10%		
Production overhead recovered		1,72,000
Selling overhead recovered		88,000
Distribution expenses recovered		51,000
Administration overhead are charged to P & L a/c		
Output at cost of production		6,35,000
Goods sold at cost of production		6,30,000
Sales		10,00,000
Payment by debtors		9,80,000
Payments to creditors		3,73,000
Discount received		12,000
Discount allowed		15,000
Transfer to general reserve		50,000

Enter these transactions in the integrated ledger and then prepare the profit and loss account and balance sheet.

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**Solution :**

<b>Dr.</b>	<b>Fixed assets a/c</b>	<b>Cr.</b>
To Balance b/d	2,00,000	

<b>Dr.</b>	<b>Issued share capital a/c</b>	<b>Cr.</b>
	By Balance b/d	3,00,000

<b>Dr.</b>	<b>Profit and loss appropriation a/c</b>	<b>Cr.</b>
To Transfer to general reserve	50,000	By Balance c/d 80,000
To Balance c/d	1,23,500	By Profit and loss a/c 93,500
	1,73,500	1,73,500
	By Balance b/d	1,23,500

<b>Dr.</b>	<b>Provision for depreciation a/c</b>	<b>Cr.</b>
To Balance c/d	50,000	By Balance b/d 30,000
	50,000	By Prodn. od. control a/c 20,000
		50,000
		By Balance b/d 50,000

<b>Dr.</b>	<b>Debtors control a/c</b>	<b>Cr.</b>
To Balance b/d	50,000	By Bank 9,80,000
To Sales a/c	10,00,000	By Discount allowed 15,000
	.	By Balance c/d 55,000
	10,50,000	10,50,000
To Balance b/d	55,000	

<b>Dr.</b>	<b>Trade creditors control a/c</b>	<b>Cr.</b>
To Stores control a/c	10,000	By Balance b/d 20,000
To Bank	3,73,000	By Stores control a/c 4,00,000
To Discount received	12,000	
To Balance c/d	25,000	.
	4,20,000	4,20,000
	By Balance b/d	25,000

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<b>Dr.</b>	<b>Expense creditors control a/c</b>		<b>Cr.</b>
To Bank a/c	1,70,000	By Balance c/d	15,000
To Balance c/d	25,000	By Production overheads	65,000
		By Work-in-progress	5,000
		By Admn. overheads	60,000
		By Selling overheads	30,000
		By Distrn. overheads	20,000
	1,95,000		1,95,000
		By Balance c/d	25,000

<b>Dr.</b>	<b>Bank a/c</b>		<b>Cr.</b>
To Balance b/d	25,000	By Wages & Sal. control a/c	3,75,000
To Sundry debtors	9,80,000	By Expense creditors a/c	1,70,000
		By Sundry Creditors a/c	3,73,000
		By Balance c/d	87,000
	10,05,000		10,05,000

<b>Dr.</b>	<b>Stores control a/c</b>		<b>Cr.</b>
To Balance c/d	95,000	By S/Creditors – returns a/c	10,000
To Sundry Creditors	4,00,000	By WIP control a/c	3,20,000
		By Prodn. Od. control a/c	30,000
		By Balance c/d	1,35,000
	4,95,000		4,95,000
To Balance c/d	1,35,000		

<b>Dr.</b>	<b>Work-in-progress a/c</b>		<b>Cr.</b>
To Balance b/d	35,000	By Fin. goods control a/c	6,35,000
To Stores control a/c	3,20,000	By Balance c/d	49,500
To Salary/wages control a/c	1,52,500		
To Expense creditors	5,000		
To Production ovd. control a/c – overheads applied	1,72,000		
	6,84,500		6,84,500
To Balance c/d	49,500		

<b>Dr.</b>	<b>Finished goods control a/c</b>		<b>Cr.</b>
To Balance b/d	40,000	By Cost of sales a/c	6,30,000
To Work-in-progress control a/c	6,35,000	By Balance c/d	45,000
	6,75,000		6,75,000
To Balance b/d	45,000		

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<b>Dr.</b>	<b>Production overhead control a/c</b>		<b>Cr.</b>
To Stores control a/c	30,000	By Work-in-progress a/c	1,72,000
To Salaries and wages cont. a/c	55,500		
To Expense creditors a/c	65,000		
To Depreciation	20,000		
To Overheads adjustment a/c	1,500		
	1,72,000		1,72,000

<b>Dr.</b>	<b>Salaries and wages a/c</b>		<b>Cr.</b>
To Bank a/c	3,75,000	By Work-in-progress a/c	1,52,500
To Accrued wages	3,000	By Production overheads	55,500
		By Admn. overhead control	80,000
		By Selling overhead control	60,000
		By Distribution overheads	30,000
	3,78,000		3,78,000

<b>Dr.</b>	<b>Accrued wages a/c</b>		<b>Cr.</b>
To Balance b/d	3,000	By Salary & wages control a/c	3,000
	3,000		3,000
		To Balance b/d	3,000

<b>Dr.</b>	<b>Administration overhead a/c</b>		<b>Cr.</b>
To Salaries and wages control a/c	80,000	By Administration overheads prepaid a/c	5,000
To Expense creditors cont. a/c	60,000	By Profit and loss a/c	1,35,000
	1,40,000		1,40,000

<b>Dr.</b>	<b>Selling overhead control a/c</b>		<b>Cr.</b>
To Salaries and wages control a/c	60,000	By Cost of sales a/c applies	88,000
To Expense creditors	30,000	By Overheads adj. a/c	2,000
	90,000		90,000

<b>Dr.</b>	<b>Distribution overhead control a/c</b>		<b>Cr.</b>
To Salaries and wages control a/c	30,000	By Cost of sales a/c	51,000
To Expense creditors control a/c	20,000		
To Overheads adjustment a/c	1,000		
	51,000		51,000

<b>Dr.</b>	<b>Cost of sales a/c</b>		<b>Cr.</b>
To Finished goods control a/c	6,30,000	By Profit and loss a/c transfer	7,69,000
To Selling & Distrn. control a/c	88,000		
To Distribution ovd. control a/c	51,000		
	7,69,000		7,69,000

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<b>Dr.</b>	<b>Sales a/c</b>			<b>Cr.</b>
To Profit and loss a/c – transfer	10,00,000	By Sundries		10,00,000
	10,00,000			10,00,000
<hr/>				
<b>Dr.</b>	<b>Discount allowed a/c</b>			<b>Cr.</b>
To Debtor's control a/c	15,000	By Profit and loss a/c		15,000
	15,000			15,000
<hr/>				
<b>Dr.</b>	<b>Discount received a/c</b>			<b>Cr.</b>
To Profit and loss a/c – transfer	12,000	By Sundry Creditor's control a/c		12,000
	12,000			12,000
<hr/>				
<b>Dr.</b>	<b>Overhead adjustment a/c</b>			<b>Cr.</b>
To Selling overhead	2,000	By Production Overhead control a/c		1,500
To Profit and loss a/c – transfer	500	By Dist. overhead control a/c		1,000
	2,500			2,500
<hr/>				
<b>Dr.</b>	<b>Profit and loss a/c</b>			<b>Cr.</b>
To Cost of sales a/c	7,69,000	By Sales		10,00,000
To Admin. overhead control a/c	1,35,000	By Discount received		12,000
To Discount allowed	15,000	By Overheads adjustment a/c		500
To Balance trns. to Apprn.a/c	93,500			
	10,12,500			10,12,500
<hr/>				

**Balance Sheet as at .....**

Particulars	Assets Rs.	Liabilities Rs.
Share capital		3,00,000
General reserve		50,000
Fixed assets	2,00,000	
Profit and loss account		1,23,500
Depreciation provision		50,000
Debtors' control	55,000	
Trade creditors control		25,000
Expenses creditors control		25,000
Bank	87,000	
Stores control	1,35,000	
Work-in-progress control	49,500	
Finished goods control	45,000	
Prepaid expenses	5,000	
Accrued salaries and wages		3,000
<b>Total</b>	<b>5,76,500</b>	<b>5,76,500</b>

## 8.6 BASICS OF COMPUTERISATION OF ACCOUNTS

A computer can be applied to almost all types of accounting functions. It is a “a data processor that can perform substantial computation, including arithmetic and logic operations, without intervention by a human operator during the run”. With the increase in the size of the organisation and the number of transactions, most of the accounting operations are now mechanised. Earlier it was punched card accounting system, and now it is a computer including personal or mini computer.

Whether it is a Punched Card accounting or a computer, the fundamental requirement of data processing is the same. In any data processing system, whether the manual or mechanised, the basic functions involved are —

- (a) Collecting and recording facts,
- (b) Analysing and classifying the facts, and
- (c) Summarising and the interpreting them. The prerequisites for a data processing system are as follows :—
  - (i) A proper system of codification of all activities, departments, products and expense transactions.
  - (ii) There should be prompt, accurate and systematic preparation and maintenance of basic documents, such as Stores Receipt Notes, Material Requisition Note, Material Transfer Note, Time Card, Job Card, Idle Time Card, Vouchers, etc.
  - (iii) Data base should be created out of the basic documents, which should be processed in convenient batches. Each batch should have a control total for both quantity and value, so that after processing the results can be compared with the original documents.
  - (iv) Thus, there should be a procedure for ensuring reconciliation of total as per printed tabulation with that as per books of accounts. This is necessary because based on these data, various information and reports will generate.
  - (v) Data processing should be completely integrated.

Needless to mention, that a complete classification and codification of materials, labour, operations and utilities is required to prepare the data base from the original documents, which will indicate unit code, transaction code, source code, quantity and rate. Such coding structure will depend on the nature of business, size of the organisation, reporting requirement, etc.

### ◆ SPECIMEN QUESTIONS WITH ANSWERS

#### Question 1 :

Explain how to deal with the following in the cost accounts. Each answer should be in two or three sentences only, showing also the appropriate journal entry, wherever necessary.

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- (a) A shortage of 10 kg. of a store item (book value Rs. 150) was noticed during physical verification. Investigations revealed that it was due to natural causes.
- (b) An abnormal gain of Rs. 42,500 was noticed in process "A" of a chemical factory at the end of a month.
- (c) A sum of Rs. 1,500 was realised by sale of saw dust and useless scantlings in a furniture-making business.
- (d) In a factory, using historical cost system, there was an under-recovery of fixed factory overheads amounting to Rs. 24,000 at the end of the accounting period.
- (e) A company spent Rs. 15 lakhs on advertisement in the national television network before launching a new product.
- (f) A sum of Rs. 20,000 was incurred on printing and stationery in connection with the issue of non-convertible debentures by a company.
- (g) A sum of Rs. 7,500 was paid as wages to workers in a factory when there was no work due to power failure.
- (h) Overtime wages amounting to Rs. 500 was incurred to meet an urgent order of a customer who wanted the delivery date to be advanced.

**Answer :**

Action to be taken is briefly indicated as follows :

- (a) Since the loss is due to natural causes, the loss incurred may be debited to "factory overhead" or "stores overheads" by crediting the "stores control account". Simultaneously corrections may be made in the bin card and priced stores ledger.
- (b) Abnormal gain may be credited to P & L account by debiting to process account.
- (c) The amount should be credited to "miscellaneous income" and should not affect cost of the products.
- (d) The under-recovered fixed overheads should be transferred by debit to costing profit and loss account and credit to overheads control account.
- (e) The impact of the advertisement on the sales for each year should be carefully estimated and only the proportionate amount of advertisement charged to costs each year. The balance should be treated as a deferred revenue expenditure.
- (f) This is an item of pure finance and is not included in cost accounts.
- (g) The idle time wages, if unusual, may be debited to costing P & L a/c direct, as an extraordinary expense. If power failure is frequent, the cost may be debited to idle time wages under "factory Ovds." and absorbed in cost.
- (h) The overtime wages has to be borne by the customer, as the work is rushed at his specific request. The concerned job and WIP will be directly debited by credit to wages control account.

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**Question 2 :**

“Non-integrated accounting” is one of the systems of cost control accounting to keep cost books.

- (a) Define the term “nonintegrated accounting”.
- (b) Explain the system of nonintegrated accounting and state the principal ledgers that are to be maintained (briefly mention about the contents) and the principal accounts that are to be maintained.
- (c) Pass journal entries in the cost books (nonintegrated system) for the following transactions :
  - (i) Materials worth Rs. 25,000 returned to the stores from job.
  - (ii) Gross total wages paid Rs. 48,000. Employer’s contribution to P.F. and State Insurance amounts to Rs. 2,000. Wages analysis book detailed Rs 20,000 towards direct labour, Rs. 12,000 towards indirect factory labour, Rs.10,000 towards salaries, etc. to office staff and Rs. 8,000 for salaries, etc., to selling and distribution staff.

**Answer :**

- (a) **Non-integral accounting system :** in order to employ an appropriate accounting system regard must be had to the important matters as to whether cost and finance transactions should be integrated or kept separate. Where cost and financial transactions are integrated, the system is called integrated or integral accounting and where cost and financial transactions are kept separate, the system is called non-integral or cost ledger accounting system. However, records should be kept on a double entry basis, each transaction being represented by a debit and a credit.

Under the non-integral accounting system as separate ledgers are maintained for cost and financial accounts, the cost accountant is responsible for the recording of the costing transactions, whereas the financial accountant is in charge of the financial records. No personal accounts are kept in the cost books but transactions affecting the nominal accounts are recorded separately in both accounts.

As the system is not properly integrated, some items may appear in cost ledgers only, while some other items appear only on financial ledgers. Moreover, the valuation of opening and closing stocks of raw materials, work-in-process and finished goods may differ and there may be under-or over-absorption of overheads in cost ledgers. The profit or loss shown by one system will not agree with that of the other and as such, a reconciliation of costing profit or loss with that of the financial accounts is essential. This system, therefore, increases clerical cost and requires reconciliation.

- (b) (i) **Principal ledgers in cost department**

1. **Cost ledger:**

Contains all impersonal accounts and is made self-balancing by maintaining a control account for each of the other three ledgers given below.

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- |                                    |   |
|------------------------------------|---|
| <b>2. Stores ledger:</b>           | Contains all stores accounts, separate accounts being kept for each item of store.  |
| <b>3. Work-in-progress ledger:</b> | Records each type of job undertaken; the cost of all materials, wages and overheads of each job is posted to respective job account in this ledger. |
| <b>4. Finished goods ledger:</b>   | This ledger contains accounts of completely finished jobs or products, separate accounts are opened for each type of finished job, product, etc.    |

Each of these important ledgers has a control account so that cost ledger will have all the control accounts.

(ii) **Principal accounts** to be maintained

- a) General ledger adjustment account
- b) Stores ledger control account
- c) WIP ledger control account
- d) Finished goods ledger control account
- e) Wages control account
- f) Production overhead account
- g) Administration overhead account
- h) Selling and distribution overhead account
- i) Cost of sales account
- j) Costing profit and loss account.

The following **control accounts** are discussed below :—

1. *General ledger adjustment (or control) account*: This account is essential to make the cost ledger “self-balancing”. All transactions of income and expenditure which originate in the financial accounts must be entered in this ledger for eventual transfer to cost control accounts.  
If a transaction is of an internal nature affecting the cost accounts only, e.g., a transfer from stores ledger control account to work-in-progress ledger control account, then no entry is necessary in the general ledger adjustment account, because a double entry is possible to this balancing account.
2. *Stores ledger control account*: This account is debited with all purchases of materials for the stores and credited with all issues of material from stores.
3. *Work-in-progress ledger control account*: This account represents the total work-in-progress of different jobs at any time. All direct materials, direct wages,

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direct expenses, special purchases and production overhead are debited to this account. Goods completed in a period are credited with this account, and debited to the finished goods ledger control account.

4. *Finished goods ledger control account:* The total value of finished goods in stock is represented by this account. When goods are sold, the cost of such goods is credited to this account and debited to cost of sales account.

**(c) Journal entries:**

(i)	Stores ledger control account	Dr.	25,000	
	To Work-in-progress ledger control account			25,000
	(Being material returned to stores from the job)			
(ii) (a)	Wages control account	Dr.	50,000	
	To General ledger adjustment a/c			50,000
	(Being entry in cost books for gross wages and employer's contribution to PF and state insurance)			
(b)	WIP ledger control account	Dr.	20,000	
	Factory overhead a/c	Dr.	12,000	
	Administration overhead a/c	Dr.	10,000	
	Selling and distribution overhead a/c	Dr.	8,000	
	To Wages control account			50,000
	(Being the amount of direct labour to WIP control account and indirect expenses transferred to respective overhead accounts)			

**Question 3 :**

Journalise the following transactions in the integrated books of accounts :-

(a)	Credit purchase	Rs. 12,00,000
(b)	Production wages paid	7,00,000
(c)	Stocks issued to production orders	8,00,000
(d)	Works expenses charged to production	4,50,000
(e)	Finished goods transferred from production orders	18,00,000
(s)	Administration expenses charged to production	1,50,000
(g)	Work expenses outstanding	1,20,000
(h)	Work expenses paid	4,60,000



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	Rs.
(i) Average material cost per piece of "Senior" bat	80
(ii) Average material cost per piece of "Sub-junior" bat	60
(iii) Average cost of labour per piece of "Senior" bat	140
(iv) Average cost of labour per piece of "Sub-junior" bat	110
(v) Finished goods sold :	
Senior 300 pieces	
Sub junior 700 pieces	
(vi) Sale price:	
– per piece of "Senior" bat	500
– per piece of "Sub-junior" bat	390
(vii) Works expenses incurred during the period 1,20,000	
(viii) Office expenses	68,000

You are required to prepare a statement showing :-

- (1) The profit per each brand-piece of bat; charge labour and material at actual average cost, works cost at 100% on labour cost and office cost at 25% of works cost.
- (2) financial profit for the half-year ending 30.9.01.
- (3) reconciliation between profit as shown by cost accounts and financial accounts.

**Answer :**

**Statement of cost and Profit (Cost books).**

	Senior bat 300 units	Sub-junior bat 700 unit	Total of both Varieties
	Per unit cost Rs.	Total cost cost Rs.	Per unit cost Rs.
			Total cost Rs.
Material cost	80	24,000	60
Labour cost	140	42,000	110
Prime cost	220	66,000	170
<i>Add:</i> Factory overhead (100% of labour cost)	140	42,000	110
Work cost	360	1,08,000	280
<i>Add :</i> Office overhead (25% of works cost)	90	27,000	70
Total cost	450	1,35,000	350
Sales	500	1,50,000	390
Profit	50	15,000	40
		28,000	43,000

Total profit as per cost books Rs. 43,000.

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**Profit and loss account (financial books) for half year ending 30.9.01**

		Rs.	Rs.			Rs.	Rs.
To	Materials			By	Sales		
	Senior Bat	42,000			Senior	1,50,000	
	Sub-junior bat	42,000	66,000		Sub-junior	2,73,000	4,23,000
To	Wages						
	Senior bat	42,000					
	Sub-junior bat	77,000	1,19,000				
To	Works expenses		1,20,000				
To	Office expenses		68,000				
To	Net profit		50,000				
			4,23,000				4,23,000

**Reconciliation statement**

		Rs.
Profit as per cost books		43,000
<i>Add:</i>	Office overhead expenses over charged in cost books Rs. 76,000 as against actual of Rs. 68,000	8,000
		51,000
<i>Less:</i>	Works overheads undercharged in cost books Rs. 1,19,000 instead of actuals of Rs. 1,20,000	1,000
	Profit as per financial accounts	50,000

**Question 5 :**

- (a) (i) What do you understand by integrated accounts?  
(ii) What are the principles on which the system is based?  
(iii) How does computerised environment influence the need for having integrated accounts?
- (b) Show the journal entries for the following transactions in the integrated books of accounts:
- |  |              |
|--|--------------|
| (ii) Credit purchase                                 | Rs. 2,45,000 |
| (iii) Materials issued to production                 | Rs. 3,25,000 |
| (iv) Wages paid to workers                           | Rs. 1,39,612 |
| (v) Finished goods transferred from production       | Rs. 6,29,775 |
| (vi) Administrative overhead allocable to production | Rs. 78,900   |
| (vii) Works expenses outstanding                     | Rs. 2,25,000 |
| (viii) Goods sold during the month                   | Rs. 7,65,000 |

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**Answer :**

**(i) Integrated Accounts :**

Integrated Account is the name given to a system of accounting, whereby cost and financial accounts are kept in the same set of books. Obviously, there will be no separate sets of books for costing and financial records. Integrated accounts provide or meet out fully the information requirement for costing as well as for financial accounts. For costing it provides information useful for ascertaining the cost of each product, job, process, operation or any other identifiable activity and for carrying necessary analysis. Integrated accounts provide relevant information which is necessary for preparing profit and loss account and the balance sheet as per the requirement of law and also helps in exercising effective control over the liabilities and assets of its business.

**(ii) Principles of Integrated Accounts :**

The management's decision about the extent of integration of the two sets of books is needed. Some concerns find it useful to integrate upto the stage of primary cost or factory cost while other prefer full integration of the entire accounting records.

A suitable coding system must be made available so as to serve the accounting purposes of financial and cost accounts.

An agreed routine, with regard to the treatment of provision for accruals, prepaid expenses, other adjustment is necessary for preparation of interim accounts.

Perfect coordination should exist between the staff responsible for the financial and cost aspects of the accounts and an efficient processing of accounting documents should be ensured.

- (iii) In computerised environment, the maintenance of two sets of books for cost accounting and financial accounting is dispensed with.

**Answer :**

**JOURNAL ENTRIES**

<i>Particulars</i>		<i>Rs.</i>	<i>Rs.</i>
i)	Stores Ledger Control A/c To Cash	Dr. 18,000	 18,000
ii)	Stores Ledger Control A/c To Sundry Creditors A/c	Dr. 2,45,000	 2,45,000
iii)	Work-in-Progress Control A/c To Stores Ledger Control A/c	Dr. 3,25,000	 3,25,000
iv)	Wages Control A/c To Cash	Dr. 1,39,612	 1,39,612
v)	Finished Stock Ledger Control A/c To Work-in-Progress Control A/c	Dr. 6,29,775	 6,29,775
vi)	Work-in-Progress Control A/c To Administrative Overhead Control A/c.	Dr. 78,900	 78,900

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vii)	Prod. Overhead/Works Expns. Control A/c	Dr.	2,25,000	
	To Works Expenses A/c			2,25,000
viii)	Sundry Debtors A/c	Dr.	7,65,000	
	To Sales A/c			7,65,000

**Question 6 :**

Gemini Industries maintains separate books for financial accounting and cost accounting. The Financial Profit and Loss Account of the company for the year ended 31.3.2001 is given below:

**Profit and loss account for the year ended 31.3.2001**

	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
To Opening bal. of inventory:			By Sales	36,08,000
Raw materials	2,00,000		” Closing bal of inventory:	
Work-in-progress	50,000		Raw materials	1,80,000
Finished goods	1,50,000	4,00,000	Work-in-progress	40,000
” Purchase of raw materials		15,40,000	Finished goods	1,60,000
” Wages		4,80,000	” Miscellaneous income	22,000
” Factory overheads		2,60,000		
” Admn. overheads		2,40,000		
” Distrn. and selling Overheads		1,80,000		
” Debenture interest		40,000		
” Preliminary expenses written off		50,000		
” Net profit		8,20,000		
		40,10,000		40,10,000

A statement reconciling profit as per financial accounts with that as per cost accounting records prepared by firm is also given below :

**Reconciliation Statement**

	<i>Rs.</i>	<i>Rs.</i>	<i>Rs</i>
Profit as per profit and loss account			8,20,000
(a) Differences in valuation of inventory :			
Deduct :Raw materials – opening balance		20,000	
Work-in-progress – opening balance		12,000	
Work-in-progress – closing balance		4,000	
Finished goods – opening balance		30,000	
		66,000	
<i>Add,</i> Raw materials – closing balance	30,000		
Finished goods – closing balance	15,000	45,000	21,000

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(b) Other items :

<i>Add,</i>	Debenture interest	40,000	
	Preliminary expenses written off	50,000	
		90,000	
<i>Deduct,</i>	Miscellaneous income	22,000	68,000
	Profit as per costing profit and loss account		8,67,000

Prepare the following accounts as they would appear in the cost records :

- (i) Raw materials control account
- (ii) Work-in-progress account;
- (iii) Finished goods stock account;
- (iv) Cost of sales account;
- (v) Costing profit and loss account.

**Answer :**

- (i) The accounts which would appear are as follows :-

Dr.	<b>(i) Raw materials control account</b>		Cr.
	<i>Particulars</i>	<i>Rs.</i>	<i>Particulars</i>
	To Opening balance	2,20,000	By Closing balance
	To Purchases	15,40,000	By Work-in-progress A/c
		17,60,000	17,60,000

Dr.	<b>(ii) Work-in-progress account</b>		Cr.
	<i>Particulars</i>	<i>Rs.</i>	<i>Particulars</i>
	To Opening balance	62,000	By Closing balance
	To Raw mat. control A/c	15,50,000	By F.goods stock. A/c
	To Wages control A/c	4,80,000	
	To Factory overhead control A/c	2,60,000	
		23,52,000	23,52,000

Dr.	<b>(iii) Finished goods stock account</b>		Cr.
	<i>Particulars</i>	<i>Rs.</i>	<i>Particulars</i>
	To Opening balance	1,80,000	By Closing balance
	To Work-in-progress control A/c	23,16,000	By Cost of sales account
		24,96,000	24,96,000

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Dr.	<i>(iv) Cost of sales account</i>		Cr.
To Finished goods stock A/c	23,21,000	By Costing profit and loss A/c	27,41,000
To Administration ovd. A/c	2,40,000		
To Selling & Distrn. ovd A/c	1,80,000		
	27,41,000		27,41,000
Dr.	<i>(v) Costing profit and loss account</i>		Cr.
To Cost of sales A/c	27,41,000	By Sales account	36,08,000
To Net profit (as per cost accounts)	8,67,000		
	36,08,000		36,08,000

**Working Notes :-**

(i) Opening balance of raw materials in cost accounting —	Rs.
Opening balance as per financial Accounting	2,00,000
<i>Add</i> : difference as per Reconciliation Statement	20,000
	2,20,000
(ii) Closing balance of raw materials in Cost Accounting	
Closing as per Financial Accounting	1,80,000
<i>Add</i> : difference as per Reconciliation Statement	30,000
	2,10,000
(iii) Similarly, the following calculations can be made —	
(a) WIP opg. balance in Cost Accounting (50,000 + 12,000)	62,000
WIP closing balance in Cost Accounting ( 40,000 – 4,000)	36,000
(b) Fin. goods opg. balance in Cost Accounting (1,50,000 + 30,000)	1,80,000
Fin. Goods cl. balance in Cost Accounting (1,60,000 + 15,000)	1,75,000

**Question 7 :**

- (a) Enumerate the principal ledgers that are to be maintained in a system of cost control accounting (briefly mention the contents).
- (b) From the following data prepare a reconciliation statement :

	Rs.
Profit as per cost account	1,45,500
Works overheads under-recovered	9,500
Administrative overheads under-recovered	22,750
Selling overheads over-recovered	19,500
Overvaluation of opening stock in cost accounts	15,000
Overvaluation of closing stock in cost accounts	7,500
Interest earned during the year	3,750
Rent received during the year	27,000
Bad debts written off during the year	9,000
Preliminary expenses written off during the year	18,000

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**Answer :**

**(a) Principal ledgers in a system of Cost Control Accounting :**

- Cost ledger control account
- Stores ledger control account
- Work-in-progress ledger control account
- Finished good ledger control account.

Cost ledger control account maintains a link with financial account and completes the double entry. For input items such as material, labour and expenses this account is credited and the respective control account is debited.

Any transfer from cost books to financial books for transactions such as return of materials from stores, transfer of capital work performed by the factory, transfer of costing profit and loss etc. is entered in this account.

Stores ledger control account is debited for receipt of materials as per goods received note and credited for issue of materials as per material requisition note. The balance of the account indicates the stock value of materials lying in the stores.

Work-in-progress account is debited with the cost of production i.e. direct material, direct wages, direct expenses and production overheads recovered and credited with the value of finished goods completed and transferred to finished goods control account. The balance of this account indicates the value of incomplete jobs or other cost units.

Finished goods ledger control account is debited with the cost of completed units and credited with the cost of units sold. The balance in this account represents the costs of finished goods at any given time.

<b>(b) Reconciliation Statement</b>	<i>Rs.</i>	<i>Rs.</i>
Profit as per Cost Accounts		1,45,500
<i>Add :</i> Over-recovery of Selling Overheads	19,500	
Over-valuation of Opening Stock	15,000	
Income excluded from Cost Accounts :		
Interest earned	3,750	
Rent received	27,000	
	30,750	65,250
		2,10,750
<i>Less :</i> Under-recovery of Works Overhead	9,500	
Under-recovery of Administration Overhead	22,750	
Over-valuation of closing stock	7,500	
Expenses excluded from Cost Accounts :		
Bad Debts	9,000	
Preliminary Expenses	18,000	
Profit as per Financial Account	27,000	66,750
		1,44,000

## ◆ TEST YOURSELF

### A. OBJECTIVE TYPE QUESTIONS

1. Which of the following statements are true ?
  - i) Cost accounting is interested in detailed analysis of expense, and not with assets and liabilities.
  - ii) Wages control account is a control account in its true sense.
  - iii) Production overheads control account is not a control account in its true sense.
  - iv) Integrated accounts merge the financial and cost accounts in one set of accounts.
  - v) Reconciliation of profit reflected by financial account with that of cost accounts is not required under integral accounts.
  - vi) Material control and stores ledger control accounts are one and the same.

### B. DESCRIPTIVE QUESTIONS

- 1 (a) What are the advantages of maintaining a cost ledger ?  
 (b) Insert specimen entries in the following accounts of a cost ledger, explaining the sources of such entries:
  - Stores ledger account
  - Wages control account
  - Production overhead control account
  - WIP account
  - Finished stock control account
  - Cost of sales account
2. Indicate the main reasons why it is necessary for the cost and financial accounts to be reconciled ? Under what circumstances a reconciliation can be avoided ? List down some of the items which appear in the financial accounts, but not in cost accounts.
3. It is proposed to integrate the cost and financial account in a company in which they have previously been separated. State the advantages to be derived from this process and the main adjustment procedure which will be needed.
4. Profit disclosed by the financial accounts for the year was Rs. 29750, whereas cost accounts indicated Rs. 50000 as profit for the year. On the basis of the following information, prepare a statement reconciling the profit figures:
  - (a) Overheads as per cost accounts were estimated at Rs. 8.500. Actual expenses as per financial accounts were Rs. 7,000.
  - (b) Directors' fees shown in financial account only as Rs. 2000.
  - (c) The company provided Rs. 5000 as provision for doubtful debts.

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- (d) Depreciation @5% per annum was provided for 6 months for a building valued at Rs. 30000 which is yet to be used.
- (e) Share transfer fees received during the year Rs. 1000.
- (f) Provision for Income Tax was Rs.15000.
5. What do you understand by integrated accounts ? What are the principles on which the system is based ? Explain the system with reference to the following three transactions:
- (i) Materials purchased Rs.10000.
- (ii) Wages paid Direct Rs. 20000. Indirect Rs. 15000.
- (iii) Credit Sales Rs. 50000.
6. Merrick & co. Ltd. has a good job order cost system. Its accounting year closing on 30th June. As on 1 st June 1991 the following information is available:

		Rs.
(a) Opening inventory raw materials	–	30000
Work-in-progress	–	40000
Finished goods	–	50000
(b) Ledger balance of other accounts are as follows		
Factory overhead control	–	Dr. 375000
Factory overhead applied	–	Cr. 390000
Cost of goods sold	–	Dr. 16,00,000
(c) Job cost sheets (work in progress details)		
	Job AB	Job XY
	Rs.	Rs.
Direct materials	3650	6000
Direct labour	7000	5000
Factory overheads	3850	2750
Job MN		4000
		5000
		2750

- (d) The following transactions were completed in June.1991:

	Rs.
i) Raw materials purchased	102000
ii) Payroll cost distribution as under:	
Direct labour. – Job AB	2,500
– Job XY	3,000
– Job MN	2,500
Indirect labour	1,000
Sales salaries	4,000
Administration salaries	5,000
Total	18 000

General overtime and other allowances work out to 9% of the Payroll.

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iii) Analysis of material requisitions shows the following :-

	<i>Rs.</i>
Job AB	12,000
Job XY	15,000
Job MN	18,000
	45,000
Repair and maintenance	12,000

- iv) Depreciation on factory equipment for the month amounted to Rs. 3,500.
- v) Sundry factory expenses amounted to Rs. 4,200 for the month.
- vi) Factory overhead is applied to production @ 55% of direct labour costs.
- vii) Goods completed during the month relate to job AB. Ail finished goods are to be valued at an average cost of Rs. 2.50 each.
- viii) 0000 units were sold during June at a sales value of Rs. 90,000.
- ix) on 30 the June, 1991, the amount of over/under absorbed Factory overheads is to be transferred to the cost of goods sold account.
- x) Sales for the year upto 31 st May, 1991 amounted to Rs. 18 lakhs.

You are required to complete the ledger accounts, indicate closing balances of the inventory and arrive at the profit for the year ending 30th June, 1991.

7. From the following particulars, prepare –

- (a) statement of cost of manufacture for the year,
- (b) a statement of profit as per cost accounts,
- (c) profit and loss accounts in financial books and
- (d) a reconciliation of the difference in the profit as shown by (a) and (b) above

	<i>Rs.</i>
Opening stock of raw materials	100000
Closing stock of raw materials	150000
Opening stock of finished product	200000
Closing stock of finished product	50000
Purchase of raw materials	600000
Wages	250000

Charge factory overhead at 25 per cent on prime cost. Office overhead will be levied at 75 percent on factory overhead. Actual works expenditure amounted to Rs. 1,93,750 and actual office expenses amounted to Rs. 1,52 500. The selling price was fixed at 25 per cent above cost price.



# MARGINAL COSTING AND DECISION MAKING

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## 9.0 TECHNIQUES OF COSTING

One of the basic functions of a cost accounting system is to determine the cost of products or services, which we have discussed in the last two Study Notes. Now, we shall discuss the other most important functions of cost accounting, which is the analysis, interpretation and presentation of data as an aid to cost control, profit improvement and decision making by the management. Techniques of costing refer to the manner in which cost information shall be presented to management.

In the previous Study Notes, while discussing job, process and operating costing methods generally the technique of absorption or total costing has been applied, where cost of sales represents aggregate of direct material, direct labour, direct expenses and applied overhead.

*Cost and Management Accounting*

No distinction has been made between fixed and variable components of overheads, and total overheads are absorbed according to the activity level. Absorption costing technique suffers from two basic weaknesses, which renders it useless for taking managerial decisions :

- (i) Costs differ if levels of output vary from one period to another due to the application of fixed overheads. Same product may cost differently on 28th February and 1st March because of variation in output and expense. February have less number of working days than January, and fixed overheads have been distributed over a lower volume of output.
- (ii) Carry-over a portion of fixed overheads from one period to subsequent period along with closing inventory, which makes comparison between two periods useless. Besides, under this technique, profit and loss in the accounts are related to production and sales, i.e. including unsold stock. But profit is earned only when sale is effected.

Absorption costing technique is useful, if :

- (i) there is only one product,
- (ii) there is no inventory, and
- (iii) overhead recovery rate is based on normal capacity, instead of actual level of activity.

We have, therefore other techniques of costing, which serve the purpose of cost control and both strategic and tactical decision-making, such as, marginal costing, standard costing, budgetary control, differential costing, etc.

## 9.1 MARGINAL COSTING – BASIC CONCEPT

**Marginal costing** is a technique of ascertaining cost used in any method of costing. According to this technique, variable costs are charged to cost units and the fixed cost attributable to the relevant period is written off in full against the contribution for that period. Contribution is the difference between sales value and variable cost. Thus, all expenses are classified under two groups, variable and fixed. Variable expenses are those which vary in sympathy with increase or decrease of unit production or sales. Variable expenses are direct materials, direct labour, direct expenses, variable factory overheads and variable administration, selling & distribution overheads. Fixed expenses include fixed factory overheads, administration overheads and fixed selling and distribution overheads. Fixed expenses have no effect on the volume of activity and are written-off to the profit and loss account at the end of the period. It is, therefore, called period cost. Variable cost, on the other hand, relates to the product, and hence, termed as product cost.

### Fixed and Variable Cost

Marginal costing technique is based on the segregation of fixed and variable costs. Fixed costs or period or time costs arise from policy decisions of the top-management to provide and to keep in readiness a given capacity to produce and sell, regardless of the current actual volume of production or sales. Most of the fixed costs are determined by the volume of business expected rather than by the volume of business actually done.

### *Marginal Costing and Decision Making*

Variable costs or product or output costs, on the other hand, vary directly or tends to vary directly with current volume without need for managerial decision. Time has no effect on this type of cost.

However, it is important to note that fixed costs tend to remain unchanged only within a given range of activity and within a relevant time-period. If activity level fluctuates from zero level to full capacity, naturally fixed expenses cannot remain constant. Similarly, fixed cost cannot remain unchanged over a long period of time. Even within a short period, say, one year, there may be changes in salary and wages for normal increments or change in Dearness Allowance rates or price increase due to inflation. Such changes are inevitable even within a short period, say, one year. Hence, the concept of fixed cost as envisaged in marginal costing holds good within a relevant period. Variable costs normally remain unaffected by the change in activity level or change in the period, unless there is operational changes.

#### **INCOME STATEMENT**

Under marginal costing technique, Income Statement is presented in the following format:

Sales		
Less : Variable manufacturing cost —		_____
Direct material	_____	
Direct labour	_____	
Direct expenses	_____	
Variable factory overhead	_____	
Variable admn., selling and distrn. overhead	_____	_____
Variable cost of sales		_____
<b>CONTRIBUTION or GROSS MARGIN</b>		_____
Less : Fixed costs : —		
Manufacturing overhead	_____	
Administrative overhead	_____	
Selling and distribution overhead	_____	
Total fixed costs		_____
<b>NET INCOME OR NET MARGIN</b>		_____

It is evident from above that contribution is an unit concept, and relates to cost units, so much so that given volume of output, the total contribution can be worked out. For example, if sales value of a Product A is Rs. 10 per unit, variable cost of sales Rs. 4 and total output is 200 units, then total contribution will be Rs. 1200 i.e.  $200 \times (10 - 4)$ . If another Product B sells at Rs. 12 per unit having variable cost of sales Rs. 5, and total output is 300 units, then contribution of Product B will be Rs. 2100 i.e.  $300 \times (12 - 5)$ . If fixed cost for the same period is Rs. 1500, the net income will be Rs. 1,800 i.e.  $(Rs. 1200 + 2100) - 1500$ . Graphically, it can be presented in the following manner

*Cost and Management Accounting*

PRODUCT A	Rs.	PRODUCT B	Rs.	TOTAL	Rs.
Sales	2000	Sales	3600	5600	
Less : Variable cost	800	Less : Variable cost	1500	2300	
Contribution	1200	Contribution	2100	3300	
		Less : Fixed cost		1500	
		Net Income		1800	

Each of the products will add their contribution in a pool, from where fixed expenses will be met. Any surplus in the pool fund will indicate profit. Any deficit will indicate loss. The merit in such an analysis is that profitability of each product is reflected correctly, in that the contribution of each product is independent of the others, as well as of the fixed overheads. Any variation in the contribution rate or sales volume will have effect on the overall profit of the organisation.

## 9.2 MARGINAL COSTING VS. ABSORPTION COSTING

Under marginal costing system, inventory is valued at variable cost, and fixed cost is deducted from contribution to arrive at profit. Profit is termed as net income or net margin. No portion of fixed cost enters into inventory value, hence no part of fixed cost is carried to the next period with work-in-progress and finished goods. Thus, profit is related entirely to the sales value of the period and production has no bearing on the profit. Herein lies the basic difference between absorption costing and marginal costing techniques, which can be summarised as follows :

### (a) Concept of profit

- Under absorption costing, net profit is arrived at by deducting administration, selling and distribution expenses from gross profit.
- Under marginal costing, net profit is arrived at by deducting fixed expenses from contribution.

The difference lies in the gross profit and contribution margin concepts.

### (b) Valuation of inventory

Under absorption costing, inventory is valued at factory cost, which includes production overheads, - both fixed and variable. A part of production overhead is, therefore, carried to the next accounting period with work-in-progress and finished goods. As a result, profits of both current period as well as next period are influenced by the inventory value. Under marginal costing, inventory is valued at variable cost and no part of fixed cost is applied to the inventory. Thus, the influence of production on profit is totally eliminated. Profit of both the periods remain unaffected by the inventory holding. Hence, net profit will be the same under both the techniques, if no inventory exists. Net operating profit will differ, if inventory exists.

*Marginal Costing and Decision Making*

The effect upon profit it under absorption and marginal costing will differ with the increase or decrease of inventory as indicated below :

<b>Inventory position</b>	<b>Effect on profit shown by absorption costing and marginal costing</b>
(a) Production and sales are same – Nil inventory	Profit same under both the techniques.
(b) Sales less than production i.e. closing stock increase	Absorption costing will show higher profit than under marginal costing, since some portion of current cost is transferred to next period with inventory value.
(c) Sales more than production i.e. closing stock is less than opening stock.	Absorption costing will show lower profit than under marginal costing, since some cost of previous period is added to this period, which reduces profit, whereas under marginal costing, fixed cost of the period only will be deducted from gross margin.

Let us take an illustration to explain the above by showing difference between production and sales between periods I, II, III and IV.

The cost details are as follows:

Direct materials – @ Rs. 3 per unit.

Direct labour – @ Rs. 2 per unit.

Applied factory overheads @ 100% direct labour.

Actual factory overheads are Rs. 3750 for Period I, Rs. 4000 for Period II, Rs. 4300 for Period III and Rs. 4100 for Period IV, of which variable factory overheads is @ Re. 0.60 per unit.

Selling price is Rs. 10 per unit. Administration and selling expenses are Rs. 2000 for each period. Production, Sales and Inventory during the periods are as follows :

	<i>Period I</i>	<i>Period II</i>	<i>Period III</i>	<i>Period IV</i>
Opening Inventory	–	–	300	200
Production	1750	2100	1900	2000
Sales	150	1800	2000	17000
Closing inventory	–	300	200	500

*Cost and Management Accounting*

**Solution :**

**A. Cost and Profit Statement under Absorption Costing**

<i>Cost elements</i>	<i>Period I Rs.</i>	<i>Period II Rs.</i>	<i>Period III Rs.</i>	<i>Period IV Rs.</i>
Direct materials	5250	6300	5700	6000
Direct labour	3500	4200	3800	4000
Applied factory overheads	3500	4200	3800	4000
<b>FACTORY COST</b>	<b>12250</b>	<b>14700</b>	<b>13300</b>	<b>14000</b>
<i>Add</i> : Opening inventory	–	–	2100	1400
<i>Less</i> : Closing inventory	–	2100	1400	3500
<b>COST OF GOODS SOLD</b>	<b>12250</b>	<b>12600</b>	<b>14000</b>	<b>11900</b>
(Over)/Under applied overheads	250	(200)	500	100
Actual cost of goods sold	12500	12400	14500	12000
Sales	17500	18000	20000	17000
<b>GROSS PROFIT</b>	<b>5000</b>	<b>5600</b>	<b>5500</b>	<b>5000</b>
<i>Less</i> : Administration & Selling exp.	2000	2000	2000	2000
<b>NET OPERATING PROFIT</b>	<b>3000</b>	<b>3600</b>	<b>3500</b>	<b>3000</b>

**B. Cost and Profit Statement under Marginal Costing**

<i>Cost elements</i>	<i>Period I Rs.</i>	<i>Period II Rs.</i>	<i>Period III Rs.</i>	<i>Period IV Rs.</i>
I. Sales	17500	18000	20000	17000
II. Direct cost of production :				
Direct materials	5250	6300	5700	6000
Direct labour	3500	4200	3800	4000
Variable factory overheads	1050	1260	1140	1200
Direct cost of production	9800	11760	10640	11200
<i>Add</i> : Opening inventory	–	–	1680	1120
<i>Less</i> : Closing inventory	–	1680	1120	2800
III. Direct cost of goods sold	9800	10080	11200	9520
IV. Contribution (I-III)	7700	7920	8800	7480
V. Fixed cost:				
Factory overheads	2700	2740	3160	2900
Administration and selling expenses	2000	2000	2000	2000
Total	4700	4740	5160	4900
VI. Net Operating Profit	3000	3180	3640	2580

*Marginal Costing and Decision Making*

**Note:**

Actual factory overheads	3750	4000	4300	4100
Less: Factory overheads	1050	1260	1140	1200
Fixed factory overheads	2700	2740	3160	2900

The difference in the net operating profit and inventory valuation under the two systems are as follows :

	<i>Period I</i> Rs.	<i>Period II</i> Rs.	<i>Period III</i> Rs.	<i>Period IV</i> Rs.
I. Inventory valuation				
As per absorption costing	Nil	2100	1400	3500
As per marginal costing	Nil	1680	1120	2800
Difference due to elimination of fixed cost under marginal costing	Nil	420	(280)	700
II. Effect on profit				
Profit as per absorption costing	3000	3600	3500	3000
Profit as per marginal costing	3000	3180	3640	2580
Difference in net profit	Nil	420	(140)	420

Two points emerge from the above analysis—

- (i) The difference in the net operating profit between the three periods II, III and IV are due to change in inventory as will be evident from the following:

<i>Change in inventory</i>	<i>Period I</i>	<i>Period II</i>	<i>Period III</i>	<i>Period IV</i>
– Units	Nil	300	(100)	300
– Value-Rs.	Nil	420	(140)	420

- (ii) In Period I, when production and sales are same, there is no difference in profit between the two systems.

In Period II and IV, when production exceeds sales, absorption costing shows higher profit than under marginal costing.

In Period III, when sales exceed production, absorption costing shows less profit than under Marginal costing.

### 9.3 COST-VOLUME-PROFIT (CVP) ANALYSIS

Two significant relationships between Sales, Cost and Profit can be established; they are :

- (a) Sales – Variable cost = Contribution  
 (b) Contribution – Fixed cost = Profit or Contribution = Fixed cost + Profit.

Hence, Sales—Variable cost = Fixed cost + Profit.

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From the above equation, it is clear that if any three of the above are known, the fourth one can be worked out. The same equation can also be used to find out break even point (BEP), where there will be no profit and no loss. It is that volume of sale, where Sales – Variable cost = Fixed cost.

From total sales volume variable cost and fixed cost, break even sales can be calculated as follows:

Suppose, S = Total sales value

V = Variable cost

F = Fixed cost

Then,

Break-even sales = (Contribution at break-even point / P/V ratio)

= Fixed cost / P/V ratio

[Since, Contribution at break-even point = Fixed cost]

Here, we will get sales in rupee value

If we want to obtain break-even sales in units we can utilise the following formulae directly

Break-even (units) = Fixed cost/Contribution per unit

#### **9.4 PROFIT-VOLUME RATIO**

The P/V ratio formulae,  $(S - V)/S = (\text{Sales} - \text{Variable cost})/\text{Sales}$   
 $= \text{Contribution}/\text{Sales}$

indicates a ratio of contribution in relation to sales, or profit in relation to sales volume. This is called profit/volume or P/V ratio. So long as unit selling price and unit variable cost remain constant, P/V ratio can also be found out by expressing change in contribution in relation to change in sales. P/V ratio is normally expressed in percentage. P/V ratio determines the increase or decrease in contribution which can be expected from increase or decrease in volume, provided there is no change in other factors. A higher P/V ratio will indicate high profitability, whereas a lower P/V ratio will indicate low profitability. Where the profitability is high, increase of sales volume is possible through more spending in advertisement and sales promotion. The scope for price reduction in the face of stiff competition is also revealed by P/V ratio.

Any improvement of P/V ratio indicates additional profit, since the additional contribution will only add to profit, fixed overheads remaining constant. The improvement of P/V ratio can be done by any of the following ways —

- (i) increasing selling price,
- (ii) reducing variable cost, and
- (iii) if there are more than one products, then changing sales-mix i.e. increasing sales of products having higher P/V ratio.

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**Illustration :** A retail trader has just started his business by setting a cosmetic article at Rs. 20 each, the variable cost of purchase, etc. of which is Rs.12. The fixed costs are Rs. 8,000 per month. You are required to —

- (a) Prepare a statement showing profit or loss if monthly sales are 500 units, 1000 units, 3000 units.
- (b) Establish the fundamental margin cost equations and calculate
  - (i) P/V ratio
  - (ii) Break-even sales
  - (iii) Profit at sales Rs. 40,000
  - (iv) Sales to earn a profit of Rs. 5000
  - (v) Margin of safety when sales are Rs. 44000
- (c) Using a simple model of CVP calculate –
  - (i) Break-even sales
  - (ii) Profit at sales Rs. 40000
  - (iii) Sales to earn profit of Rs. 5000.

**Solution :**

(a) **STATEMENT SHOWING PROFIT/LOSS**

		<i>500 units</i>	<i>1000 units</i>	<i>3000 units</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Sales	(S)	10000	20000	60000
Variable cost	(V)	6000	12000	36000
<b>Contribution (S–V) = (C)</b>		4000	8000	24000
Fixed cost	(F)	8000	8000	8000
<b>Profit</b>	(P)	(4000)	Nil	16000

(b) The usual marginal cost equations are

$$S - V = C \quad \dots\dots\dots (1)$$

$$P + F = C \quad \dots\dots\dots (2)$$

$$S - V - F = P \quad \dots\dots\dots (3)$$

$$P/V \text{ Ratio} = \frac{C}{S} \text{ or } \frac{\Delta C}{\Delta S} \text{ or } \frac{\Delta P}{\Delta S} \quad \dots\dots\dots (4)$$

$$S = \frac{C}{P / V \text{ Ratio}} \quad \dots\dots\dots (5)$$

$$C = S \times \frac{P}{V} \text{ Ratio} \quad \dots\dots\dots (6)$$

$$S_{\text{BEP}} = \frac{C_{\text{BEP}}}{P/V \text{ Ratio}} = \frac{F}{P/V \text{ Ratio}} \quad \dots\dots\dots (7)$$

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$$M/S = \text{Sales at selected activity} - \text{B.E.Sales} \dots\dots\dots (8)$$

$$\text{or } \frac{P}{\text{P/V Ratio}} \dots\dots\dots (9)$$

- (i)  $P/V \text{ Ratio} = (C/S) = \text{Rs. } 8/20 = 0.40 \text{ or } 40\%$
- (ii)  $\text{B.E.S} = \text{Rs. } 8000/0.40 = \text{Rs. } 20000 \text{ or } (1000 \text{ units})$
- (iii)  $C = 40000 \times 0.40 = \text{Rs. } 10000$   
Hence Profit is ( Rs. 16000 - Rs. 8000 ) = Rs. 8000
- (iv) To earn a profit of Rs. 5000 is to earn a contribution of (Rs. 5000 + Rs. 8000) = Rs. 13000.  
Sales =  $13000/0.40 = \text{Rs. } 32500$
- (v)  $M/S = 4000 / 0.40 \quad \text{Rs. } 10000$
- (vi)  $M/S = \text{Rs. } 44000 - 20000 = \text{Rs. } 24000$

(c) A simple CVP model is –

$$n(S - V) - F = P$$

Where n = Number of units; S is the selling price per unit and V is the variable cost per unit, F is the fixed cost and P is the profit

- (i) At, Break-even point ( P ) = 0,  
Hence,  $n(20 - 12) - 8000 = 0$  or,  $n = 1000 \text{ units ( or sales Rs. } 20000)$
- (ii) When  $S = 40000$ ,  $n = 2000 \text{ units}$   
Hence  $P = 2000 \times 8 - 8000 = \text{Rs. } 8000$
- (iii) Here,  $n \times 8 = 5000 + 8000$   
or,  $n = 1625 \text{ units (or, Rs. } 32500)$

**(For details refer to Chapter on Marginal Costing from ‘Cost Accounting Methods and Problems’ by B. K. Bhar.)**

## 9.5 BREAK-EVEN ANALYSIS

A Break even chart depicts marginal costing technique graphically. It is a “chart which shows the profitability or otherwise of an undertaking at various levels of activity and as a result indicates the point at which neither profit nor loss is made”. The break even chart (BEC) indicates the following :–

- (a) Variable cost, fixed cost and total cost
- (b) Sales value
- (c) Profit or loss and point of “no-profit, no loss” i.e. break-even point.
- (d) Margin of safety.

The margin of safety represents excess sales over and above the Break-even point, and indicates the strength of the business.

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### Construction of Break-even Chart

Construction of break-even chart involves the drawing of fixed cost line, total cost line, and sales line as follows :—

- (1) Select a scale for production on the horizontal axis and a scale for costs and sales on the vertical axis.
- (2) Plot the fixed cost on the vertical axis and draw fixed cost line passing through this point parallel to horizontal axis.
- (3) Plot the variable costs for some activity levels starting from the fixed cost line and join these points. This will give the total cost line. Alternatively, obtain total cost at different levels, plot the points starting from horizontal axis and draw the total cost line.
- (4) Plot the maximum or any other sales volume and draw the sales line by joining zero and the point so obtained.

**Illustration :** A company produces a single article and sells at Rs. 10 each. The marginal cost of production is Rs. 6 each and total fixed cost of the concern is Rs. 400 per annum.

Construct a break-even chart and show :—

- (a) break-even point ;
- (b) margin of safety at sales Rs.1,500 ;
- (c) angle of incidence ;
- (d) increase in selling price if the break-even point is reduced to 80 units.

**Solution :** A break-even chart is prepared by obtaining the information at these levels —

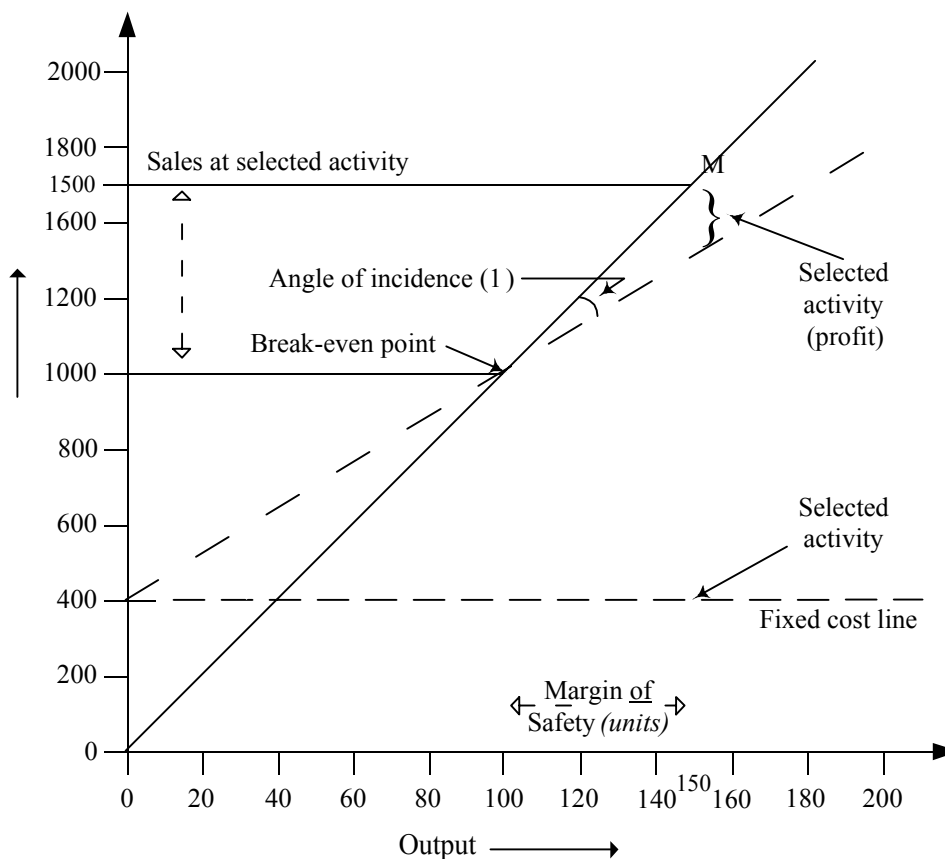
Output	40	80	120	200
	Rs.	Rs.	Rs.	Rs.
Sales	400	800	1,200	2,000
Fixed cost	400	400	400	400
Variable cost	240	480	720	1,200
Total cost	640	880	1,120	1,600

Fixed cost line, total cost line, and sales line are drawn one after another following the usual procedure described hereinbefore.

- (a) *Break-even point* : This is the point at which the sales line and the total cost line intersect. Here B is the break-even point equivalent to a sale of Rs. 1,000 or 100 units.
- (b) *Margin of safety* : This is the difference in sales or units of production from the break-even point. Thus margin of safety at M is sales of (Rs. 1,500 — Rs. 1,000) i.e., Rs. 500 or 50 units of production.
- (c) *Angle of incidence* : This is the angle formed by the sales line and the total cost line at the break-even point. A large angle of incidence shows a high rate of profit being made and *vice versa*.

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- (d) At 80 units the total cost (from the table) = Rs. 880 = Sales value of 80 units.  
Hence, selling price for break-even at 80 units = Rs. 880/80 = Rs. 11 per unit.  
Increase in selling price is Re. 1 or 10% over the original selling price of Rs. 10 per unit.

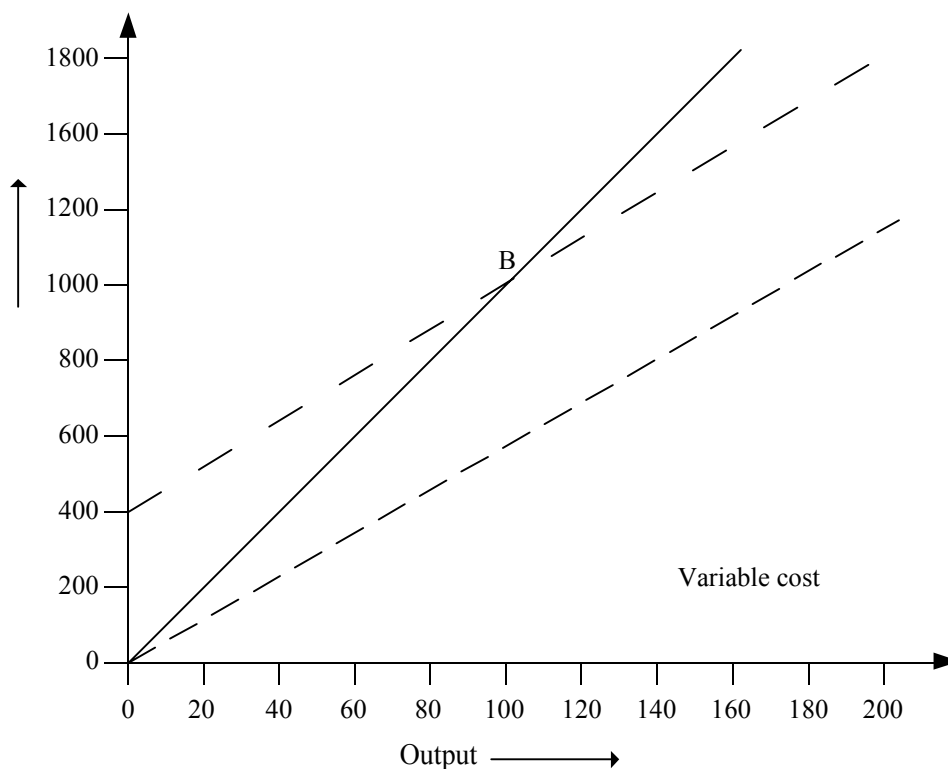


**FIG. : Contribution Break-even Chart**

*This chart shows clearly the break-even point, margin of safety and angle of incidence.*

**Alternative forms of break-even chart :** A break-even chart should be in a form which is suitable for the particular purpose. The following is a *Contribution Break-even Chart* showing the contribution more clearly than the orthodox type. Some cost accountants favour it because of the fact that it reveals more clearly the effects of fixed overheads on volume of sales. The graph is obtained from the information of previous Illustration in a similar way to previous Figure, except that variable cost line is drawn first, then fixed cost and sales lines are drawn.

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**FIG. : Contribution Break-even Chart**

*This chart shows clearly the contribution at various levels of production.*

An analytical break-even chart is another form showing —

- (i) *Fixed costs*: divided into production fixed overhead, administration and selling and distribution fixed overheads ;
- (ii) *Marginal costs* : divided into direct material cost, direct wages and variable overhead relating to factory, administration, selling and distribution ; and
- (iii) *Profit appropriations* : divided into income-tax, preference dividends, ordinary dividends and reserves.

There are other forms of break-even charts, such as, cash break-even chart showing cash requirements during period under different heads; control break-even chart comparing the actual profits, break-even points and sales with those of the budget, etc.

### Margin of Safety and Angle of Incidence

**Margin of safety** as explained earlier is denoted by excess over the break-even sales, and represents the strength of the organisation. A high margin of safety gives confidence to the organisation. A sudden drop in volume will not affect the profit so much. On the other hand,

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an undertaking with low margin of safety may wipe off the profit and turn into a loss with a drop in sales. Margin of safety (MoS) can be mathematically expressed using the marginal cost equations, namely, —

$$\text{Margin of safety} = \text{Sales at selected activity} - \text{Break-even Sales}$$

$$\text{or} = \frac{\text{Profit}}{\text{P/V Ratio}}$$

$$\begin{aligned} \text{When profit} &= \text{Sales} - \text{Total cost, and} \\ \text{P/V ratio} &= \text{Contribution} / \text{Sales} \end{aligned}$$

$$\text{When M/S is expressed in ratio we get, M/S} = \frac{\text{Sales at selected activity} - \text{B. E. S.}}{\text{Sales at selected activity}}$$

In the previous example, at 8000 units,

Sales = Rs. 1,60,000, Total cost = Rs. 1,12,000, and

Profit = Rs. 1,60,000 – 1,12,000 = 48,000

P/V ratio = Contribution/Sales = 16/20 = 0.8

$$\begin{aligned} \text{Break-even sales} &= \text{Fixed cost/P/V ratio} \\ &= \text{Rs. } 80,000 / 0.8 \\ &= \text{Rs. } 1,00,000 \end{aligned}$$

$$\begin{aligned} \text{Margin of safety, M/S} &= \text{Rs } 1,60,000 - \text{Rs. } 1,00,000 \\ &= \text{Rs. } 60,000 \end{aligned}$$

$$\begin{aligned} \text{M/S (ratio)} &= (\text{Rs. } 60,000 / \text{Rs. } 1,60,000) \times 100 \\ &= 37.5\% \end{aligned}$$

Angle of incidence is an indicator of profit earning capacity above the break-even point. A wider angle will indicate higher profitability, while a narrow angle will indicate very low profitability.

If margin of safety and angle of incidence are considered together, they will provide significant information to management regarding profit earning position of the undertaking. A high margin of safety with a wider angle of incidence will indicate the most favourable condition of the business.

### Variations of Break-even Chart

Break-even charts can be presented in various forms, such as,

- (i) Profit-volume graph,
- (ii) Multi product break-even chart,
- (iii) Elementwise break-even chart,
- (iv) Cash break-even chart,
- (v) Control break-even chart.

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Each of the above charts highlights some specific objective. For example, in the profit volume graph, the relationship between profit and volume can be indicated, if any two of the following data are known, viz., fixed overheads, profit at a given level of activity and break-even point. The graph is divided into two areas, - the vertical axis above 'X' axis i.e. zero line represents profit area and the vertical axis below the 'X' axis represents the loss or fixed cost area.

That means, '**X**' axis denotes **break-even line**.

**Illustration:**

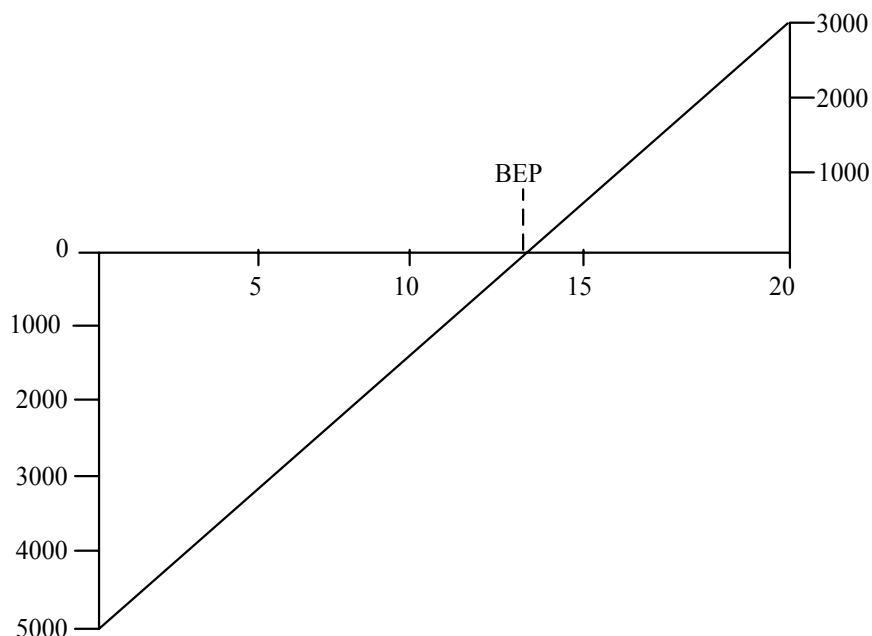
Units produced	.....	2000
Fixed overhead	.....	Rs. 5000
Variable cost per unit	.....	Rs. 6
Selling price per unit	.....	Rs. 10

Prepare a profit-volume graph.

**Solution :** At the present level of activity, the data can be prepared as –

<i>Units produced</i>	<i>Sales value Rs.</i>	<i>Variable cost Rs.</i>	<i>Fixed cost Rs.</i>	<i>Total cost Rs.</i>	<i>Profit (loss) Rs.</i>
2000	20,000	12000	5000	17000	3000

Break-even sales = Fixed cost divided by contribution per unit  
 = Rs. 5000 divided by Rs. 4 = 1250 units



**Fig. Profit-volume Graph**

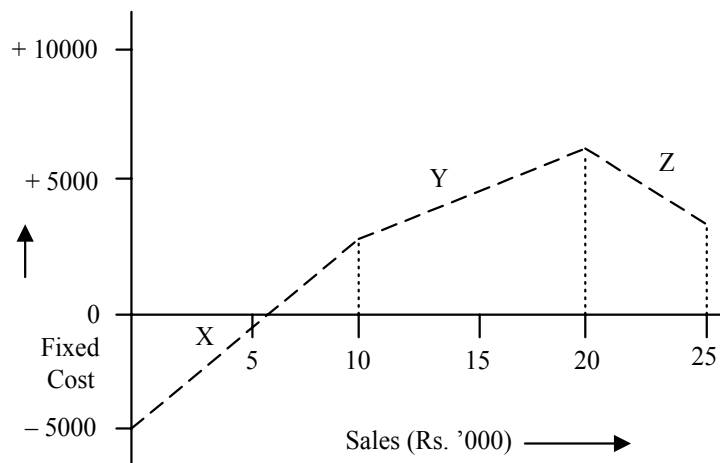
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The slope of the profit line in the P/V graph indicates the degree of contribution made, so that a 50% contribution would be steeper than a 30% one. Again, instead of drawing one profit graph for the total sales, it is possible to show the cumulative effect of various products.

**Illustration :**

<i>Products</i>	<i>Sales value</i> <i>Rs.</i>	<i>Contribution</i> <i>Rs.</i>	<i>P/V Ratio</i> <i>%</i>
X	10,000	7,000	70
Y	10,000	4,000	40
Z	5,000	- 1,000	-20
	25,000	10,000	
Fixed overheads		5,000	
Profit		5,000	

The Profit Graph can be drawn showing contribution of each of the Products as follows :



**Note :** B.E.P for all products will be Rs.12,500 which will not be reflected in this graph

**Uses of P/V Ratio**

When P/V ratio has been established, it is possible to determine—

- (a) variable cost of any volume of sales,
- (b) break-even point, and the level of output required to earn a desired profit, and
- (c) product-mix to improve overall profit of the concern.

**Illustration :**

Given: Jan.2002 - Sales Rs. 15000	Profit 800
Feb. 2002 - Sales Rs. 18000	Profit 1400

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- Calculate :
- (a) The P/V ratio
  - (b) BEP
  - (c) Profit when sales are Rs. 12000
  - (d) Sales required to earn a profit of Rs. 2000.

**Solution:**

- (a) *P/V ratio* can be established by comparing difference in sales and difference in Variable cost from the following two equations :

$$V1 = F + 1400 \quad \dots\dots (i)$$

$$V2 = F + 800 \quad \dots\dots (ii)$$

$$\text{Subtracting, } 3000 - (V1 - V2) = 600$$

$$\text{or } V1 - V2 = 3000 - 600 = 2400$$

$$P/V \text{ Ratio} = \frac{S - V}{S} = \frac{3000 - 600}{3000} \times 100 = 20\%$$

- (b) *BEP calculation:* It will be that quantity of sales where there will be no profit, no loss. So, from the first period profit has to reduce by Rs. 800. Therefore, the sales should be reduced by Rs. 800 divided by 20% - Rs. 4000. Break even sales will be Rs. 15000 - 4000 = Rs. 11000.

- (c) *Profit when sales are Rs. 12000*

Difference between January 2002 sales i.e. Rs. 15000 and Rs. 12000 = Rs. 3000. Hence, profit will be reduced by 20% of Rs. 3000 = Rs 600. Hence, profit will be Rs. 800 - 600 = Rs. 200.

- (d) *Sales required to earn a Profit of Rs. 2000.*

Difference between January 2002 profit Rs. 800 and Rs. 2000 = Rs. 1200. Additional sales required for additional profit of Rs. 1200 = 1200 divided by 20% = Rs. 6000. Hence, sales required = Rs. 15000 + 6000 = Rs. 21000.

### Limitations of a Break-even Chart

Break-even chart is drawn with certain assumptions, such as, variable cost per unit is fixed, and fixed cost in total is fixed within the level of activity. Sales value also indicate same unit price at all levels. As a result, each of the lines is a straight line. In actual practice, it is highly unlikely that variable cost, fixed cost and selling price remain totally unaffected by change in the level of activity. In fact, these lines may assume curved lines or steps for change at various levels of activity, and instead of one Break even point, there may be several Break-even points.

Besides, Break-even charts ignore the capital employed in business, which is one of the important factors in the determination of profitability. It is, therefore, wise not to place too much reliance on a break even chart or consider it as the only means of judging the profits to be obtained at higher levels. Perhaps, the best way of using Break even chart is to consider it as being an

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instantaneous photograph of the current position and possible future trend. The chart can be used along with other information before important conclusion is drawn by the management.

## 9.6 APPLICATION OF MARGINAL COSTING FOR DECISION-MAKING

Marginal costing technique is frequently used for short-term decision-making. As has been seen earlier, the contribution margin helps to forecast income, since fixed cost remains unchanged. It has to be remembered that the fixed cost remains unchanged over a relevant period, not a long period, and within the relevant range, perhaps not if production doubles the capacity. Within this parameter, variable costs, which vary in direct proportion to the changes in the activity level are the only relevant costs for short-term decision-making. In such decisions, fixed costs do not count. The basic consideration in all decision-making is that marginal contribution is a reliable index of profitability. When alternative courses of action are available, the most suitable course will be one which gives highest contribution, provided there are no limiting factors. Fixed costs will not be taken into consideration except where these are liable

to change as a result of the proposed action. For example for an additional product, if a machine has to be purchased or a conveyor belt has to be extended, the fixed cost will increase marginally.

Marginal costing technique helps short-term decision-making in the following areas —

- (a) Profit planning and selection of profitable product-mix.
- (b) Problems of limiting factor
- (c) Performance evaluation
- (d) Fixation of selling price
- (e) Accepting additional order and capacity utilisation
- (f) To make or buy
- (g) Alternative methods of manufacture
- (h) Closing down or suspending activities.

Out of the above, let us consider a few problems.

**Profit planning** - An analysis of contribution made by each product provides a basis for profit-planning in an organisation with wide range of products having varying output and contribution. In effect, contribution per unit becomes the profitability index for each product. By a careful selection of product-mix, the profit can be planned as indicated in the given example :

*Marginal Costing and Decision Making***Illustration :****PRODUCT-WISE PROFIT STATEMENT**

<i>Cost elements</i>	<i>Product X Rs.</i>	<i>Product Y Rs.</i>	<i>Product Z Rs.</i>	<i>Total Rs.</i>
Sales units - Pcs.	500	300	200	1000
Sales value - (A)	6000	4500	4000	14500
Less : Direct cost of sales :				
Material	2000	2400	2000	6400
Labour	1000	600	400	2000
Expenses	500	300	200	1000
Total (B)	3500	3300	2600	9400
Contribution (A – B)	2500	1200	1400	5100
Less: Fixed cost				3000
Profit				2100

Total contribution as indicated above can be reduced to unit-ratio, showing unit selling price, unit cost of each elements, viz. material, labour and expenses and unit contribution by each product. In-depth analysis of each of them will reveal scope for improvement of contribution, such as, reduction of material cost by usage, price, substitution, scrap reduction, etc., reduction of labour cost by improving efficiency and increasing productivity, control over expenses, revision of selling price or increasing the volume by better marketing strategies, etc. As a result of the above, the following changes may occur in respect of the same products.

**Statement showing changes in respect of products**

	Product X		Product Y		Product Z	
	Original	Revised	Original	Revised	Original	Revised
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Selling Price (A)	12	12.50	15	15.00	20	18.00
Less : Direct cost of sales :						
Material	4	3.75	8	7.25	10	8.50
Labour	2	1.75	2	1.75	2	1.75
Expenses	1	1.00	1	1.00	1	0.75
Total	7	6.50	11	10.00	13	11.00
Unit contribution (A)–(B)	5	6	4	5	7	7
Selling units	500	500	300	320	200	300
Total contribution	2500	3000	1200	1600	1400	2100

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We give below the original and revised position from the above information –

	<b>Original</b> <i>Rs.</i>	<b>Revised</b> <i>Rs.</i>
Total contribution	5100	6700
<i>Less</i> :Fixed cost	3000	3500
Profit	2100	3200

It will be observed that in Product A, selling price has been corrected upwards while material and labour costs are marginally reduced. In Product B, there was no scope for selling price increase, but by substitution of some imported material by indigenous one, some cost reduction was effected. In Product C, a price-correction has been taken as the product was over-priced. However, a simultaneous reduction in material cost, labour productivity and avoidance of some expense neutralised the effect of price-reduction. Total contribution, however, increased as sales volume goes up by 50%. There has been a marginal increase of Rs. 500 towards fixed cost.

### Limiting Factor

In the same way, under difficult situation, when a limiting factor restricts the output, a contribution analysis based on the limiting factor can help maximising profit. For example, if machine availability is the limiting factor, then machine hour utilisation by each product shall

be ascertained and contribution shall be expressed as so many rupees per machine hour utilised. Then, emphasis of one product in relation to the other one changes and subject to other conditions remaining same, it is possible to influence total contribution and thereby maximise profit. In the previous example, suppose the three products consumed total machine hours available in the following way :

	<b>Product X</b> <i>Rs.</i>	<b>Product Y</b> <i>Rs.</i>	<b>Product Z</b> <i>Rs.</i>	<b>Total</b> <i>Rs.</i>
Sales units – Pcs	500	300	200	1000
Contribution – Rs.	2500	1200	1400	5100
Machine hours utilised	6000	4800	2800	13600
Contribution per machine hour	0.42	0.25	0.50	

It appears from the above analysis, that total profit can be improved by diverting more machine hours from Product Y to Products X and Z. In the same way, if availability of particular material or skilled labour is the limiting factor, then contribution analysis in terms of that limiting factor should be worked out, and appropriate action be taken to maximise profit. Incidentally, limiting factor is defined as the factor in the activities of an undertaking, which at a particular point of time or over a particular period will limit the volume of output. However, if more than one limiting factor operates at a particular point of time, the factor which keeps the activity level at a minimum should be considered as the key factor. It should be remembered that maximum contribution fund can be achieved by manufacturing and selling that product

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which best utilises the limiting factor. Profitability index is, then, contribution per unit of limiting factor.

**Illustration :** The following information is obtained from ABC Ltd. producing Products X and Y.

	<b>Product X</b>	<b>Product Y</b>
	<i>Rs.</i>	<i>Rs.</i>
Selling price	200	128
Direct materials	80	80
Direct labour (Rs. 5 per hour)	12 hrs	4 hrs
Variable overhead 50% of direct wages		
Fixed overhead Rs. 8,000		

Present the above information to show the profitability of products during labour shortage.

**Solution :** The profitability is determined by the following formula –

$$\text{Profitability} = \frac{\text{Contribution}}{\text{Key(orLimiting) factor}}$$

**Statement showing contribution and profitability**

	Product X		Product Y	
	Rs.	Rs.	Rs.	Rs.
Sales		200		128
<i>Less : Variable cost –</i>				
Direct material	80		80	
Direct wages	60		20	
Variable overhead	30	170	10	110
Contribution per unit		30		18
Labour hours required per unit		12 hrs		4 hrs
Profitability = Contribution/Labour hours		2.50		4.50

Thus during labour shortage, Product Y is more profitable than Product X.

**(For further details refer Illustrations of Marginal Costing Chapter from “Cost Accounting Methods and Problems” by B. K. Bhar).**

### Performance Evaluation

In the previous illustration, it has been shown that the three products X, Y and Z had different revenue earning potentialities, which were exploited by several ways to increase total profit. Similarly, the various business segments of a concern such as a department, a product line, a

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market or a sales division or sales territory have different revenue earning capacities. The performance of each sector can be brought out by means of marginal cost analysis, and improvement can be made wherever necessary.

### **Fixation of selling price**

Marginal costing technique is increasingly used for fixation of selling price in a multi-product company. It is extremely useful where products are many, and fixed overheads are not too high. On the other hand, where variable cost is low, but fixed cost is too high, as in say, Petrochemical industry, the gap between the contribution margin and selling price becomes very wide and price fixation based on contribution becomes risky. Again, in the long period, all overheads have to be recovered by sales, so as to make profit, and make the business run. Hence, total costs are also considered in such cases.

When marginal cost is applied to fixation of selling price, it should be remembered that the price cannot be less than marginal cost. The price should be fixed above the contribution level in a way so as to have sufficient margin to contribute to the pool of fixed cost and profit. The margin depends on so many factors, such as, demand and supply, competition, nature of product, management policy, marketing strategy, etc.

If the price is equal to marginal cost, then no contribution will be left for fixed cost recovery, and hence, will result in loss. Therefore, even for a short period, selling price should be higher than marginal cost.

There are occasions when selling at or below marginal cost may be justified for a very short period. Mentioned below are some of the situations :

- (i) To maintain production and to keep employees occupied during a trade depression.
- (ii) To prevent loss of future orders.
- (iii) To dispose of perishable goods.
- (iv) To eliminate competition of weaker rivals.
- (v) To popularise a new product.
- (vi) To help in selling a conjoined product which is making substantial profit.
- (vii) To keep the plant ready for “full production” ahead.
- (viii) To explore foreign market when export incentives and import quotas make good the loss.

### **To Make or Buy**

Components and spare parts may be made in the factory instead of buying from the market. In such cases, the marginal cost of manufacturing the components or spare parts should be compared with market price while taking decision “to make or buy”. If marginal cost is lower than the market price, it is more profitable to make than purchasing from market. Additional or

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specific fixed cost may be a relevant cost. However, the decision shall depend on capacity utilisation. If unused capacity is available, then comparing only variable cost with market price will hold good. But if the factory operates on full capacity, then such decision has to be taken after adding opportunity cost of the product which is replaced by the manufacture of the component.

**Illustration :** In a machine shop, it takes 4 labour hours to machine and complete a component X123. It sells @ Rs. 200 per unit, while marginal cost of sales amounts to Rs. 80 per unit. Another component T12 required for internal consumption can be either made in the machine shop or purchased from outside. It can be made in 2 labour hours at a marginal cost of Rs. 40. The price quoted by outside supplier for the same component is Rs. 75 each. What would you advise ?

**Solution :**

**Comparative cost statement of components**

Particulars	Component X 123	Component T12	
		To Make	To Buy
Labour hours required	4	2	
	Rs.	Rs.	Rs.
Selling Price	200		
Less :	80	40	
Contribution	120		
Contrn. per direct lab. hr. (120/4)	30		
Loss of contrn. if T 12 is made i.e. opportunity cost of lab. hours		60	
Total cost of T 12		100	
Purchase price of T12			75

If there is spare capacity in the machine shop and demand for X123 has been fully met, the component T12 can be made. Otherwise, purchasing is profitable.

**Advantages of Marginal Costing :**

- (i) Variable cost remains constant per unit of output and fixed costs remain constant in total during short period. Thus control over costs becomes more effective and easier. Standards can be set for variable costs, while Budgets can be established for fixed cost in order to exercise full control over the total activities.
- (ii) Marginal costing brings out contribution or profit margin per unit of output, and clearly brings out the effect of change in activity. It facilitates making policy decisions in a number of management problems, such as determining profitability of products, introducing a new product, discontinuing a product, fixing selling price, deciding whether to make or buy, utilising spare capacity, profit-planning, etc.

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- (iii) The distinction between product cost and period cost helps easy understanding of marginal cost statements.
- (iv) Closing inventory of work-in-progress and finished goods are valued at marginal or variable cost only. This method leads to greater accuracy in arriving at profit as it eliminates any carry over of fixed costs of the previous period through inventory valuation.
- (v) As a corollary to above, since fixed costs do not enter into product-cost, it eliminates the process of allocating, apportioning and absorbing overheads, and adjusting under- and over-absorbed overheads. Therefore, the method is simpler to operate.

**Disadvantages or Limitations of Marginal costing are as follows :**

- (i) The technique is based on the segregation of costs into fixed and variable ones, while many expenses are neither totally fixed nor totally variable at various levels of activity. Thus, classifying all expenses into two categories of either fixed or variable is a difficult task.
- (ii) The assumptions regarding behaviour of costs, such as, fixed cost remains static, are often not realistic.
- (iii) Contribution is not the only index to take decisions. For example, where fixed cost is very high, selling price should not be fixed on the basis of contribution alone without considering other key factors such as capital employed.
- (iv) Marginal cost, if confused with total cost while fixing selling price may lead to a disaster.
- (v) Inventory valuation at marginal cost will understate profits and may not be acceptable by tax-authorities. Any claim based on cost will be very low, as it will not have a share of fixed cost.

## **9.7 RELEVANT COSTS**

It has been observed the marginal costing technique is applicable within a relevant range and a relevant period. It might give misleading results, if the decision variables do not lie within the 'relevant range' and time span exceeds 'relevant period'. Non-routine decisions are often required to be taken, such as, replacing an equipment, changing a method, introducing a new programme, etc., when quantitative as well as qualitative factors are to be considered. So far as quantitative factor is concerned, only relevant costs are considered. Costs that are affected by the decision are relevant costs, while those are not affected are irrelevant costs and should be ignored. Differential cost analysis provides one such method which is explained below.

### **Differential Cost Analysis**

*Differential costing* is defined as a technique used in the preparation of ad-hoc information in which only costs and income differences between alternative courses of action are taken into consideration. (CIMA Terminology). Costs may increase or decrease due to change in production, sale, production method, production-mix, etc. This change in total cost at a particular level of activity compared to another one is called differential costs, which are obtained by

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subtracting costs at one level from those at a higher level. Differential cost calculation includes both variable as well as fixed costs which are affected by the alternative course of action. Thus, the information can be presented by absorption costing or marginal costing techniques.

**Illustration :**

<i>Activity level</i>	<i>75%</i>	<i>60%</i>	<i>Differential</i>
Units	7500	6000	1500
Direct material	15000	12500	2500
Direct labour	7500	6000	1500
Variable overheads	3600	3000	600
Fixed overheads	3900	3500	400
Total	30000	25000	5000

Thus, the differential cost of 1500 units is Rs. 1500. In the above presentation, if the additional output does not involve additional fixed cost, then variable costs become differential costs, and in that case, the latter will have no difference with marginal cost.

**Difference with marginal costing.**

In fact, differential costs are often confused with marginal costs. This is because of the fact that both marginal costing and differential cost analysis stem from the basic behaviour of cost, i.e. fixed and variable. When fixed cost remain unaffected, both marginal costs and differential costs are the same. However, they are not the same. The differences are as follows :

- (a) Marginal cost is an unit concept and applies to output per unit basis. Differential cost is a total concept and applies to a fixed additional quantity of output.
- (b) Marginal costing is presented by showing contribution per unit and fixed cost as a total amount. Differential costs are presented in totals in both formats – i.e. under marginal cost as well as absorption cost techniques.
- (c) Product cost under differential cost analysis may contain fixed costs, which will not be so under marginal costing.

**Use of Differential Cost Analysis**

Differential cost analysis may be a useful technique in taking appropriate policy decisions, such as,—

- (i) Acceptance of an additional order at lower than existing price to a special customer,
- (ii) Acceptance of an export order, requiring additional outlay,
- (iii) Introduction of a new product,
- (iv) Opening of a new sales territory or channel of distribution,
- (v) Processing of a by-product or a joint product beyond the split-off point.

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In all such cases, the differential cost is compared with incremental revenue. As long as incremental revenue is more than or equals to incremental or differential cost, the additional activity is justified. However, if differential cost exceeds incremental revenue, the project should be abandoned.

**Illustration :**

A company is at present working at 90% of its capacity, producing 13500 units per annum. It operates flexible budgetary control system. The following figures are obtained from its budget :

<i>Activity level</i>	<i>90%</i>	<i>100%</i>
Units	13500	15000
<i>Cost Elements</i>	<i>Rs. '000</i>	<i>Rs. '000</i>
Sales	1500	1600
Fixed expenses	300	300
Semi-fixed Expenses	98	100
Variable expenses	142	150

Labour and material cost per unit are constant under present condition. Profit margin is 10 per cent.

You are required to determine the differential cost of producing 1500 units. What price would you recommend for exporting these 1500 units, considering the fact that overseas prices are much lower than indigenous prices?

**Solution :**

(a) **Calculation of Labour and material cost**

Sales at 90% capacity		13500 units
		<i>Rs.</i>
Sales value at 90% capacity		15,00,000
<i>Less</i> : Profit (10% on sales)		1,50,000
Cost of goods sold		13,50,000
	<i>Rs.</i>	
<i>Less</i> : Variable expenses	1,42,000	
Semi-variable expenses	98,000	
Fixed Expenses	3,00,000	5,40,000
Labour and material cost		8,10,000

Therefore, material and labour cost at 100% capacity = Rs. 8,10,000 divided by 90% = Rs. 9,00,000

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(b) **Flexible Budget**

Activity level	90%	100%	<i>Differential</i>
Sales – units	13500	15000	1500
Cost elements —	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Material and labour	810000	900000	90000
Variable expenses	142000	150000	8000
Semi-fixed expenses	98000	100000	2000
Fixed expenses	300000	300000	—
Total cost	1350000	1450000	100000

- (c) The export price should be quoted not lower than Rs. 66.67 (i.e. Rs. 100000 divided by 1500) per unit, assuming that export price will have no effect on domestic market.

**Incremental Cost and Incremental Revenue**

A slight variation of differential cost analysis is incremental costing, which is defined as a technique used in the preparation of adhoc information, where consideration is given to a range of graduated or stepped changes in the level or nature of activity, and the additional costs and revenues likely to result from each degree of change are presented. (CIMA terminology). Incremental costing technique considers incremental costs and incremental revenue arising out of a decision to change the level of activity. If the incremental revenue exceeds incremental cost by changing a level of activity, it will be an acceptable decision.

Consider the following example :

**Illustration :** Modern Sewing Machines Co. manufactures hand operated sewing machines in batches of 60000. Prepare a schedule showing the total incremental costs and incremental revenue from the following data.

<i>Output Nos. in lakhs</i>	<i>Selling Per machine Rs.</i>	<i>Total Semi-fixed cost Rs. lakhs</i>	<i>Total variable cost Rs.lakhs</i>	<i>Total fixed cost Rs.lakhs</i>
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	325.6	28.4
3.00	160	40	355.6	28.4
3.60	140	40	380.4	28.4

At what volume the company will set its level of Production?

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**Solution :**

<i>Output No. in lakhs</i>	<i>Revenue Rs. Lakh</i>	<i>Incremental revenue Rs. Lakhs</i>	<i>Total cost Rs. Lakhs</i>	<i>Differential cost Rs. Lakhs</i>
0.60	144	–	142	–
1.20	264	264 – 144 = 120	222	222 – 142 = 80
1.80	360	360 – 264 = 96	318	318 – 222 = 96
2.40	432	432 – 362 = 72	318	378 – 318 = 60
3.00	480	480 – 432 = 48	424	424 – 378 = 46
3.60	504	504 – 480 = 24	449	449 – 424 = 25

\* Total cost = Total semi-fixed cost + Total variable cost + Total fixed cost

It will be observed that at a production volume of 180000, the incremental cost equals to incremental revenue. This is the first level of production where the company can maximise its profit. However, if the company intends to exceed 1.80 lakh machines, then the next economic production level will be 3.00 lakhs. Beyond that level, differential cost is higher than incremental revenue.

**OTHER RELEVANT COSTS :**

**SUNK COST**

*Relevant costs* are aimed at decision making, which again are taken for future. Hence, past costs incurred are sunk, and has no relevance in the decision which will apply for future activity. Cost of a fixed asset is an example of sunk cost. Expenditure incurred in research and development for new product, new method, etc. are all instances of sunk costs, which are not retrievable by managerial action, and hence irrelevant for future decisions.

**OPPORTUNITY COST**

Again, for each decision, there may be alternatives. Each alternative will have its cost and benefit. Analysis should be made for those costs which are different in each alternative, and therefore, relevant. Opportunity cost is based on the concept of scarce resources, which have alternative uses. Opportunity cost is defined as the value of benefit sacrificed in favour of an alternative course of action. There may be alternative uses of a factor of production. Opportunity cost is the contribution foregone by not accepting the best of the alternatives. Let us take an example of sunk cost and opportunity cost.

Mr. X has developed a new product at a cost of Rs. 1,00,000. He is presently working in a firm at a salary of Rs. 25,000 per month. He paid Rs. 50,000 to a Consultant to assesses the market potential of the new product developed by him. Having received good report, Mr. X has to decide now whether to start the business, if so, at what volume, for which he has collected all necessary data. In calculation the profitability of the project, he has to consider

- (a) Rs.1,00,000 spent for development work and Rs.50,000 paid to the consultant as Sunk Cost, as they are not retrievable, and

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- (b) His salary of Rs.25,000 per month has to be foregone, which will add to the project cost as Opportunity Cost.

It shall be noted that opportunity cost is a notional cost and does not involve cash outlay.

### **Avoidable and Unavoidable Cost**

Costs may be avoidable or unavoidable. Avoidable costs are those which can be identified with an activity or sector of a business which would be avoided, if that activity or sector did not exist. For example, 'the hiring cost of a machine' hired specially for the manufacture of a product becomes an avoidable cost, if that product is discontinued. Common costs apportioned to a particular activity or segment of a business are usually unavoidable because total common cost cannot be avoided or reduced if that activity or sector does not exist. For example, a part of rent of the factory, apportioned on machine shop, is an unavoidable cost for machine shop.

### **Qualitative Factors In Decision-Making**

Management sometimes faces situation when qualitative factors alone cannot decide the issue. For example, take the case of changing a method of eleven-billets rolling to thirteen-billets rolling in 40 minutes instead of 50 minutes. In such case, both quantitative, such as relevant costs as well as qualitative factors, such as effect on work-force and reaction by labour union have to be considered. But these factors cannot be quantified. Yet, its overall effect on cost-benefit has to be analysed before making decision.

## ◆ **SPECIMEN QUESTIONS WITH ANSWERS**

### **Question 1 :**

A company producing a single product sells it at Rs. 50 per unit. Unit variable cost is Rs. 35 and fixed cost amounts to Rs. 12 lakhs per annum. With this data you are required to calculate the following, treating each independent of the other :

- (a) P/V Ratio and Break-even sales.
- (b) New Break-even sales if variable cost increases by Rs. 3 per unit, without increase in selling price.
- (c) Increase in sales required if profits are to be increased by Rs. 2.4 lakhs.
- (d) Percentage increase/decrease in sales volume units offset.
  - (i) An increase of Rs. 3 in the variable cost per unit.
  - (ii) A 10% increase in selling price without affecting existing profits quantum.
- (e) Quantum of advertisement expenditure permissible to increase sales by Rs. 1.2 lakhs, without affecting existing profits quantum.

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**Answer 1 :**

$$(a) \text{ P/V ratio} = \frac{\text{Contribution per unit}}{\text{Selling price per unit}} = \frac{50 - 35}{50} = 30\%$$

$$\text{B.E. sales} = \frac{12}{30\%} = \text{Rs. 40 lakhs}$$

$$(b) \frac{\text{Existing C} - \text{Increase in V.C}}{\text{Selling price per unit}} = \frac{15 - 3}{50} = \frac{12}{50} = 24\% \text{ is revised P/V ratio}$$

Revised B.E. sales is  $12 \div 24\% = \text{Rs. 50 lakhs}$

$$(c) \text{ Increase in sales required} = \frac{\text{Increase in C}}{\text{P / V ratio}} = \frac{2.4}{30\%} = \text{Rs. 8 lakhs}$$

$$(d) \quad (i) \quad \% \text{ increase in sales volume (units)} = \frac{\text{Reduction in C}}{\text{New C per unit}} = \frac{3}{12} = 25\%$$

(ii) % decrease in sale volume

$$= \frac{\text{Increase in C per unit}}{\text{New C per unit}} = \frac{5(10\% \text{ of } 50)}{(55 - 35) \text{ i.e. } 20} = 25\%$$

(e) C generated by sales arising out of advertisement expenses should be equal to amount of Rs. 1.2 lakhs sale increase to avoid loss.

30% of 1.2 lakhs or Rs. 36,000 should be maximum permissible advt. expenditure for incurrence to get an increase of sales of Rs. 1.2 lakhs without affecting existing profits.

**Question 2 :** A manufacturing company produces and sells three products P, Q and R. It has an available machine hour capacity of one lakh hours, interchangeable among the three products. Presently the company produces and sells 20,000 units of P and 15,000 each of Q and R. The unit selling price of the three products are Rs. 25, Rs. 32 and Rs. 42 or P, Q and R respectively. With this price structure and the aforesaid sales-mix the company is incurring loss. The total expenditure, exclusive of Fixed charges (presently Rs. 5 per unit), is Rs. 13.75 lakhs. The unit cost ratio amongst the products P, Q and R is 4 : 6 : 7. Since the company desires to improve its profitability without changing its cost and price structures, it has been considering the following three mixes so as to be within its total available capacity.

Products	Mix I (in units)	Mix II (in units)	Mix III (in units)
P	25000	20000	30000
Q	15000	12000	5000
R	10000	18000	15000

You are required to compute the quantum of loss now incurred and advise the most profitable mix which could be considered by the company.

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**Answer : Working Note :**

Product	Present production	Cost ratio	Equivalent units
P	20,000	4	80,000
Q	15,000	6	90,000
R	15,000	7	1,05,000
	50,000		2,75,000

Total variable cost                      Rs. 13,75,000

Hence, variable cost per equivalent unit Rs. 5 (i.e. 13,75,000/2,75,000)

Variable cost of product P is Rs. 20 per unit.

Variable cost of product Q is Rs. 30 per unit

Variable cost of product R is Rs. 35 per unit

Contribution for existing mix –

		Rs.
P	20,000 × (25 – 20) =	1,00,000
Q	15,000 × (32 – 30) =	30,000
R	15,000 × (42 – 35) =	1,05,000
Total contribution		2,35,000
Less : Fixed cost @ Rs. 5/unit for 50,000 units		2,50,000      (constant for all levels of activity)
Loss		(15,000)

**Statement showing contribution for different mixes**

Products	Mix I Rs.	Mix II Rs.	Mix III Rs.
P	1,25,000	1,00,000	1,50,000
Q	30,000	24,000	10,000
R	70,000	1,26,000	1,05,000
Total	2,25,000	2,50,000	2,65,000

Fixed cost of Rs. 2,50,000 being constant at all levels of activity, Mix III giving highest contribution is the best of the three and hence recommended.

**Note :** Since it is stated that machine capacity is interchangeable and it is also stated that the company has selected the three mixes “so as to be within its total available capacity”, no capacity constraint is considered.

**Question 3 :** A company has two plants at Locations I and II, operating at 100% and 75% of their capacities respectively. The company is considering a proposal to merge the two plants at one location to optimise available capacity. The following details are available in respect of the two plants, regarding their present performance/operations :

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	<i>Location I</i>	<i>Location II</i>
Sales (Rs. in lakhs)	200	75
Variable cost (Rs. in lakhs)	140	54
Fixed cost (Rs. in lakhs)	30	14

For decision-making purposes you are required to work out the following information :

- (a) The capacity at which the merged plant will break-even.
- (b) The profit of the merged plant working at 80% capacity.
- (c) Sales required if the merged plant is required to earn an overall profit of Rs. 22 lakhs.

**Answer :**

**Computation of comparative performance of plant under existing capacity and converted to 100% capacity.**

<i>Plant</i>	<i>Plant location – I</i>	<i>Plant location – II</i>	<i>Merged plant</i>
<i>Existing :</i>			
Capacity (%)	100%	75%	
Sales (Rs. in lakhs)	200	75	275
<i>Less :</i> Variable cost (Rs. in lakhs)	140	54	194
Contribution	60	21	81
<i>Less :</i> Fixed cost (Rs. in lakhs)	30	14	44
Profit/(Loss)	30	7	37
<i>Converted : To 100% capacity :</i>			
Capacity (%)	100%	100%	100%
Sales (Rs. in lakhs)	200	100	300
<i>Less :</i> Variable cost (Rs. in lakhs)	140	72	212
Contribution	60	28	88
<i>Less :</i> Fixed cost (Rs. in lakhs)	30	14	44
Profit/(loss)	30	14	44
P/V ratio : (%) : (Contribution ÷ Sales)	30	28	39.33
Break-even point (Fixed cost ÷ P/V ratio) (Rs. in lakhs)			150

- (a) Capacity at BEP : (%) : (i.e. Sales at BEP ÷ Total sales) 50%
- (b) Computation of profitability of the Merged Plant working at 80% capacity :

	<i>(Rs. in lakhs)</i>
Sales (80% of 300)	240.00
<i>Less :</i> Variable cost	169.60
Contribution	70.40
<i>Less :</i> Fixed cost	44
Profit	26.40

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(c) Computation of sales required to earn the overall profit of Rs. 22 lakhs :

(i) Contribution required : (Rs. in lakhs)		
Fixed cost	44.00	
Desired profit	22.00	66.00
P/V ratio (%)		29.33%
Desired sales level (Rs. in lakhs) $(66.00 \div 29.33\%)$		
		225.00

**Question 4 :** The valuable cost structure of a product manufactured by a company during the current year is as under :

	<i>Rs. per unit</i>
Material	120
Labour	30
Overheads	12

The selling price per unit is Rs. 270 and the fixed cost and sales during the current year are Rs. 14 lakhs and Rs. 40.5 lakhs respectively.

During the forthcoming year the direct workers will be entitled to a wage increase of 10% from the beginning of the year and the material cost, variable overhead and fixed overhead are expected to increase by 7.5%, 5% and 3% respectively.

The following are required to be computed :-

- (a) New sale price in the forthcoming year if the current p/v ratio is to be maintained.
- (b) Number of units that would require to be sold during the forthcoming year so as to yield the same amount of profit in the current year, assuming that selling price per unit will not be increased.

**Answer 4 :**

**Statement showing profitability for the current year**

<i>Particulars</i>	<i>Rs.</i>	<i>Total</i>
No. of units sold		15,000 units
Selling price (Rs.)	270	
<i>Less : Marginal cost per unit</i>		
Material	120	
Labour	30	
Overheads	12	162
Contribution	108	
Total contribution (Rs. 15,000 × 108)		16,20,000
<i>Less : Fixed cost</i>		14,00,000
Profit		22,00,000
P/V ratio :	(108/270)	40%

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**(a) Statement showing New selling price for the forthcoming year (retaining current year's P/V ratio)**

<i>Particulars</i>	<i>Rs.</i>
Selling price	291.00
(Variable cost ÷ .60) = (174.60 ÷ 0.60)	
Variable cost (1 – P/V ratio)	
(Ref. working note – 1)	
Material	129.00
Labour	33.00
Overhead	12.60
Contribution	174.60
P/V ratio	40%

**Computation of number of units to be sold during forthcoming year maintaining amount of profit in current year :**

<i>Particulars</i>	<i>Rs.</i>	<i>Rs.</i>
(i) Current year profit to be retained (ref. above statement)	2,20,000	
(ii) Fixed cost (revised) (Ref. working note – 1)	14,42,000	
(iii) Required contribution [(i) + (ii)]		16,62,000
(iv) Contribution per unit [(Rs. 270 – V.(R) – 174.60)]		95.40
Number of units to be sold (16,62,000/95.40)		17,422
		17,422

**Question 5 :** The following standard data is available :

		<i>Product</i>	
		<i>Able</i>	<i>Baker</i>
Direct materials per unit		Rs. 10	Rs. 30
Direct labour –	Rate per hour		
Grinding	Rs. 5.00	7 hours	5 hours
Finishing	Rs. 7.00	15 hours	9 hours
Selling price per unit		Rs. 206.50	Rs. 168
Budgeted production		1,200 units	600 units
Maximum sales for the period		1,500 units	800 units

*Notes*

- (a) No closing stock are anticipated

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- (b) The skilled labour used for the grinding processes is highly specialised and in short supply, although there is sufficient to meet the budgeted production. However, it will not be possible to increase the supply for the budget period.

*Required*

- (a) Prepare a statement showing the contribution from each product based on the budgeted production.
- (b) Prepare a statement showing the total contribution that could be obtained if the best use was made of the skilled grinding labour.

[ Notes to students :

1. Prepare a statement which shows per unit, for each product, selling price, direct material, direct labour and contribution. Calculate from this information total contribution.
2. From information derived in (a), determine a contribution per unit of scarce resource. Ascertain total availability of the scarce resource and hence establish an optimum plan, from which total contribution can be calculated. ]

**Answer :**

- (a) Statement to show the contribution from each product

	<i>Able</i>		<i>Baker</i>	
	<i>Rs./unit</i>	<i>Rs./unit</i>	<i>Rs./unit</i>	<i>Rs./unit</i>
Selling price		206.5		168.0
Direct materials	10.0		30.0	
Direct labour : grinding	35.0		25.0	
finishing	112.5		67.5	
		157.5		122.5
Contribution per unit		49.0		45.5
Budgeted production units		1,200		600
∴ Budgeted contribution		Rs. 58,800		Rs. 27,300
Total contribution			Rs. 86,100	

(b)		<i>Able</i>	<i>Baker</i>
Contribution per unit [from (a)]		Rs. 49	Rs. 45.50
Grinding labour hours		7	5
Contribution per hour		Rs. 7	Rs. 9.10

In view of the limiting factor the company should sell as many units of Baker as possible, since this would maximise the contribution from the limited number of labour hours in the grinding process.

Total labour hours available in grinding process

$$= \text{hours used on budgeted production} = (1,200 \times 7) + (600 \times 5) = 11,400 \text{ hours}$$

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The optimum plan is therefore as follows :

	<i>Contribution</i>	
	<i>Hours</i>	<i>Rs.</i>
800 units of Baker (maximum sales)	4,000	36,400
7,400 hours remain = 1,057 units of Able	7,399	51,793
Maximum total contribution		88,193

**Question 6 :**

A firm manufactures three joint products A, B and C and a by-product X by processing a common stock of raw material which costs Rs. 8 per kg. The details of output, market price and the initial processing cost for an input of 10,000 kg of raw material is as follows :

Product	Output(kg)	Current market price/kg (Rs.)	Initial processing cost
A	5000	18	Direct labour : 1000 hrs. @ Rs. 20/hr.
B	2500	20	Variable overhead : 80% of direct labour
C	1500	24	Fixed overheads : Rs. 21,000
X	500	4	

The company apportions common cost among joint products on physical units basis. All the products including the by-product can be processed further and sold at a higher market price, with some sales promotion effort. The estimated further processing cost, marketing cost and the final selling price are given below :

Product	Further processing cost per kg	Further marketing cost per kg	Final price/kg
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
A	4	2	28
B	5	2	26
C	6	2	34
X	2	1	6

*Required :*

- (a) Cost of joint products at the point of separation after initial processing. Comment on the method of apportioning joint costs.
- (b) Profit or loss if the products are sold without further processing.
- (c) Which of the products have to be processed further for maximising profits? Show workings.

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**Answer : (a) Cost of production of the joint products**

	<i>Rs.</i>
Raw material : 10000 kg @ Rs. 8 per kg	80,000
Direct labour : 1000 hours @ Rs. 20 per hour	20,000
Variable overheads : 80% of direct labour	16,000
Fixed overhead	21,000
	1,37,000
<i>Less</i> : Sale value of by-product	2,000
Total cost to be distributed among joint products	1,35,000

(b) Allocation of joint cost (on the basis of physical units) & profit or loss sold at split off point:

Products	Qty. (kg)	Joint cost distributed	Sales value	Profit
		<i>Rs.</i>	<i>Per kg</i>	<i>Amt. (Rs.)</i>
				<i>Rs.</i>
A	5,000	75,000	18	90,000
B	2,500	37,500	20	50,000
C	1,500	22,500	24	36,000
	9,000	1,35,000		1,76,000
				41,000

If joint costs are distributed in proportion to sales value of the products profits earned will be different. The physical units basis is not suitable where market prices of joint products differ considerable.

(c) If the incremental revenue earned by the products is higher than the additional cost of further processing and marketing it will be profitable to further process them.

Product	Additional cost for processing & marketing <i>Rs.</i>	Incremental revenue <i>Rs.</i>	Incremental revenue less additional cost <i>Rs.</i>
A	6	10	4
B	7	6	-1
C	8	10	2
X	3	2	-1

Hence, products A and C alone should be processed further. Products B and X should be sold at the point of separation after initial processing.

**Question 7:** Stirling Industries Ltd., manufactures a product 'Z' by making and assembling three components A, B and C. The components are made in a machine shop using three identical machines each of which can make any of the three components. However the total capacity of the three machines is only 12,000 machine-hours per month and is just sufficient to meet the current demand. Labour for assembling is available according to requirements. Further details are given below :

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Components	Machine-hours required per unit	Variable cost per unit Rs.	Market price at which the component can be purchased if required Rs.
A	4	48	64
B	5	60	75
C	6	80	110
Assembling	—	30 (per unit of Z)	—

Fixed costs per month amount to Rs. 50,000. Product 'Z' is sold at Rs. 300 per unit.

From next month onwards the company expects the demand for 'Z' to rise by 25%. As the machine capacity is limited, the company wants to meet the increase in demand by buying such numbers of A, B or C which is most profitable.

You are asked to find out the following :

- (a) Current demand and profit made by the company.
- (b) Which component and how many units of the same should be bought from the market to meet the increase in demand ?
- (c) profit made by the company if suggestion in (b) is accepted.

**Answer :**

- (a) Total machine hours required per unit of Z = 15 hrs.  
Hence with 12,000 hrs. available 800 units of Z can be produced.

	<i>Rs.</i>
Selling price per unit	300
Variable cost including assembling	218
Contribution per unit	82
Total contribution from 800 units @ Rs. 82	65,600
Less : Fixed costs	50,000
Current net profit	15,600

- (b) Additional cost per hour by purchasing from the market :

	<i>A</i> <i>Rs.</i>	<i>B</i> <i>Rs.</i>	<i>C</i> <i>Rs.</i>
Market price to be paid per unit	64	75	110
Variable cost for making per unit	48	60	80
Additional cost for purchasing per unit	16	15	30
Hours saved by purchasing	4	5	6
Additional cost per hour saved (Rs.)	4	3	5



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Break even sales = Sales – 37.5/100 Sales

Rs. 12.50 lakhs = 62.5/100 Sales

Sales = (Rs. 12.50 lakhs × 100)/62.5 = Rs. 20 lakhs

- (iii) Total variable costs = 60% of Rs. 20 lakhs  
= Rs. 12 lakhs
- Hence Sales – Variable cost = Contribution
- iv) Current Profit = Sales – (Variable costs + Fixed costs)  
= Rs. 20 lakhs – (Rs. 12 lakhs + Rs. 5 lakhs)  
= Rs. 20 lakhs – Rs. 17 lakhs  
= Rs. 3 lakhs
- Variable costs = Sale – Contribution = 60%
- v) New margin of safety if sales value is increased by 7.5 % :  
New sale value = Rs. 20 lakhs + 7.5 % = Rs. 21.50 lakhs  
Hence, new margin of safety  
= Rs. 21.50 lakhs – B.E. Sales of Rs. 12.50 lakhs = Rs. 9 lakhs.

**(b) Assumptions for construction of break-even chart —**

- i) Fixed costs will tend to remain constant.
- ii) Price of variable cost factors will remain unchanged.
- iii) Semi-variable costs can be segregated into variable and fixed elements.
- iv) Product specifications and methods of manufacturing and selling will not change.
- v) Operating efficiency will remain unchanged.
- vi) There will not be any change in pricing policy due to change in volume, competition etc.
- vii) The number of units sold will coincide with the units produced so that there is no closing or opening stock.
- viii) Product-mix will remain unchanged.

**Question 9 :** X Y Ltd. is manufacturing three household products A, B and C, and selling them in a competitive market. Details of current demand, selling price and cost structure are given below :

	A	B	C
Expected demand (units)	10,000	12,000	20,000
Selling price per unit (Rs.)	20	16	10
Variable cost per unit (Rs.) :			
Direct materials (Rs.10/kg.)	6	4	2
Direct labour (Rs.15/hr.)	3	3	1.50
Variable overheads	2	1	1
Fixed overhead per unit (Rs.)	5	4	2



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Situation (a) : Raw material available is **12,100 kg.** Production plan is as follows :

Product	No. of units	Raw Material required	Contribution per unit	Total contribution
C	20,000	4,000 kg.	Rs. 5.50	Rs. 1,10,000
B	12,000	4,800 kg.	Rs. 8.00	Rs. 96,000
A	5,500	3,300 kg.	Rs. 9.00	Rs. 49,500
Total :		12,100 kg.		Rs. 2,55,500
			Less : Total fixed costs	Rs. 1,38,000
			Net profit :	Rs. 1,17,500

**Total fixed costs**

$$A : 10,000 \times \text{Rs. } 5 = \text{Rs. } 50,000$$

$$B : 12,000 \times \text{Rs. } 4 = \text{Rs. } 48,000$$

$$C : 20,000 \times \text{Rs. } 2 = \text{Rs. } 40,000$$

$$\underline{\underline{\text{Rs. } 1,38,000}}$$

Situation (b) : Labour Hours available is 5,000 hours. Production plan is as follows :

Product	No. of units	Labour hours required	Contribution per unit	Total contribution
C	20,000	2,000	Rs. 5.50	Rs. 1,10,000
A	10,000	2,000	Rs. 9.00	Rs. 90,000
B	5,000	1,000	Rs. 8.00	Rs. 40,000
Total :		5,000		Rs. 2,40,000
			Less : fixed cost	Rs. 1,38,000
			Net profit :	Rs. 1,02,000

Situation (c) :

No shortage of material and labour. Most profitable product C is to be selected for 25% more Production and Sale, i.e. 25% of 20,000 or 5,000 units.

Extra 5,000 units will fetch an additional contribution of Rs. (5,000 × Rs. 5.50) or Rs. 27,500, which is more than additional expenditure on advertisement of Rs. 20,000.

Plan :	Product	No. of units	Contribution per unit	Total contribution
	A	10,000	Rs. 9.00	Rs. 90,000
	B	12,000	Rs. 8.00	Rs. 96,000
	C	25,000	Rs. 5.50	Rs. 1,37,500
				Rs. 3,23,500

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Less : Fixed costs	138000	
Advertisement Expenses	20000	Rs. 1,58,000
	Net Profit :	Rs. 1,65,500

**Question 10:**

- (a) A company wants to buy a new machine to replace one which is having frequent breakdown. It received offers for two models  $M_1$  and  $M_2$ . Further details regarding these models are given below :

	$M_1$	$M_2$
Installed capacity (units)	10,000	10,000
Fixed overhead per annum (Rs.)	2,40,000	1,00,000
Estimated profit at the above capacity (Rs.)	1,60,000	1,00,000

The product manufactured using this type of machine ( $M_1$  or  $M_2$ ) is sold at Rs.100/unit.

You are required to determine :

- (a) Break even level of sales for each model.
  - (b) The level of sales at which both the models will earn the same profit.
  - (c) The model suitable for different levels of demand for the product.
- (b) Explain the terms "Margin of Safety" and "Angle of Incidence" in Break even analysis. Illustrate your answer graphically.

**Answer :****(a) Statement showing comparative parameters of two machines.**

<i>Type of machines</i>	<i>Model-<math>M_1</math></i>	<i>Model-<math>M_2</math></i>	<i>Remarks</i>
1. Installed Capacity (units)	10000	10000	
2. Fixed Overhead per annum (Rs.)	240000	100000	
3. Selling price of the product (Rs.)	100	100	
4. Estimated profit at the above capacity. (Rs.)	160000	100000	
5. Total Sales Value (Rs.)	1000000	1000000	
A. Total Contribution (Rs.) (2+4)	400000	200000	
B. P/V Ratio = Contribution / Sales	0.40	0.20	
(a) Break even point = Fixed cost / P/v ratio (Rs.)	600000	500000	
Break-even point in units	6000	5000	
(b) Level of sales at which profit will be same (Rs.)	700000	700000	
Corresponding units will be	7000	7000	
Profit	40000	40000	

(Ref : Working Note – 1)

**Working Note – 1 :** Let, S be the level of sales at which both the models will earn the same profit.

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Type of Machine	Model-M <sub>1</sub>	Model-M <sub>2</sub>
Sales =	$\frac{240000 + P}{0.40}$	

*Where* : F = Fixed Costs ; P = Profit ; C = Contribution ; S = Sales.

According to given expression : ; i.e. P = 40,000 (by solving)

Putting the value of P, we get, or 7000 units.

- (c) *Model suitable for different levels of Demand* : In the light of above stated comparative parameters, Model = M<sub>2</sub> is suitable for low demand since it has a lower Break Even Point and Lower Fixed Cost and makes higher profit between 5000 units and 7000 units than Model = M<sub>1</sub>. If the level of demand for the product exceeds 7000 units, Model M<sub>1</sub> is better as it makes greater profit.

To support the above, profitability of two of models of Machines at different levels (6000 Units and 8000 Units) is depicted below :

<i>Levels of demand</i>	<i>6000 Units</i>		<i>8000 Units</i>	
Types of machines :	M <sub>1</sub>	M <sub>2</sub>	M <sub>1</sub>	M <sub>2</sub>
Total contribution (Rs.) :	2,40,000	1,20,000	3,20,000	1,60,000
Less fixed cost (Rs.) :	2,40,000	1,00,000	2,40,000	1,00,000
		<del>20,000</del>	<del>80,000</del>	60,000

S =  $\frac{C}{S} = \frac{240000 + P}{0.40} = 700000$

Therefore, Level of demand – Up to 7000 Units, Model M<sub>2</sub> is more profitable than Model - M<sub>1</sub> due to lower fixed cost. However, level of demand beyond 7000 Units Model - M<sub>1</sub> is more profitable due to better P/V Ratio.

**(b) Margin of safety :**

Margin of Safety (M/S) is the difference between actual sales and at the break-even point. It is the relationship of budgeted volume/actual volume to the Break-even volume.

The soundness of a business may be gauged by the size of the margin of safety. A high margin of safety shows that the break even point is much below the actual sales so that even if there is a fall in sales, there will still be a profit. A small margin, on the other hand, indicates a different position. If a low margin of safety is accompanied by high fixed cost and high contribution margin ratio, action is called for reducing the fixed cost or increasing sales volume. Margin of safety (M/S) can be mathematically expressed using the Marginal Cost equation e.g.

Margin of Safety = Sales at selected activity – Break-even sales.

**Angle of Incidence** : Angle of incidence is an indicator of profit earning capacity above the break-even point. This is the angle formed by the Sales Line and the Total Cost line at Break-Even Point.

### *Marginal Costing and Decision Making*

The angle of incidence indicates the rate at which profits are being earned. A wide angle will indicate higher profitability, while the narrow angle will indicate very low profitability.

If Margin of Safety and Angle of Incidence are considered together, they will provide significant information to the management regarding Profit earning position of the undertaking. A high Margin Safety with wider Angle of incidence will indicate the most favourable condition of the business.

The angle of incidence reflects the responsiveness of profits to variations in the volume sold. The higher the angle of incidence the greater the responsiveness of profits to variations in the volume sold and *vice versa*.

## ◆ TEST YOURSELF

### I. OBJECTIVE TYPE AND MULTIPLE CHOICE QUESTIONS

1. Which of the following statements are true ?
  - a) Marginal cost is the cost of marginal unit of output.
  - b) “Direct costing” and “variable costing” are synonyms for marginal costing.
  - c) Marginal cost absorbs a part of fixed expenses in marginal costing, fixed cost is excluded from inventory valuation.
  - d) In marginal costing, fixed cost is excluded from inventory valuation.
  - e) Marginal costing is more relevant for short term decision making.
  - f) Margin of safety is usually expressed as a percentage of total sales.
  - g) Incremental cost is same as marginal cost.
  - h) At break-even point, contribution is equal to fixed cost.
2. Fill in the Blanks :
  - a) Product costs under marginal cost include \_\_\_\_\_cost only.
  - b) Period costs \_\_\_\_\_are costs.
  - c) Contribution margin is equal to \_\_\_\_\_minus \_\_\_\_\_cost.
  - d) Marginal costing is useful for\_\_\_\_\_planning.
3. Tick the most appropriate statement in the following multiple-choice questions :
  - i) Difference between marginal costing and absorption costing arises out of the treatment of
    - (a) Direct material
    - (b) Variable overhead
    - (c) Fixed overhead
    - (d) Prime cost
  - ii) A costing method in which fixed factory overheads are added to inventory valuation is

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- (a) Direct costing
- (b) Marginal costing
- (c) Absorption costing.
- iii) Contribution margin is equal to
  - (a) Sales – Fixed cost – Profit
  - (b) Profit + Variable cost
  - (c) Fixed cost – Loss
- iv) Profit/Volume ratio is an indicator of
  - (a) the volume of sales
  - (b) the volume of profit
  - (c) the rate of profit.
- v) If net profit is 10% and P/V ratios is 50%, the margin of safety will be
  - (a) 20%
  - (b) 50%
  - (c) 10%

## II DESCRIPTIVE QUESTIONS

1. Define “Marginal cost”. Discuss the importance of classifying expenses into variable and fixed. Give two examples each.
2. What is the difference between absorption costing and marginal costing in concept and use?
3. How is Price cost different from Marginal cost?  
State the elements of cost included in the two types of cost indicating their significance in cost accounting.
4. “The break-even concept is fundamentally a static analysis “ , discuss and explain the limitations of the concept.
5. The size of the “margin of safety” is an extremely valuable guide to the strength of a business. Discuss the possible steps to rectify the position, when margin of safety is unsatisfactory.
6. “The choice between absorption costing and marginal costing is determined by certain factors”. What are they ? What are the advantages and disadvantages of using marginal costing ?
  - (a) “In times of trade depression selling below total costs but above marginal costs may increase profit”. Discuss.
  - (b) Would advise management to sell even below marginal costs ? If so, state the circumstances.
8. In the concept of marginal costing, what is meant by ‘limiting factor’ ? State the difficulties experienced in the determination of the limiting factors in a concern and indicate how would you overcome them.

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9. “Marginal cost reveals the lowest price at which a product can be sold during trade depression, but they also reveal to management the most profitable lines during a period of intense trade activity”. Explain with examples, the second part of this statement.
10. Differential costs are basically special purposes costs applicable only to a set of circumstances. Do you agree with this statement ? To what extent will it be prudent to take major policy decision regarding selling prices based on differential cost alone ? Give reasons for your answer.
11. Write short notes on :
  - (a) Key-factor of production,
  - (b) P/V ratio
  - (c) Opportunity cost,
  - (d) Sunk Cost
  - (e) Relevant Cost.
12. “The effect of price reduction is always to reduce the P/V ratio, to raise the Breakeven Point and to shorten the margin of safety.” Explain and illustrate with the help of numerical examples.
13. A Company has the option of buying one of the two Machines E & F available. From the data 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.

	<i>Machine E</i>	<i>Machine F</i>
Output - per year - units.	10000	10000
Fixed cost - per year - Rs.	30000	16000
Profit at full capacity - Rs.	30000	24000

Both the machines will produce identical products. The annual market demand is 10000 units @ Rs. 10 per unit.

14. N.C. Ltd. has two factories with similar plant and machinery for manufacture of X. The Board of directors of the company has decided to merge them and 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 :

<i>Factory</i>	<i>A</i>	<i>B</i>
Capacity in operation	60%	100%
Turnover – Rs. lakhs	120	300
Variable cost – Rs. lakhs	90	220
Fixed cost – Rs. lakhs	25	25

Find out :

- (a) what should be capacity of the merged factory to be reoperated for break-even?
- (b) What is the profitability of working 80% of the integrated capacity, and
- (c) What turnover will give an overall profit of Rs. 60 lakhs?

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15. X Ltd. has been offered an order from a Ltd. for 10,000 units of output @ Rs. 100 each which has a variable cost of Rs. 60 and will involve an outlay of Rs. 60,000 for setup, jigs and dies. at the same time, there is another offer of B Ltd. for 8000 units of output at Rs. 110 each. Variable costs are estimated at Ra. 68 each and involves an outlay of Rs. 50000 for set up jigs and dies. Which offer should the company accept?
16. In a purely competitive market, 10000 pocket transistors can be manufactured and sold and a certain profit is generated. It is estimated that 2000 pocket transistors need be manufactured and sold in a monopoly market to earn the same profit. The profit under both the conditions is targeted at Rs. 2 lakhs. The variable cost per transistor is Rs. 100 and the total fixed cost is Rs. 37000.

You are required to find out the selling prices under both the competitive and monopoly conditions.

17. Sales turnover and profit during two periods are as follows :

	<i>Period 1</i>	<i>Period 2</i>
Sales – Rs. lakhs	20	30
Profit – Rs. lakhs	2	4

Calculate :-

- (a) P/V ratio, and  
 (b) Sales required to earn a profit of Rs. 5 lakhs.
18. A Company has a capacity of producing 100000 units of a certain product in a month. The sales department reports that the following schedule of sale prices is possible

<i>Production volume</i>	<i>Selling price per unit</i>
60%	0.90
70%	0.80
80%	0.75
90%	0.67
100%	0.61

The variable cost of manufacture between these levels is Re. 0.15 unit and fixed cost Rs. 40000.

- (a) Prepare a statement showing incremental revenue and differential cost at each level. At which volume of production will the profit be maximum ?  
 (b) If there is a bulk offer at Re. 0.50 per unit for the balance capacity over the maximum profit volume for export and price quoted will not affect internal sales, will you advise accepting this bid and why ?



## BUDGETARY CONTROL

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### 10.0 BUDGETARY CONTROL

#### 10.1 BASIC CONCEPT

*Budget* is defined as "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". (CIMA Terminology). An analysis of the definition will bring out the following features of a budget :

*Cost and Management Accounting*

- (a) it is a plan expressed in monetary terms; but it also contains physical units;
- (b) it is prepared prior to the period during which it will operate;
- (c) it is approved by the management for implementation;
- (d) it is related to a definite future period;
- (e) it indicates planned income and expenditure including capital expenditure during the period, and
- (f) it is prepared for the purpose of implementing the policy formulated by the management, and the objective to be achieved during the period.

A budget may be expressed in relation to **time**, viz. short-term and long-term budget, in relation to **functions**, viz. production budget, sales budget, cash budget, capital budget, etc. and in relation to **behaviour**, viz. fixed budget and flexible budget.

*Budgetary control* is the system of planning and accounting control through the use of budget. It is defined as "the establishment of budgets relating the responsibilities of executives to the requirement of a policy, and the continuous comparison of actual with budgeted results either to secure by individual action the objective of that policy or to provide a basis for its revision" – (CIMA Terminology). From the definition, the following features of budgetary control emerge :-

- a) **Establishment of budgets** – Budgets are prepared for each function relating to the responsibilities of individual executives. The overall functional budgets are then coordinated with each other, so that an overall budget for the business may be prepared.
- b) **Executive responsibility** – Executives have specific tasks to be performed and responsibilities to be discharged. These must be directed towards the attainment of the objectives of the enterprise.
- c) **Requirement of a policy** – A budget is a policy statement. It indicates what the business plans to do, and how it proposes to do it.
- d) **Comparison of actuals with Budgets** – Comparison is the foundation of control. Actual performance must be measured and periodically compared with the plans. Such comparisons will indicate deviations from the planned course of action which must be highlighted in time, so that remedial action can be taken to reach the preset goods.
- e) **Revision of policy** – Sometimes the comparison of actual performance with the plans may indicate the need to change policies. If a change in policies is necessary to reach the goals of the organisation, then the policy change must be brought about. To that extent, policies must be flexible.

Budgetary control involves the following steps :-

- » Setting up of plans and budgets for each functional area like sales, production, purchase, etc

### *Budgetary Control*

- » Measuring and recording actual performance of each functional area.
  - » Comparing actual performance with the planned performance and measuring the deviation or variations.
  - » Investigating into the cause of the deviations and identifying the persons responsible.
  - » Taking corrective action and ensuring that such deviation do not arise in future.
- Budgetary control implies a constant and continuous watch on all phases of business activities daily, weekly, monthly, quarterly and yearly.

The objectives of budgetary control may be listed under three heads :-

- a) **Planning** – To achieve its goal, an enterprise must plan what it must do and how it will reach the goal. In the process of assessing the factors that will help reaching the goals, the enterprise should also anticipate problems that would make the process of reaching its goals difficult. Having identified some of these problems, it can decide well in advance how it would overcome them, if and when they come up.
- b) **Coordination** – This involves proper balancing of all factors and coordinating the efforts put together by various departments and persons to reach the goals of the enterprise. If they do not work in a synchronised manner, the organisation will never be able to reach its goals.
- c) **Control** – It is a process of keeping watch over actions and taking immediate action at the first signs of deviation from the planned course of action. In this way, events are compelled or directed to conform to plans.

**Establishing a budgetary control system** involves the following :

- a) Selecting the budget period,
- b) Identifying the types of budget to be prepared,
- c) Consideration of the limiting factor.

#### **BUDGET PERIOD**

The budget period is the period of time for which the budget is prepared and used. In most cases, the period of time chosen is the accounting period of the organisation, since this period is usually sufficiently long to take care of seasonal variations that would occur in production and sales. In certain industries, which are characterised by significant seasonal variation, a shorter period of six-months or a quarter may be found more useful. In industries involving large capital outlay and long production cycles such as, shipbuilding or generation of electricity, the budget period is likely to extend beyond one accounting year. However, for the purpose of control, it is important that the budget is broken down into figures for shorter period. Thus, a budget may be prepared for five years, indicating monthly figures for the first year, and annual figures for the next four years.

*Cost and Management Accounting***TYPES OF BUDGET**

Generally, a **Master Budget** is prepared, which in turn, is broken into functional budgets. Budgets may be classified as follows:

- i) Basic budget and current budget
- ii) Fixed budget and flexible budget
- iii) Master budget and functional budget.

**Basic Budget**

A **basic budget** is based on a long term plan and is used as a basis for developing current budgets. A basic budget is much broader in scope and less detailed than a current budget. It may be fixed or flexible. The basic data are not updated whenever there are changes in conditions, such as, increase in material price or wage rates. As a result, the use of basic budgets obscures operating variances. That is why for control purposes, current budgets are more useful.

**Current Budget**

**Current budget** is established for use over a short period of time, usually one year but sometimes even less, and related to current conditions, that is, average conditions which are likely to prevail during the budget period.

**Fixed Budget**

A **Fixed Budget** is designed to remain unchanged irrespective of the volume of output or turnover attained. The budget remains fixed over a given period and does not change with the change in the volume of production or level of activity attained. Normally, such a budget is prepared in respect of expenses of a fixed nature. As such, this budget is of limited practical application.

**Flexible Budget**

A **Flexible Budget** by recognising the difference in behaviour between fixed and variable costs in relation to fluctuation in output or turnover, is designed to change appropriately with such fluctuations. A flexible budget changes according to the levels of activity.

**Master Budget and Functional Budgets**

A **Master Budget** is prepared from, and summarises, the various functional budgets. It is also called summary budget. It is a summary plan of the overall activities of the enterprise for a definite future period. It generally includes details relating to production, sales, stocks, debtors, cash position, fixed assets, etc. in addition to important control ratios. A **functional budget** is a budget of income or expenditure appropriate to or the responsibility of a function, such as, production, sales, purchase, etc. Each functional department prepares its own budget, and all these functional budgets are then integrated into the master budget.

### *Budgetary Control*

#### **CONSIDERATION OF LIMITING FACTORS**

A *limiting factor* is the key factor which at a particular time, or over a period, will limit the activities of an undertaking. This limiting factor is usually the level of demand for the products and services of the undertaking but it could be a shortage of one of the productive resources, for example, raw material, skilled labour, or machine capacity or financial resources, such as, working capital. In order to ensure that the functional budgets are reasonably capable of fulfilment, the extent of the influence of this factor must be first assessed. It is, therefore, known as principal budget factor, or key factor.

#### **10.2 ORGANISATION FOR BUDGETARY CONTROL**

For effective budgetary control, a sound and efficient organisation is essential. The following requirements are to be fulfilled for establishing a sound system :-

- a) **Budget cost centre** – A budget cost centre is a section of the organisation for which separate budgets can be prepared and control exercised. They can be same as cost centres with accountability resting with a responsible person who heads that cost centre.
- b) **Organisation chart** – There should be well-defined organisation chart, showing the lines of authority and responsibility of each executive, and his position in relation to others, - both upwards as well as downwards. The design of the organisation chart will vary depending on the nature and size of the individual business and the extent of control desired.
- c) **Budget committee** – The responsibility for the preparation of budgets generally rests with the budget committee, which includes the following executives :
  - » Chief executive, who will be the Chairman of the committee
  - » Production manager
  - » Sales manager
  - » Materials manager
  - » Standards and quality control manager
  - » Finance manager
  - » Other departmental heads.

The main functions of the budget committee are as follows:

- i) Assisting the managers in making budget by giving them information about past performances,
- ii) Circulating broad outline of the policies framed by the top management, which should be taken under consideration while preparing the budgets,
- iii) Reviewing the budget estimates prepared by the various departments, and suggesting modifications, if necessary,

*Cost and Management Accounting*

- iv) Preparing the master budget after the functional budgets are approved,
- v) Comparing reports of actual performance with budgets and initiating follow up action,
- vi) Making changes in budget policies and procedure,
- vii) Assisting in preparing budget manual.

The management accountant performs the role of Secretary to the committee, and assists in coordinating the tasks of various departments in the budget preparation.

- d) **Budget manual** – It is a document which contains the guidelines for the preparation of various budgets, and sets out the responsibilities of the persons engaged in the routine of and the forms and records required for budgetary control. All departments refer to this manual for clarification regarding procedural details and formats to be used at every stage from preparing budgets till reporting of actuals and deviations from budgets.

### 10.3 FUNCTIONAL BUDGETS

A *functional budget* is a statement of income and/or expenditure applicable to a particular function, department or process. The following functional budgets are generally prepared:

<i>Budget</i>	<i>Prepared by</i>
Sales - Quantity and value	Sales manager
Selling and distribution cost	Sales manager
Production- Units and plant	Production manager
Utilisation personnel	Personnel manager
Materials	Purchase manager
Factory expenses	Production manager
Administrative expense	Finance manager
Cash	Finance manager
Capital expenditure	Chief executive
Research and development	R and D manager

These budgets are briefly discussed and illustrated.

#### Sales Budget

This is generally the starting point for the preparation of the functional budgets. It shows the quantities and values of each products to be sold during the next year, usually broken down into quarterly and monthly figures. It may be further classified into product groups, areas or territories, salesman or agent wise, types of customers, etc. The sales budget is prepared from :-

### *Budgetary Control*

- a) Analysis of past sales,
- b) Market analysis, and survey reports,
- c) Reports of field staff,
- d) Growth trend in the volume of sales
- e) General business condition.

If the principal budget factor is production capacity, then the sales budget will be determined by output, and preparation of budget will be relatively easy. However, if sales is the key factor, then the production budget will be determined by estimated sales.

#### **Selling and Distribution Cost Budget**

After sales budget is finalised and approved, selling and distribution cost budget is prepared based on the selling and distribution planned during the budget-period. Most of the expenses are related to the sales volume, and, therefore, estimated by the sales manager. Other expenses which are not directly related to sales-volume, such as advertising, sales promotion, market research, etc. are determined by marketing manager and conveyed to the sales manager for incorporation in the budget.

#### **Production Budget**

This is prepared by the Production Manager and shows the quantities of the products to be made, the departments which will produce them and the time within which the production will take place. The product budget is built up from plant utilisation budget, which shows the extent of utilisation of plant and machinery. This budget is important because —

- i) it shows the extent of utilisation of each machine,
- ii) if the capacity is insufficient, extra-shift working may be required or new machinery may be purchased or a portion of output may have to be manufactured by outside plants,
- iii) if the capacity is idle, the sales department can be alerted to find out ways and means to get additional sales volume.

#### **Labour and Manpower Budget**

This budget will show the number of each grade of workmen required to produce the target output which has been approved by the budget committee. It will also indicate anticipated labour cost for the budget period, and the period of training that would be required for the additional workmen, if required to be recruited. However, the labour cost has to be classified into direct and indirect labour for incorporation in variable cost and fixed overheads.

*Cost and Management Accounting***Materials Budget**

This will project the total quantities and value of each item of raw-materials, components and packing materials that will be consumed in the process of producing the budgeted output. It will take into account the projected inventories at the commencement of the budget period and the inventory norms fixed by the management and determine the quantities and value of materials that are needed to be purchased. This can be scheduled by the months when the materials will be required. Preparation of this budget requires the anticipation of material prices prevailing during the budget period.

**Production Cost Budget**

With the help of production budget, material budget, labour budget and expense budget, the cost department normally prepares production cost budget for each of the intermediate and final products.

**Capital Expenditure Budget**

Based on the plant utilisation budget, capital assets required for the production departments are projected. Other assets required for administration and other departments shall be considered while preparing and placing for approval of total capital expenditure budget before the budget committee.

**Research and Development Budget**

The research and development manager will provide his estimate of expenses on research and development work itemwise, which after receiving approval from the chief executive will be adopted in the budget.

**Cash Budget**

When all the budgets are approved, a cash budget summarising the anticipated Cash receipts and cash payments shall be prepared. This will help in anticipating cash shortfalls and excesses, and assist in planning in advance to meet shortfalls. It is desirable to break this budget into monthly and quarterly budgets.

**Master Budget**

Master budget is a comprehensive plan which is prepared from and summarises the functional budgets. The master budget embraces both operating decisions and financial decisions. When all budgets are ready, they can finally produce budgeted profit and loss account or income statement and budgeted balance sheet. Such results can be projected monthly, quarterly, half-yearly and at year-end. When the budgeted profit falls short of target it may be reviewed and all budgets may be reworked to reach the target or to achieve a revised target approved by the budget committee.

### *Budgetary Control*

#### **Flexible Budget**

As mentioned earlier, there are two approaches to budgeting viz. Fixed Budgeting, which we have so far discussed, and flexible budgeting which is now being explained. For control of expenses under fixed budgeting procedure, the expenses included in the budgets are used as a guide for expense limitation during the budget period, and a standard against which actual expenses are compared and variances are ascertained.

When **flexible budgeting procedure** is used, the budgeted expenses will be analysed and adjusted to the actual volume before comparing with actual expenses incurred. In other words, a flexible budget is not a schedule of expenses at a specific or defined volume of activity. It consists of a series of figures for a series of volumes or levels of activity.

**Flexible budget** is also called variable budgeting or slide scale budgeting. The main principle involved in flexible budgeting is that cost can be related to activity, and can be primarily the results of two factors, viz. (a) the passage of time, and (b) the productive activity. The concept of cost variability gives rise to three categories of costs, such as —

- i) Fixed cost
- ii) Variable cost
- iii) Semi-variable cost.

Fixed costs do not vary with the volume or production activity, but accrue with the passage of time. They are time or period costs. They remain constant over a period of time irrespective of the volume or level of activity. Variable costs vary in proportion to the volume of activity. They accrue as a result of efforts, activity or work done. They are product cost. They would not arise if there are no activity. Semi-variable costs contain elements of both fixed and variable costs.

There are two methods of preparing flexible budget, viz.

- i) Formula method, and
  - ii) Multi-activity or tabular method.
- i) Under the Formula Method, the following procedure is adopted :
- a) **Before the budget period :**
    - » A budget is prepared for normal level of activity
    - » Costs are segregated into fixed and variable.
    - » A variable cost per unit is computed.
  - b) **At the end of the budget period :**
    - » The actual output and actual level of activity are ascertained.
    - » The variable cost allowed for the actual output is calculated and added to the fixed cost to obtain the budget cost allowance.
    - » Actual expenses are compared against allowed cost.
    - » Expressed as a formula, Allowed cost = Fixed cost + (Actual units of output × Variable cost per unit).

*Cost and Management Accounting***Illustration:**

Budget output - 8000 units per month  
 Budget fixed overheads - Rs. 40000 per month  
 Budget variable cost - Rs. 5 per unit  
 Budget total overheads - Rs. 80000 per month  
*Actual for January, 2002*  
 Output - 7000 units

**Solution :** Hence, allowed cost for January 2002 will be Rs. 40000 + (7000 x 5) = Rs.75000. Actual expense will be compared against allowed cost of Rs.75000.

- ii) The **Multi-activity method** involves the preparation of a budget for all major levels of activity. When the actual output is known at the end of the budget period, the allowed costs are computed by either adopting the budget of the given level or next higher level of activity or by interpolating between the budgets of the activity levels on either side of the actual level of activity. For example, if the budget amounts for the following levels are given,

At 70% – Rs. 24,000  
 80% – Rs. 28,000  
 90% – Rs. 30,000,

and actual level of activity attained is 75%, then the allowed cost will be either (a) Rs.28000, i.e. the budget for next higher level or (b) by interpolation method, Rs. 24000 + (28000 - 24000) x 5 / 10 or Rs. 24000 + 2000 = Rs. 26000

**Illustration:** X Ltd. produces a standard product, the estimated cost of which is given below :

Raw-materials – Rs. 10 per unit  
 Direct wages – Rs. 8 per unit  
 Direct expenses – Rs. 2 per unit  
 Variable overheads – Rs. 3 per unit.

Semi-variable overheads at 100% activity level (10000 units) are expected to be Rs. 40000, and these overheads vary in steps of Rs. 2000 for each change of output of 1000 units. Fixed overheads are estimated at Rs. 50000. Selling price per unit is expected to be Rs. 40. Prepare a flexible budget at 50%, 70% and 90% levels of activity.

*Budgetary Control***Solution:****FLEXIBLE BUDGET**

Period:	Normal levels		
	50%	70%	90%
Capacity			
Units	5,000	7,000	9,000
	Rs.	Rs.	Rs.
Direct materials	50,000	70,000	90,000
Direct wages	40,000	56,000	72,000
Direct expenses	10,000	14,000	18,000
<b>PRIME COST</b>	100,000	140,000	180,000
Variable overheads	25,000	35,000	45,000
Marginal cost	125,000	175,000	225,000
Sales	200,000	280,000	360,000
<b>CONTRIBUTION</b>	75,000	105,000	135,000
Fixed overheads	70,000	70,000	70,000
<b>PROFIT</b>	5,000	35,000	65,000

*Note:* Semi-variable overheads are segregated into variable and fixed parts such as:

Variable cost per unit = Rs. 2000 divided by 1000 = Rs. 2 per unit.

Fixed cost = Rs. 40000 - (10000 units @ 2/-) = Rs. 20,000.

Hence, total variable overheads = Rs. 3 + Rs. 2 = Rs. 5 per unit, and total fixed overheads = Rs. 50000 + 20000 = Rs. 70000.

**BUDGET VARIANCE**

A *budget variance* represents the difference between plan and achievements expressed in monetary terms, that is, the difference between budget figure and actual figure. Variance analysis is the process of ascertaining variances from budget and finding reasons for such variances. Variance is unfavourable if actual is more than budget. The same is favourable if actual is less than budget. Variance report is prepared showing budget and variances and sent to persons responsible for each functional budgets for comments and action. When standard costing is employed along with a system of flexible budgeting, variance analysis is greatly facilitated.

**Illustration 1:** The following details apply to an annual budget for a manufacturing company:

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Quarter	1st	2nd	3rd	4th
Working days	65	60	55	60
Production (units per working day)	100	110	120	105
Raw material purchase				
(% by weight of annual total)	30%	50%	20%	–
Budgeted purchase price (per kg.)	Re. 1	1.05	1.125	–

Quantity of raw material per unit of production: 2 kg. Budgeted opening stock of raw material : 4,000 kg. (cost Rs. 4,000)

Budgeted closing stock of raw material: 2,000 kg. Issues are priced on FIFO basis.

Calculate the following budgeted figures :–

- (a) Quarterly and annual purchase of raw material, by weight and value.
- (b) Closing quarterly stocks by weight and value.

**Solution:**

**BASIC CALCULATIONS**

<p>(i) <i>Annual consumption</i></p> <p>1st Qtr. <math>65 \times 100 \times 2</math></p> <p>2nd Qtr. <math>60 \times 110 \times 2</math></p> <p>3rd Qtr. <math>55 \times 120 \times 2</math></p> <p>4th Qtr. <math>60 \times 105 \times 2</math></p>	<p><i>Kg.</i></p> <p>= 13,000</p> <p>= 13,200</p> <p>= 13,200</p> <p>= 12,600</p> <p>52,000</p>	<p>(ii) <i>Annual purchases</i></p> <p>Consumption</p> <p>Add: Budgeted closing stock</p> <p>Annual requirements</p> <p>Less: Opening stock</p> <p>Purchases</p>	<p><i>Kg.</i></p> <p>52,000</p> <p>2,000</p> <p>54,000</p> <p>4,000</p> <p>50,000</p>
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**(a) RAW MATERIALS PURCHASE BUDGET**

<i>Quarter</i>	<i>Quantity</i>	<i>Rs.</i>	<i>Rate</i>	<i>Amount</i>
1st	$50,000 \times 30/100$	= 15,000	Re. 1	Rs. 15,000
2nd	$50,000 \times 50/100$	= 25,000	1.05	26,250
3rd	$50,000 \times 20/100$	= 10,000	1.125	11,250
Annual purchase		50,000		52,500

**(b) STATEMENT OF QUARTERLY BUDGETED CLOSING STOCK**

Particulars	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	Qty. (Kg.)	Rate Rs.	Amt. Rs.	Qty. (Kg.)	Rate Rs.	Amt. Rs.	Qty. (Kg.)	Rate Rs.	Amt. Rs.	Qty. (Kg.)	Rate Rs.	Amt. Rs.
Op. Stock	4000	1	4000	6000	1	6000	17800	1.05	18690	14600	–	16080
Purchase	15000	1	15000	25000	1.05	26250	10000	1.125	11250	–	–	
	19000	1	19000	31000		32250	27800	–	29940	14600	–	16080
Consumn.	13000	1	13000	13200		*13560	13200	1.05	13860	12600	–	–13830**
Cl. Stock	6000		6000	17800		18690	14600		16080	2000	–	2250

*Budgetary Control*

\*  $600 \times \text{Re. } 1 + 7,200 \times 1.05$

\*\*  $4,600 \times \text{Rs. } 1.05 + 8,000 \times \text{Rs. } 1.125$ .

**Illustration 2 :** AB Co. wishes to arrange overdraft facilities with its bankers during the period April to June 2002 when it will be manufacturing mostly for stock. Prepare a cash budget for the above period from the following data, indicating the extent of the bank facilities the company will require at the end of each month :-

(a)	Months	Sales Rs.	Purchases Rs.	Wages Rs.
	February	1,80,000	1,24,800	12,000
	March	1,92,000	1,44,000	14,000
	April	1,08,000	2,43,000	11,000
	May	1,74,000	2,46,000	10,000
	June	1,26,000	2,68,000	15,000

(b) 50 per cent of the credit sales are realised in the month following the sales and the remaining 50 per cent in the second month following. Creditors are paid in the month of purchase.

(c) Cash at bank on 1.4. 2002 (estimated is Rs. 25,000)

**Solution:**

**ABC Co.  
CASH BUDGET FOR APRIL TO JUNE 2002**

	April Rs.	May Rs.	June Rs.
Opening Balance (Overdraft)	25,000	56,000	(47,000)
Receipts:			
Collection from debtors	1,86,000	1,50,000	1,41,000
	2,11,000	2,06,000	94,000
Payments to creditors	1,44,000	2,43,000	2,46,000
Wages	11,000	10,000	15,000
Closing Balance (overdraft)	56,000	(47,000)	(1,67,000)
	2,11,000	2,06,000	94,000

The overdraft facilities required by ABC Co. for different months are as follows:

- (i) in May 2002 Rs. 47,000
- (ii) in June 2002 Rs. 1,67,000

*Cost and Management Accounting***Working notes:***Collection from debtors .*

<b>April 2002</b>		<i>Rs.</i>
Sales for February	1,80,000 × 1/2	90,000
Sales for March	1,92,000 × 1/2	96,000
		1,86,000
<b>May 2002</b>		
Sales for March	1,92,000 × 1/2	96,000
Sales for April	1,08,000 × 1/2	54,000
		1,50,000
<b>June 2002</b>		
Sales for April	1,08,000 × 1/2	54,000
Sales for May	1,74,000 × 1/2	87,000
		1,41,000

**Illustration 3 :** PAC, a progressive enterprise manufacturing only two products and selling them under the brand names, Resina and Pipto and prepares every month, forecast of profit (or loss) and a budgeted cash flow statement for presentation to the managing director. Each of the products requires only two types of raw materials in the following proportions :—

	Resina	Pipto
	<i>(Per unit)</i>	<i>(Per unit)</i>
Material (1)	2 kgs.	4 kgs.
Material (2)	4 kgs.	2 kgs.

The direct labour hours for R and P are 4 and 6 per unit, respectively,

For the month of November, sales forecast were as follows:

<i>Product</i>	<i>Unit</i>	<i>Price per unit</i>
Resina	3,000	Rs. 60
Pipto	6,000	Rs. 80

The opening inventory on 1 st November and the proposed closing inventory on 30 th November were :—

	<i>Opening stock</i>	<i>Budgeted closing stock</i>
Material (1)	4,000 kgs.	5,000 kgs.
Material (2)	2,500 kgs.	4,000 kgs.
Resina	200 units	250 units
Pipto	400 units	500 units

*Budgetary Control*

Standard cost data for the month of November were:

Material (1)	Rs. 2 per kg.
Material (2)	Rs. 4 per kg.
Direct labour	Rs. 4 per hour.

Manufacturing overhead (application rate) Rs. 2 per direct labour hour.

Administration overhead	Rs. 20,000
Selling and distribution overhead	Rs. 40,000

Sales are collected 50% in the month of sales and 25% in each of the next two months. Material (1) is purchased in cash but for Material (2) the suppliers allow a credit of one month, i.e. all payments are cleared in the following month. Wage calculations are ready by the first week of the next month and payment is made on the 9th and 10th. Relevant figures for the three months are extracted below:

	September <i>Rs.</i>	October <i>Rs.</i>	November <i>Rs.</i>
Sales	8,00,000	6,00,000	
Purchase:			
Material (2)			1,00,000
Wages for the month			2,00,000
Other net cash expenses			2,00,000
Opening balance of cash			20,000 on 1 st Nov.

In addition to the above, advance tax estimated at 60% of the net profit in November was required to be paid in the Month.

You are required to prepare the production budget, material and direct labour cost budgets, budgeted profit and loss statement and budgeted cash flow statement for November.

**Solution:**

**A. Production Budget (Units)**

	<b>Resina (R)</b>	<b>Pipto (P)</b>
Budgeted sales	3,000	6,000
<i>Less:</i> Opening stock	200	400
<i>Add:</i> Budgeted closing stock	250	500
Production Units	3,050	6,100

**B. Material Budget :**

	<b>Material (1)</b>	<b>Material (2)</b>
Requirement for R	$3,050 \times 2$	$3,050 \times 4$
Requirement for P	$+ 6,100 \times 4$	$+ 6,100 \times 2$
	30,500 kgs.	24,400 kgs.

*Cost and Management Accounting*

Less: Opening stock	4,000	2500
Add: Closing stock	5,000	4,000
Total budgeted quantity	31,500 kgs. × Rs.2	25,900 kgs. × Rs. 4
Total budget cost	= Rs. 63,000	= Rs. 1,03,600

**C. Direct labour cost budget:**

	<b>Resina</b>	<b>Pipto</b>
Production hours	3,050 × 4 = 12,200	6,100 × 6 = 36,600
Budgeted direct labour cost	12,200 × Rs. 4 = Rs. 48,800	36,600 × Rs. 4 = Rs. 1,46,400

**D. Budgeted profit and loss statement:**

	<i>Rs.</i>	<i>Rs.</i>
Sales	6,60,000	
Cost of sales	4,44,000	(See note)
Gross profit	2,16,000	
Administration overhead	20,000	
Selling and distribution overhead	40,000	
Net profit	1,56,000	
Tax (60%)	93,600	
After tax profit	62,400	

*Note :* Cost of sales per unit is as follows :-

	<b>Resina</b>	<b>Pipto</b>
	<i>Rs.</i>	<i>Rs.</i>
Material	20	16
Direct labour	16	24
Manufacturing overhead	8	12
	Rs. 44 × 3000	Rs. 52 × 6,000
	= Rs. 1,32,000	+ Rs. 3,12,000
Total of Resina and Pipto	= Rs. 4,44,000	

**E. Budgeted cash flow statement (November)**

<b>Receipts</b>		<b>Payments</b>	
	<i>Rs.</i>		<i>Rs.</i>
Opening balance	20,000	Material (1)	63,000
Sales		Material (2)	1,00,000
September	2,00,000	Wages	2,00,000
October	1,50,000	Other expenses	2,00,000
November	3,30,000	Tax	93,600
	6,80,000	Closing Balance	43,400
	7,00,000		7,00,000

## ◆ SPECIMEN QUESTIONS WITH ANSWERS

### Question 1 :

- (a) Define “flexible budget” and explain its importance as a budgeting technique and tool of control.
- (b) From the following data prepare a flexible budget for production of 40,000 units, 60,000 units and 75,000 units of product X, distinctly showing variable and fixed cost as well as total cost. Also indicate element-wise cost per unit.  
Budgeted output and budgeted cost per unit.

#### *Cost and Management Accounting*

Budget output	1,00,000 units Per unit cost (Rs.)
Direct material	90
Direct labour	45
Direct variable expenses	10
Manufacturing variable overhead	40
Fixed production overhead	5
Administration overhead (fixed)	5
Selling overhead	10 (10% fixed)
Distribution overhead	15 (20% fixed)

### Answer 1:

- (a) Budgets are classified into fixed or flexible depending on the attribute of flexibility present in them. According to CIMA, *flexible budget* is a budget which is designed to change as volume of output changes by recognising different cost behaviour pattern. It is also called sliding scale budget.

Flexible budgets are schedules of costs or expenses that indicate how each cost or expense should change with changes in volume of activities. In other words flexible budgets specify in advance what individual costs should be at various levels or volume of activities. It is a budget “which by recognising the difference between fixed, semi-fixed and variable costs, is designed to change in relation to the level of activity attained.

#### **Importance of flexible budget:**

- (i) Reckons operational realities.
- (ii) Streamlines control functions and profit planning.
- (iii) Gives balanced perspective on comparisons.
- (iv) Widening of scope of control to various areas of business including operating cost control.
- (v) Recognises concept of cost variability and provides logical comparison of expenditure with actual expenditure as a means of control.

## Budgetary Control

## (b) Flexible budget of Product X

	40,000 units		60,000 Units		(Rs. in Lakhs) 75,000 Units.	
	<i>Total</i>	<i>Cost</i>	<i>Total/</i>	<i>Cost</i>	<i>Total</i>	<i>Cost</i>
	<i>cost</i>	<i>per</i>	<i>cost</i>	<i>per</i>	<i>cost</i>	<i>per</i>
	(Rs.lakhs)	Rs.	(Rs.lakhs)	Rs.	(Rs.lakhs)	Rs.
Direct costs—						
Direct material	36.00	90.00	54.00	90.00	67.50	90.00
Direct labour	18.00	45.00	27.00	45.00	33.75	45.00
Direct expenses	4.00	10.00	6.00	10.00	7.50	10.00
Variable overheads—						
Production overhead	16.00	40.00	24.00	40.00	30.00	40.00
Selling overhead (refer W.N.1)	3.60	9.00	5.40	9.00	6.75	9.00
Distrn. overhead (refer W.N. 2)	4.80	12.00	7.20	12.00	9.00	12.00
Total variable cost (A)	82.40	206.00	123.60	206.00	154.50	206.00
Fixed overhead—(refer W.N. 3)						
Production overhead	5.00	12.50	5.00	8.33	5.00	6.67
Administration overhead	5.00	12.50	5.00	8.33	5.00	6.67
Selling overhead	1.00	2.50	1.00	1.67	1.00	1.33
Distribution overhead	3.00	7.50	3.00	5.00	3.00	4.00
Total fixed cost (B)	14.00	35.00	14.00	23.33	14.00	18.67
Total cost (A + B)	96.40	241.00	137.60	229.33	168.50	224.67

**Working Notes:**

- Selling overhead
 

Total for one lakh units @ 10	Rs. 10 lakhs
Fixed portion 10% (i.e.)	Rs. 1 lakh
Variable overhead for 1 lakh units	Rs. 9 lakhs
Variable overhead per unit	Rs. 9 lakhs
- Distribution overhead
 

Total for 1 lakh units @ 15 per unit	Rs. 15 lakhs
Fixed portion 20%	Rs. 3 lakhs
- Selling fixed overhead
 

Distribution overhead fixed	Rs. 3 lakhs
Production overhead fixed 5 × 1 lakh units	Rs. 5 lakhs
Administration overhead fixed 1 lakh units	Rs. 5 lakhs

*Cost and Management Accounting*

**Question 2 :**

A company is drawing its production plan for the year 1997-98 in respect of two of its products 'Gamma' and 'Delta'. The company's policy is not to carry any closing WIP at the end of any month. However, its policy is to hold a closing stock of finished goods at 50% of the anticipated quantity of sales of the succeeding month. For the year 1997-98 the company's budgeted production is 20,000 units of "Gamma" and 25,000 units of "Delta". The following is the estimated cost data :

	<i>Gamma</i>	<i>Delta</i>
	Rs.	Rs.
Direct material per unit	50	80
Direct labour per unit	20	30
Other manufacturing expenses apportionable to each type of product based on production	2,00,000	3,75,000

The estimated units to be sold in the first 7 months of the year 1997-98 are as under :

	April	May	June	July	Aug.	Sept.	Oct.
Gamma	900	1100	1400	1800	2200	2200	1800
Delta	2900	2900	2500	2100	1700	1700	1900

You are required to

- (a) prepare a production budget showing month-wise number of units to be manufactured;
- (b) present a summarised production cost budget for the half-year ending 30.9.97.

**Answer 2 :**

- (a) **Production budget for the half year ending 30th Sept.1997**

(Month wise) in units							
M O N T H S							
<i>Details:</i>	<i>April</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug.</i>	<i>Sept.</i>	<i>Total</i>
<b>Product – Gamma:</b>							
Budgeted Sales:	900	1100	1400	1800	2200	2200	9600
Add : Stock to be built up (Closing) (Note-1)	550	700	900	1100	1100	900	900
Total	1450	1800	2300	2900	3300	3100	10500
Less : Carry-over Stock (Opening) (Note-2)	450	550	700	900	1100	1100	450
Budgeted Production	1000	1250	1600	2000	2200	2000	10050

*Budgetary Control*

**Product – Delta :**

Budgeted sales	2900	2900	2500	2100	1700	1700	13800
Add : Stock to be built up (Closing) (Note- 1)	1450	1250	1050	850	850	950	950
Total	4350	4150	3550	2950	2550	2650	14750
Less : Carry-over stock (Opening) (Note 2)	1450	1450	1250	1050	850	850	1450
Budgeted production	2900	2700	2300	1900	1700	1800	13300

**Note 1 :** Closing stock of finished goods at the end of each month is to be ascertained as per company's policy i.e. 50% of the anticipated quantity of sales of the succeeding month.

**Note 2 :** Opening stock of each month is the closing stock of preceding month.

(b) Summarised production cost budget for the half-year ending 30th September 1997

<i>Products</i> <i>Production (units)</i>	<i>Gamma</i> <i>10050</i>		<i>Delta</i> <i>13300</i>	
	<i>Cost (Rs.)</i>		<i>Cost (Rs.)</i>	
<i>Details:</i>	<i>Per unit</i>	<i>Total</i>	<i>Per unit</i>	<i>Total</i>
Direct material	50	5,02,500	80	10,64,000
Direct labour	20	2,01,000	30	3,99,000
Other manufacturing expenses (Ref. Note 3)	10	1,00,500	15	1,99,500
Total	80	8.04.000	125	16.62.500

**Note 3 :** Other manufacturing expenses are apportioned on the basis of production to be made and details thereof are as under:

	<i>Gamma</i>	<i>Delta</i>
Units to be produced in 1997-98	20,000	25,000
Other manufacturing expenses (Rs.)	2,00,000	3,75,000
Therefore, rate per unit (Rs.)	10	15

**Question 3 :** JK Ltd has recently completed its sales forecasts for the year to 31 December 19X4. It expects to sell two products – J and K – at prices of Rs.135 and Rs.145 each respectively. Sales demand is expected to be :

J	10,000 units
K	6,000 units

Both products use the same raw materials and skilled labour but in different quantities per unit :

	<i>J</i>	<i>K</i>
Material X	10 kgs	6 kgs
Material Y	4 kgs	8 kgs
Skilled labour	6 hours	4 hours

*Cost and Management Accounting*

The prices expected during 19X4 for the raw materials are :

Material X	Rs.1.50 per kg
Material Y	Rs.4.00 per kg

The skilled labour rate is expected to be Rs. 6.00 per hour.

Stocks of raw materials and finished goods on 1 January 19X4 are expected to be :

Material X	400 kgs	@ Rs.1.20 per kg
Material Y	200 kgs	@ Rs.3.00 per kg
J	600 units	@ Rs.70.00each
K	800 units	@ Rs.60.00 each

All stocks are to be reduced by 15% from their opening levels by the end of 19X4 and are valued using the FIFO method.

The company uses absorption costing, and production overhead costs are expected to be :

Variable	Rs. 2.00 per skilled labour hour
Fixed	Rs. 3,15,900 per annum

Required Prepare for the year to 31 December 19X4 JK Limited's:

- production budget (in units);
- raw material purchases budget (in units and in rupees)
- production cost budget.

**Answer 3:**

(a) **Production budget**

	J Units	K Units
Opening stock	(600)	(800)
Closing stock (85%)	510	680
Sales	10,000	6,000
	9,910	5,880

(b) **Raw materials purchases budget**

	X Kg	Y Kg
Opening stock	(400)	(200)
Production [per (a)]		
J (10 kg)	99,100	39,640
K (6 kg)	35,280	47,040
	1,33,980	86,480
Closing stock	340	170
	1,34,320	86,650
Cost per kg	Rs. 1.50	Rs. 4.00
Purchase cost	Rs. 201,480	Rs. 346,600

*Budgetary Control***(c) Production cost budget**

Materials	<i>Rs.</i>
Opening stock (400 kg × Rs. 1.20 + 200 kg × Rs. 3)	1,080
Purchases Rs. (201,480 + 3,46,600)	5,48,080
	5,49,160
Closing stock (340 kg x Rs. 1.50 +170 kg x Rs. 4)	(1,190)
	5,47,970
Skilled labour (W1)	4,97,880
Variable overhead (W2)	1,65,960
Fixed overhead	3,15,900
	15,27,710

**Workings**

## 1. Labour hours budget

	<i>Rs.</i>	<i>Rs.</i>
Units produced per (a)	9,910	5,880
Hours per unit	6	4
Total hours	59,460	23,520
(59,460 + 23,520)		
= 82,980 hours x Rs. 6		
= Rs. 497,880		

## 2. Variable overheads

82,980 hrs x Rs. 2
= Rs. 1,65,960

**Question 4 :** The following data and estimates are available for XYZ Ltd for June, July and August.

	<i>June</i>	<i>July</i>	<i>Aug</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Sales	45,000	50,000	60,000
Wages	12,000	13,000	14,500
Overheads	8,500	9,500	9,000

The following information is available regarding direct materials.

	<i>June</i>	<i>July</i>	<i>August</i>	<i>September</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Opening stock	5,000	3,500	6,000	4,000
Material usage	8,000	9,000	10,000	

*Cost and Management Accounting*

**Notes**

- (a) 10% of sales are for cash, the balance is received the following month. The amount received in June for May's sales is Rs.29,500.
- (b) Wages are paid in the month they are incurred.
- (c) Overheads include Rs.1,500 per month for depreciation. Overheads are settled the month following. Rs.6,500 is to be paid in June for May's overheads.
- (d) Purchases of direct materials are paid for in the month purchased.
- (e) The opening cash balance in June is Rs. 11,750
- (f) A tax bill of Rs.25,000 is to be paid in July.

*Required :*

- (a) Calculate the amount of direct material purchases in each of the months of June, July and August.
- (b) Prepare cash budgets for June, July and August.
- (c) Describe briefly the advantages of preparing cash budgets.

**Answer :**

(a)		<i>June</i>	<i>July</i>	<i>August</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
	Material usage	8,000	9,000	10,000
	Closing stock (= next month's opening stock)	3,500	6,000	4,000
	Total requirements for month	11,500	15,000	14,000
	Less: opening stock	5,000	3,500	6,000
	Direct material purchases for month	6,500	11,500	8,000
(b)	Cash budgets for June, July and August	<i>June</i>	<i>July</i>	<i>August</i>
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
	<i>Receipts :</i>			
	Sales: 10% for cash	4,500	5,000	6,000
	90% received in following month	29,500	40,500	45,000
		34,000	45,500	51,000
	<i>Payments :</i>			
	Wages	12,000	13,000	14,500
	Overheads (note)	6,500	7,000	8,000
	Direct materials (from (a))	6,500	11,500	8,000
	Tax bill	—	25,000	—
		25,000	56,500	30,500
	Net cash inflow/(outflow)	9,000	(11,000)	20,500
	Opening balance	11,750	20,750	9,750
	Closing balance	20,750	9,750	30,250

*Budgetary Control*

**Note.** Remember that depreciation is not a cash flow. It must be deducted from the figures given. Therefore the payment in July is Rs. 8,500 overheads from June, less Rs. 1,500 depreciation. The payment for August is Rs. 9,500 less Rs. 1,500 = Rs. 8,000.

- (c) A cash budget shows the cash effect of all of the decisions taken in the budgeted planning process. For example, a decision to increase stock or to extend further credit to customers will both have an impact on cash. The cash budget forewarns managers of the cash position which will result from their intended actions. Therefore they can take action now to avoid or to provide for deficits. For example, they can arrange for extended credit from suppliers, they can negotiate a bank loan or they can arrange to invest surpluses wisely. The investment decision will depend on whether the surplus is forecast to be short term, or long term.

**Question 5:**

- (a) Prepare a flexible budget for 19X6 for the overhead expenses of a production department at the activity levels of 80%,90% and 100%, using the information listed below.

(i) The direct labour hourly rate is expected to be Rs.3.75.

(ii) 100% activity represents 60,000 direct labour hours.

(iii) variable costs

Indirect labour Re.0.75 per direct labour hour

Consumable supplies Re.0.375 per direct labour hour

Canteen & other welfare services 6% of direct & indirect labour costs

(iv) Semi-variable costs are expected to correlate with the direct labour hours in the same manner as for the last five years which was as follows.

<i>Year</i>	<i>Direct labour hours</i>	<i>Semi-variable costs Rs.</i>
19X1	64,000	20,800
19X2	59,000	19,800
19X3	53,000	18,600
19X4	49,000	17,800
19X5	40,000 (estimate)	16,000 (estimate)

(v) Fixed costs are as follows.

	<i>Rs.</i>
Depreciation	18,000
Maintenance	10,000
Insurance	4,000
Rates	15,000
Management salaries	25,000

(vi) Inflation is to be ignored.

- (b) Calculate the budget cost allowance for 19X6 assuming that 57,000 direct labour hours are worked.

*Budgetary Control***Answer :****(a) FLEXIBLE BUDGET**

	80%	90%	100%
Direct labour hours	48,000	54,000	60,000
<b>Variable costs :</b>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Indirect labour (Rs. 0.75 per hour)	36,000	40,500	45,000
Consumable supplies (Re. 0.375 per hour)	18,000	20,250	22,500
Canteen and other welfare services (W1)	12,960	14,580	16,200
Semi-variable (Re. 0.20 per hour (W2))	9,600	10,800	12,000
	76,560	86,130	95,700
<b>Fixed costs :</b>			
Depreciation	18,000	18,000	18,000
Maintenance	10,000	10,000	10,000
Insurance	4,000	4,000	4,000
Rates	15,000	15,000	15,000
Management salaries	25,000	25,000	25,000
Semi-variable (see workings)	8,000	8,000	8,000
	1,56,560	1,66,130	1,75,700

**Workings:**

1. Canteen and other welfare services	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Direct labour (Rs. 3.75 per hour)	180	202.5	225
Indirect labour (Rs. 0.75 per hour)	36	40.5	45
	216	243.0	270
Canteen costs (6%)	Rs.12.36	Rs. 14.58	Rs.16.20

## 2. Semi-variable Costs

Using data from 19X1 to 19X5, range of direct labour hours 64,000 – 40,000 = 24,000 and range of semi-variable costs = Rs. 20,800 – Rs. 16,000 = Rs.4,800.

Hence, Variable costs =  $64,000 \times \text{Rs.}4,800/24,000$  Rs.12,800 out of a total of Rs.20,800 costs.

Hence, Variable cost per hour =  $\text{Rs.}12,800/64,000$  = Rs.0.20 per hour

Hence, Fixed costs = Rs. 20,800.– Rs.12,800 = Rs. 8,000

*Cost and Management Accounting*

(b) Budget cost allowance for 57,000 direct labour hours

	<i>Rs.</i>	
For 60,000 direct labour hours	95,700	variable costs
Less 5%	4,785	
	90,915	
Plus	80,000	fixed costs
Therefore, budget cost allowance is	170,915	

**Question 6 :**

- (a) Distinguish between “fixed budget” and “flexible budget”.
- (b) Galaxy Pvt. Ltd. is engaged in production of certain T.V.parts, 100% capacity being 10000 units. Given are the information for January and February 2002:

<i>Months</i>	<i>January</i>	<i>February</i>
Parts produced (in units)	6000	9000
Elements of overhead costs :	<i>Rs.</i>	<i>Rs.</i>
Salaries	3,000	3,000
Power	3,000	3,900
Consumable stores	3,000	4,500
Repairs	4,000	4,600
Shop labour	1,500	2,250
Depreciation	2,500	2,500
Inspection	1,000	1,300

Rate of production per hour is 10 units. Direct material costs are Rs. 2 per unit and direct labour costs per hour Rs. 8. You are required to compute (a) cost of production at 50%, 80% and 100% capacity respectively showing separately the fixed, semi-variable and variable expenses in the Flexible Budget and (b) show the overhead absorption rate per unit at 100% capacity.

**Answer : (a)**

**Distinction between fixed and flexible budget :**

<i>Fixed Budget</i>	<i>Flexible Budget</i>
1. It does not change with actual volume of activity achieved. Thus it is known as rigid or inflexible budget.	1. It can be recasted on the basis of activity level to be achieved. Thus it is not rigid.
2. It operates on one level of activity and under one set of conditions. It assumes that there will be no change in the prevailing conditions, which is unrealistic.	2. It consists of various budgets for different levels of activity.

*Budgetary Control*

- |   |   |
|---|---|
| <p>3. Here, as all costs like fixed, variable and semi-variable are related to only one level of activity, so variance analysis does not give useful information.</p> <p>4. If the budget and actual activity levels differ significantly, then the aspects like cost ascertainment and price fixation do not portray correct picture.</p> <p>5. Comparison of actual performance with budgeted targets will be meaningless specially when there is a difference between the two activity levels.</p> | <p>3. Here analysis of variance provides useful information as each cost is analysed according to its behaviour</p> <p>4. Flexible budgeting at different levels of activity, facilitates the ascertainment of cost, fixation of selling price and tendering of quotations.</p> <p>5. It provides a meaningful basis of comparison of the actual performance with the budgeted targets.</p> |
|---|---|
- 

**(b)**

<b>Flexible Budget</b>			
	50%	80%	100%
Production capacity	5,000	8,000	10,000
T.V. parts produced (in units)	500	800	1,000
Production hours	Rs. 10,000	Rs. 16,000	Rs. 20,000
Direct material	4,000	6,400	8,000
Direct labour	14,000	22,400	28,000
(A) Prime cost			
Factory overhead :			
Variable :			
Consumable stores	2,500	4,000	5,000
Shop labour	1,250	2,000	2,500
Semi-variable :			
Power	2,700	3,600	4,200
Repairs	3,800	4,400	4,800
Inspection	900	1,200	1,400
Fixed			
Salaries	3,000	3,000	3,000
Depreciation	2,500	2,500	2,500
(B) Factory overhead	16,650	20,700	23,400
(a) Total cost of production (A) + (B)	30,650	43,100	51,400
(b) Overhead absorption rate per unit @ 100% capacity =		$\frac{23,400}{10,000}$	= Rs. 2.34

*Cost and Management Accounting*

**Note :** *Semi variable expenses*

Power :	Diff. in Capacity	Diff. in Overhead	Variable Rs.	+	Fixed Rs.	=	Total Rs.
	30%	Rs. 900					
	1%	Rs. 30					
At 60% capacity			$60 \times 30 = 1800$	+	1200	=	3,000
At 50% capacity			$50 \times 30 = 1500$	+	1200	=	2,700
At 80% capacity			$80 \times 30 = 2400$	+	1200	=	3,600
At 100% capacity			$100 \times 30 = 3000$	+	1200	=	4,200

Similarly, other semi-variable expenses figures are calculated.

**Question 7 :**

XYZ Ltd. furnished you with the following data :

	Budget	Actual (in a particular month)
No. of working days	25	27
Production in units	20000	22000
Fixed overheads (Rs.)	30,000	31,000

Budgeted overhead rate is Re. 1 per hour. In a particular month the actual hours worked were 31,500.

Calculate the following variances :

- (i) Total overhead variance ;
- (ii) Expenditure variance;
- (iii) Volume variance;
- (iv) Capacity variance;
- (v) Calendar variance.

**Answer :**

**Computation of fixed overhead variances**

		<i>Fixed overhead variances</i>	
		Rs.	Rs.
		Rs.	Rs.
(a) Actual fixed overhead for production	= 31,000		
(AH × AR)	[ given ]		
(b) Budgeted fixed overhead	= 30,000		
[ given ]			
(c) Calendar days budget	= 32,400		
(Actual days × SR/day)	[ 30,000 / 25 × 27 ]		
(d) Actual hours worked × Standard Fixed overhead rate/hr.	= 31,500		
(AH × SR)	[ 31,500 × Re.1 ]		
(e) Standard fixed overhead for actual production	= 33,000		
(AP × SH/unit × SR)	[ 22,000 × 1.5 × Re.1 ]		
		TOTAL	1,900    3,900

*Budgetary Control*

- (i) Total overhead variance =  $(a) - (e) = \text{Rs. } 2,000 \text{ (F)}$
- (ii) Expenditure variance =  $(a) - (b) = \text{Rs. } 1,000 \text{ (A)}$
- (iii) Volume variance =  $(b) - (e) = \text{Rs. } 3,000 \text{ (F)}$
- (iv) Capacity variance =  $(c) - (d) = \text{Rs. } 900 \text{ (A)}$
- (v) Calendar variance =  $(b) - (c) = \text{Rs. } 2,400 \text{ (F)}$

## ◆ TEST YOURSELF

### A. OBJECTIVE TYPE QUESTIONS

1. Which of the following statements are true?
  - a) Budget is nothing but an estimate for future.
  - b) Budget is a plan explained in monetary terms.
  - c) Budget is prepared for the managers to fix their targets.
  - d) Production budget is prepared before sales budget.
  - e) Flexible budget recognizes various levels of activity.
  - f) Budget committee is headed by the finance manager.
  - g) A Budget Manual is the summary of all budgets.
  - h) Cash budget is prepared for showing cash requirements for the budget.
  
2. Fill in the blanks:
  - i) Budget is a forecast of \_\_\_\_\_ events.
  - ii) Budgetary control is the system of \_\_\_\_\_ and \_\_\_\_\_ control through the use of budgets.
  - iii) Budget may be classified as \_\_\_\_\_ budget and \_\_\_\_\_ budget.
  - iv) A basic budget is based on \_\_\_\_\_.
  - v) Flexible budget recognises the difference in behaviour between and \_\_\_\_\_ costs.
  - vi) Budget Committee is usually headed by \_\_\_\_\_.
  - vii) Budget manual contains \_\_\_\_\_ for the preparation of various budgets.
  
3. Select the correct answer in the following multiple-choice questions :
  - i) A budget that summarises all budgets is called.
    - (a) Sales budget
    - (b) Flexible budget
    - (c) Master budget
    - (d) Summary budget.
  
  - ii) Fixed and variable cost behaviour has a special significance in the preparation of:
    - (a) Cash budget
    - (b) Master budget
    - (c) Flexible budget

- iii) Cost of production as determined under standard cost is :
  - (a) Historical cost
  - (b) Predetermined cost
  - (c) Direct cost

**B. DESCRIPTIVE QUESTIONS**

1. Define “Budget” and “Budgetary Control”. State the advantages of budgetary control in an organisation.
2. What is a budgetary control ? Discuss the various preliminaries required for adoption of a system of budgetary control.
3. Enumerate the duties and responsibilities of an accountant who has been appointed a “Budget Controller” of a large manufacturing concern. State briefly the contents of a Budget manual.
4. Explain the difference between a forecast and a budget. Give examples to illustrate the difference between –
  - (a) Fixed budget,
  - (b) Flexible budget, and
  - (c) Functional budget.
5. What is a flexible budget? How it differs from fixed budget ? Prepare a flexible budget with imaginary figures.