

Cost Ascertainment – Elements of Cost

2

This Module Includes

- 2.1 Material Costs**
- 2.2 Employee Costs**
- 2.3 Direct Expenses**
- 2.4 Overheads**

Cost Ascertainment – Elements of Cost

SLOB Mapped against the Module:

To attain in-depth knowledge about element-wise cost ascertainment with a detail coverage of inventory management and control and apportionment of overheads costs. (CMLO 2b 5b)

Module Learning Objectives:

After studying this module, the students will be able to –

- ⦿ Conceptualize the various elements of cost which are basic to the cost accumulation process
- ⦿ Understand aspects of accounting for material cost
- ⦿ Understand aspects of accounting for employee (labour) cost
- ⦿ Understand aspects of accounting for overheads applicable in absorption costing system

In the last section of the previous module it is discussed that while ascertaining the cost of a product the first stage is to compute the prime cost which comprises of material cost, labour cost¹, and direct expenses. COST ACCOUNTING STANDARD - 1 (CAS - 1)² issued by the Council of the Institute of Cost Accountants of India gives various aspects of 'Classification of Cost'. According to para 6.1.1, 'items of costs differ on the basis of their nature. The natural groupings of cost are given as material, employee and expenses. According to this para, the elements of cost can be classified in the following three categories:

1. Material Cost
2. Employee Cost
3. Expenses

Accordingly, costs can be classified in the following three categories:

- ⊙ **Material Costs³** – Material Costs are cost of materials used for the purpose of production of a product or rendering of a service, net of trade discounts, rebates, taxes and duties refundable that can be quantified with reasonable accuracy. It is important to note that these costs can be quantified with judicious exactness and thus are said to be traceable costs. If some portion of the material cost cannot be traced to the product or service, it is referred as indirect cost. Thus, material cost is recognized either as:
 - Direct material cost – these are the cost of materials which can be assigned to a cost object in an economically feasible way, or
 - Indirect material cost – these are cost of materials, which cannot be directly assigned to a particular cost object in an economically feasible way.
- ⊙ **Employee Costs³** - Employee Costs are consideration, including benefits paid or payable to employees, permanent or temporary, for the purpose of production of a product or rendering of a service. In various cost accounting books, this is referred as Labour cost. It is important to note that these can be quantified with judicious exactness. Thus these costs are traceable costs. If some portion of the labour cost cannot be traced to the product or service, it is referred as indirect cost. Thus, labour cost is identified either as:
 - Direct employee cost – these are employee costs, which can be assigned to a cost object in an economically feasible way, or
 - Indirect employee cost – these are employee costs, which cannot be directly assigned to a particular cost object in an economically feasible way.

1. This is referred as Employee cost as per Cost Accounting Standard (CAS) 7, issued by the Council of the Institute of Cost Accountants of India (this along with the other CASs is covered in brief in Module 3 of this study note). In this study note the two terms are used interchangeably.

2. This standard was revised in 2015.

3. The definitions mentioned, are adopted from CAS 1

- ⦿ Expenses - Expenses are costs other than material cost and employee cost incurred for the purpose of production of a product or rendering of a service. (example - cost of utilities, payment for bought out services, job processing charge etc.). It is important to note that these can be quantified with reasonable accuracy and are thus said to be traceable costs. If some portion of the expenses cannot be traced to the product or service, it is referred as indirect cost. Thus, expenses are either as:
 - Direct expenses – these are expenses except direct material and direct employee cost which can be assigned to a cost object.
 - Indirect expenses – these are expenses, which cannot be directly assigned to a particular cost object in an economically feasible way.

Indirect material, indirect employee cost and indirect expenses are summed up and referred as Overheads. Under absorption costing system⁴, Overheads costs are absorbed to the product on a pre-determined rate⁵. Over /Under absorption arises when the overheads absorbed is more/less than the actual overheads incurred.

In this module, the elements of cost (material cost, employee/ labour cost and direct expenses) that are traceable to the products/ service are taken up for discussion in sections 2.1, 2.2 and 2.3 respectively. In section 2.4, the process of allocation, apportionment and absorption of overheads costs to the cost objects and cost units is discussed in details. It is important to note that the provision of the below mentioned cost accounting standards are predominantly⁶ relevant for the purpose of conceptualising the various elements of cost:

Production and Operation Overheads	CAS 3
Material Cost	CAS 6
Employee Cost	CAS 7
Direct Expenses	CAS 10
Administrative Overheads	CAS 11
Selling and Distribution Overheads	CAS 15

4. Absorption costing is a costing system that is used in valuing inventory. It not only includes the cost of materials, labour and direct expenses, but also overheads costs (both variable and fixed manufacturing). Absorption costing is also referred to as full costing. (<https://corporatefinanceinstitute.com/resources/knowledge/accounting/absorption-costing-guide/>). The main advantage of using the method is that it is GAAP-compliant. It is required in preparing reports for financial statements and stock valuation purposes. AS 2 (Valuation of inventories) specifically includes 'Other costs which are incurred in bringing the inventories to their present location and condition', 'Other expenditure which is directly attributable to the purchase' and 'Trade discounts, rebates, duty drawbacks and other similar items are deducted in determining the costs of purchase'. Thus it is obvious that AS 2 recommends absorption costing system for valuation of inventories.

5. This, along with the issue of under/over absorption is discoursed in Module 1 of this study note and is also discussed in detail in the last section of this module.

6. There are other CAS which are also relevant for the purpose.

Material Costs

2.1

Material cost⁷ is the cost of materials used to manufacture a product or provide a service. Material is the most important element of cost. In most manufacturing organisations, 50% to 70% of the total cost of a product is represented by the cost of the material. The percentages may differ from industry to industry. Especially for manufacturing sector, the material costs are of great significance. Inventory also constitutes a vital element in the working capital. So, it is conceptually equivalent to cash. Materials, as such, are the substances that are transformed into finished goods. Materials costs may be either direct or indirect.

● **Direct Materials** – There are three characteristics of direct materials:

1. They are traceable to the cost unit.
2. They represent a major element of the finished product cost.
3. They can be identified directly with production of the product.

Paragraph 4.7.1 of CAS 6 defines direct material as materials the costs of which can be attributed to a cost object in an economically feasible way.

Examples may include cotton used for spinning cotton yarn, wood used in making furniture, or leather used in shoe-making.

● **Indirect Materials** – These include all other materials used in production (for example: nails in furniture manufacturing) and are considered to be a factory overheads cost⁸.

Paragraph 4.7.2 of CAS 6 defines indirect material as materials, the costs of which cannot be directly attributed to particular cost object.

Material Control

Since material cost comprises a significant portion of the total cost of the product, it requires control. Material control may be defined as a system which ensures availability of the required quantity of material of proper quality at the proper time without unnecessarily blocking up of capital in stores. The system of material control should be so comprehensive that it covers the whole procedure from the point when order is placed with the suppliers up to the stage until the materials are consumed in production. In general, to effectively control materials, a business must maintain: (1) limited access, (2) segregation of duties, and (3) accuracy in recording. Some authors define material control as a management activity that administers how the inventory employed in the production process

7. This is discussed in CAS 6, issued by the Council of the Institute of Cost Accountants of India.

8. This is discussed in section 2.4 of this module.

is procured, handled and utilized. It is a process that requires planning, organisation and auditing of all the elements employed in certain productive activity. Materials control is based on (1) the physical control or safeguarding of materials and (2) control over the investment in materials.

The two important aspects of material control are:

1. To ensure the smooth flow of production without interruptions.
2. Prevention of excessive investments in materials stock.

In the below mentioned lines the objectives of material control are discussed.

Objectives of Material Control: The following steps have to be taken to see that there is no inefficiency as regards materials:

- ◉ **Availability:** The various materials and stores⁹ necessary for carrying on production smoothly should always be available. This means not only ensuring supplies of the main raw materials and the chief stores which are required but also of small and inexpensive but necessary materials. For example, in a cotton textile mill supplies of cotton and coal will always be looked after, but it is also necessary that the proper lubricating oil for machines is also always available. Stoppage of production due to any reason is very costly and the person in charge of supply of materials and stores must see to it that production is not interrupted for want of any item of materials and stores.
- ◉ **Proper quality and price:** While purchasing the materials and stores, care should be taken to see that the requisite quality of materials is purchased and that the price paid is reasonably low. It is no use purchasing goods of inferior quality or of very superior quality.
- ◉ **Minimum wastage:** While various materials are being stored in the godowns, the loss or damage of various items must be kept as low as possible. The losses usually are pilferage or damage due to rust, dust, dirt or water. All these losses must be thoroughly kept under control.
- ◉ **No overstocking:** Investment in stocks of materials and stores must be kept as low as possible. This means that unnecessarily large stocks must not be maintained.
- ◉ **Information about availability of stocks:** Information must be continuously available regarding stock. This will ensure proper planning of work and also replenishment on time.
- ◉ **Minimum loss during process:** While the materials are being used in the factory the wastage must be kept at the minimum possible level. Some wastage is bound to be there, but efficiency demands that the wastage must not be allowed to go above the minimum level.

From the above mentioned objectives, the importance of material control can be stated as follows (represented pictorially)

9. The term 'Stores' is often used synonymously with materials, however, stores has a wider connotation covers not only raw materials consumed or utilized in production but also such other items as sundry supplies, maintenance stores, fabricated parts, components, tools, jigs, other items, consumables, lubricants etc. Finished and partly finished products are also often included under the term 'Stores'.

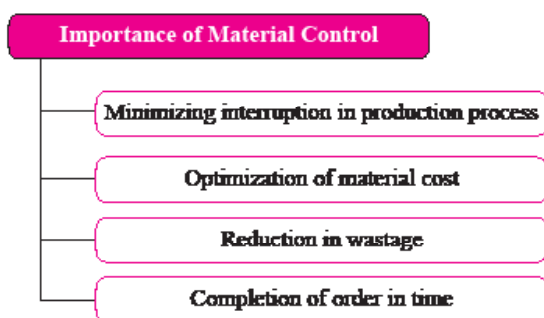


Figure 2.1: Importance of Material Control

The following are the requisites of material control system:

1. Coordination and cooperation between the various departments concerned viz purchase, receiving, inspection, storage, issues and accounts and cost departments.
2. Use of standard forms and documents in all the stages of control.
3. Classification, coordination, standardization and simplification of materials.
4. Planning of requirement of material.
5. Efficient purchase organisation.
6. Budgetary control of purchases.
7. Planned storage of materials, physical control as well as efficient book control through satisfactory storage control procedures, forms and documents.
8. Appropriate records to control issues and utilization of stores in production.
9. Efficient system of internal audit and internal checks.
10. System of reporting to management regarding material purchase, storage and utilization.

There are three broad areas where material control can be implemented:

1. Purchase and receipt
2. Stores and
3. Issue of material

This is pictorially represented as follows:

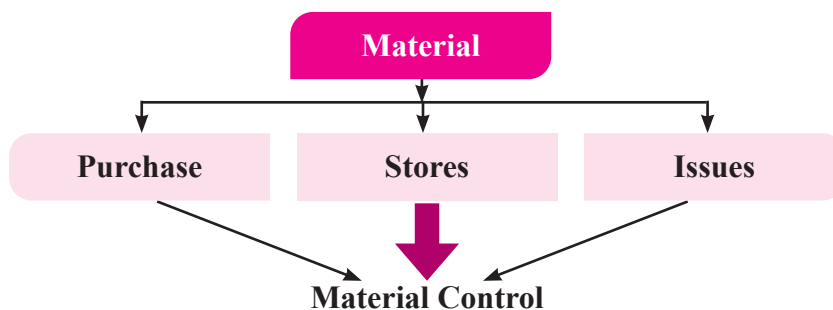


Figure 2.2: Implementation Areas of Material Control

Thus, the first aspect where material control can be effected is procurement of material (purchase) which is taken up in the following lines.

2.1.1 Procurement of Materials

The crucial function of procurement of material lies with the purchase department. Before proceeding with the function the manager in charge of purchase along with other top management personnel would have to be clear about a set of questions which are mentioned as below:

1. What to purchase? – Right Material with good quality
2. When to purchase? – Right Time
3. Where to purchase? – Right Source
4. How much to purchase? – Right Quantity
5. At what price to purchase? – Right Price

Purchase Function:

As such, purchasing involves procurement of materials of requisite quantity and quality at economic price. It is of extreme importance particularly to a manufacturing concern because it has bearing on all vital factors of manufacture such as quantity, cost, efficiency, economy, prompt delivery, volume of production and so on.

The purchase function in an organisation can be categorized either as centralized purchasing system or decentralized purchasing system. Purchasing process in most of the organisation is a centralized function because the advantages of a centralized purchasing outweighs its disadvantages.

Feature	Centralized Purchase	Decentralized Purchase
Decision-Making Authority	Centralized authority makes decisions and controls purchases.	Decision-making authority is distributed among various departments or units.
Efficiency	Streamlined processes can lead to increased efficiency and cost savings.	May have more flexibility but could result in duplication of efforts and potential inefficiencies.
Communication	Clear communication channels due to a single authority overseeing purchases.	Communication may be more complex, with different departments managing their own purchasing.
Volume Discounts	Centralized purchasing may leverage bulk buying for better volume discounts.	Decentralized purchasing may miss out on volume discounts due to smaller, scattered orders.
Customization	Limited customization options as decisions are made centrally.	Departments have more autonomy for customization based on specific needs.
Adaptability	May be slower to adapt to changes as decisions need to go through a central authority.	Can be more adaptable to the specific needs of different departments or units.
Supplier Relationships	Centralized purchasing can build stronger relationships with suppliers.	Decentralized purchasing may lead to diverse supplier relationships across departments.
Cost Control	Easier to control costs through centralized monitoring and analysis.	May face challenges in controlling costs due to dispersed decision-making.

It's important to note that the choice between centralized and decentralized purchasing depends on the specific needs, size, and structure of the organization. Some organizations may even adopt a hybrid approach, combining elements of both centralized and decentralized purchasing to balance efficiency and autonomy.

Documentation

Below listed is a set of documents which enables procurement function of the purchase department:

1. Bill of Material

Bill of Material is a complete schedule of parts and materials required for a particular order prepared by the drawing office and issued by it together with necessary blue prints of drawings. For standard products, printed copies of bill of material are kept with blank spaces for any special details of modification to be filled in for a particular job / order. The schedule details everything, even to bolts and nuts, sizes and weights. The documents solve a number of useful purposes, such as:

- It provides a quantitative estimate of budget of material required for a given job, process or operation which might be used for control purposes.
- It substitutes material requisitions and expedite issue of materials.
- The store keeper can draw up a programme of material purchases and issue for a given period.
- It provides the basis for charging material cost to the respective job / process.

The specimen form of Bill of Material is shown below:

Modern Ltd										
Bill of Materials										
No.....						Order No.....				
Date.....						Job No.....				
						Assembly drawing no.....				
Component Parts			Materials			For use of purchase dept.				
Symbol No.	Description	No. reqd.	Description	Code No.	Qty. Reqd.	Date	Regn. No.	Order No.	Date of Delivery	Remarks
Purchase dept. copy	Date of order Delivery		Prepared by:			Purchase order given by:				
			Checked by:							

2. Material Requisition Note

Material Requisition Note is a document issued by a department in charge requesting the storekeeper to issue certain materials to a job or standing order number. It is an important document as it authorises issue of materials from stores and thereby should be authenticated by appropriate authority. It forms the basis of crediting the marginal account in the stores ledger as the materials are taken out on the strength of such documents. The corresponding debit to work in progress account for job account for standing order number is also made on the basis of such documents. The document enables the accounts department to value the issue of the materials to find out the cost of materials issued. The storekeeper uses this to check total item wise issues made by him during a certain period by adding up the details of issue from this document.

3. Purchase Requisition

Purchase Requisition Note is a request made to the Purchase Department to procure materials of given description and of the required quality and quantity within a specified period. It is a formal request and it authorises the purchase department to issue a purchase order to secure materials intended for periodic requirements to provide guidance to the purchase department to estimate the future requirements in order to secure maximum purchase benefits in the form of higher discount and better credit terms. The extent and range of materials requirements provide a basis for preparation of purchase budget. The actual requirements of a given period can be summarised from the purchase requisition and compared with the purchase budget in order to determine the variances and reason thereof. This form is prepared by storekeeper for regular items and by the departmental head for special materials not stocked as regular items.

The purchase requisition is prepared in three copies. Original will be sent to purchase department, duplicate copy will be retained by the indenting (request initiating) department and the triplicate will be sent to approver for approving the purchase requisition.

Purchase Requisition provides the three basic things:

- What type of material is to be purchased?
- When to be purchased?
- How much is to be purchased?

The specimen form of Purchase Requisition is as shown below:

Modern Ltd					
Purchase Requisition or Indent					
Purchase Req. Type: Special / Regular:					
Purchase Req. No:			Purchase Requisition Date:		
Department:					
S. No.	Material Code	Description of the Goods	Quantity Required	Material Required by date	Remarks
Requested by			Approved by		
For use in Purchase Department Quotations from (1) PO Placed: Yes / No (2) PO No: (3)					

A number of factors should be considered before deciding from where the purchase should be made viz. inquiry and call for tenders or quotations, analysis of tenders called, selection of the appropriate source with appropriate fixation of price, quality, time of delivery, terms of payment, mode of delivery, etc.

4. Purchase Order

Purchase Order (PO) is a request made in writing to selected supplier to deliver goods of requisite quality, quantity, (as per the purchase requisition) at the prices, terms and conditions agreed upon. It is a commitment on the part of the purchaser to accept the delivery of goods contained in the Purchase Order if the terms included therein, are fulfilled. Purchase Order contains the following details:

(a) Purchase Order No; (b) PO Date; (c) Supplier Name and Address; (d) Material Code; (e) Material description; (f) Grade and Other particulars of the material; (g) Quantity to be supplied; (h) Price; (i) Place of delivery; (j) Taxes; (k) Terms of Payment (Credit period) etc.

Usually, a purchase order is made in five copies, one each for suppliers, Receiving / Stores Department, Originating Department, Accounts Department and filing. Thus, all the concerned departments with the materials are informed fully about all the details of every purchase and it becomes easier for everyone to follow up on any relevant matter.

The Specimen form of Purchase Order is as shown below:

Modern Ltd							
Purchase Order							
To							
Supplier_____				PO No:			
Address				PO date:			
				Quotation Reference:			
				PR No.			
Please supply the following items in accordance with the instructions mentioned therein on the following terms and conditions.							
S. No.	Material Code	Material Description	Quantity	Rate per unit	Amount	Delivery Date	Remarks
Packing and Freight							
Taxes							
Total Amount							
Delivery: Goods to be delivered at							
Delivery date:							
Payment terms:							
Authorised Signatory							

5. Goods Received cum Inspection Note

The stores department will receive the material after the gate entry. It will compare the quantities received with the PO Quantity. It is a valuable document as it forms the basis of accounting entry in the stores ledger and stock records. It is the document basis for quality control department to carry inspection of the material in warded.

It also forms the basis of payments to be made to the supplier in respect of the materials supplied by him. Supplier's invoices are checked with goods received notes for actual receipt of the goods supplied by the supplier. One copy of such note is also sent to inspection department who after inspection of materials approves the notes for stores department to receive the materials. Outstanding goods received notes which are not linked with supplier's bills enable the accounts department to estimate at the year end the liability for goods purchased for which supplier's bills not received.

The specimen of the Goods Received cum Inspection Note as below:

New India Ltd							
Goods Received cum Inspection Note							
Received from:				GRN No:			
				GR Date:			
Received at:				PO Ref. No:			
				Gate Entry No:			
S. No.	Material Code	Material Description	Quantity Received	Quantity Accepted	Quantity Rejected	Reason for Rejection	Remarks
Prepare by				Inspected by			
Received by				Storekeeper			

6. Material Transfer Note

Material Transfer Note is a document used for transferring the material from one department to other department or one site to other site or one job to other job. The need for Material Transfer Note arises under the following conditions:

- a. Great urgency for such materials as normal procedure for requisitioning the materials may result in delay in completion of the job.

- b. Where two jobs are being executed side by side or very near to each other and stores department is situated at a great distance, adoption of normal procedure for requisitioning the materials may mean unnecessary expenditure in handling and transportation, especially in cases of heavy materials.
- c. Frequent shifting of materials (for returning to stores and for re-issue) may result in wastage or breakage.
- d. If the goods are of perishable nature (e.g., Vegetable or Fruits) and refrigeration may not keep them fresh for a long time.

7. Material Return Note

At times materials have to be returned to the suppliers after these are received in the factory. If the return takes place before the preparation of Goods Received Note, such materials will not be included and shown in the stores ledger. However, if the material is returned after the entry into the Goods Received Note, a document called “Material Return Note” will be prepared simultaneously to exclude the quantity and value of the returned material from the stores ledger.

Purchase Quantity

Important requirement for an efficient system of purchase control is to ensure that only the correct quantity of materials is purchased. The basic factors to be considered while fixing the ordering quantity are as follows:

- a. There should be no overstocking.
- b. Materials should always be available in sufficient quantity to meet the requirements of production and to avoid plant shut down.
- c. Purchases should be made in economic lots.

Other factors to be considered are quantity already ordered, availability of funds, business cycle etc.

Purchase department in manufacturing concerns is usually faced with the problem of deciding the quantity of various items, which they should purchase basing on the above factors. If purchases of material are made in bulk, then inventory cost will be high. On the other hand, if the order size is small each time, then the ordering cost will be very high. In order to minimize ordering and carrying cost it is necessary to determine the order quantity which minimizes these two costs. Thus Economic Order Quantity (EOQ) should be determined.

Economic Order Quantity (EOQ)

The total costs of a material usually consist of Buying Cost + Total Ordering Cost + Total Carrying Cost.

Economic Order Quantity is ‘The size of the order for which total cost of material is minimum’.

Ordering Cost: The costs which are associated with the ordering of material. It includes cost of staff posted for ordering of goods, expenses incurred on transportation, inspection expenses of incoming material etc.

Carrying Cost: The costs for holding the inventories. It includes the cost of capital invested in inventories. Cost of storage, insurance etc.

The calculation of economic order of material to be purchased is subject to the following assumptions:

- i. Ordering cost per order and carrying cost per unit per annum are known and they are fixed.
- ii. Anticipated usage of material in units is known.
- iii. Cost per unit of the material is constant and is known as well.
- iv. The quantity of material ordered is received immediately i.e., lead time is zero.

The famous mathematician 'WILSON' derived the formula for determining the size of order for each purchase at which total material cost is minimum.

$$\text{Economic Order Quantity} = \sqrt{\frac{2AO}{C}}$$

where, A = Annual demand / consumption

O = Ordering Cost per Order

C = Carrying Cost per unit per annum

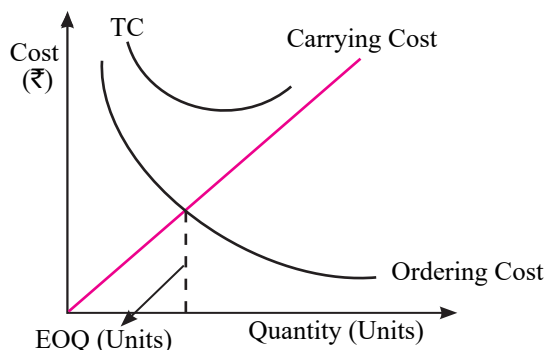


Figure 2.3: Graphical representation of EOQ

2.1.2 Inventory Management and Control

Material Storage and Control

Once the material is received, it is the responsibility of the stores in charge, to ensure that material movements in and out of stores are done only against the authorised documents. Stores in charge is responsible for proper utilization of storage space and exercise better control over the material in the stores to ensure that the material is well protected against all losses as theft, pilferage, fire, misappropriation etc.

Different classes of stores

Broadly speaking, there are three classes of stores:

1. Centralized Stores

The usual practice in most of the concerns is to have a central store. Separate store to meet the requirements of each production department are not popular because of the heavy expenditure involved. In case of centralized stores materials are received by and issued from one store department. This enables better control, supervision and vigilance. All materials are kept at one central store. However central storage involves high transportation cost, chances of loss in transit and delay in receipt of stores by the departments.

2. Decentralized stores

Under this type of stores, independent stores are situated in various departments. Handling of stores is undertaken by the store keeper in each department. The departments requiring stores can draw them from their respective stores situated in their departments. The disadvantages of centralized stores can be eliminated, if there are decentralized stores. But these types of stores are uncommon because of heavy expenditure involved.

3. Central stores with sub-stores / Imprest Stores

In large organisation, factories / workshops may be located at different places which are far from the central stores. So, in order to keep the transportation costs and handling charges to the minimum level, sub-stores are situated near to the factory. For each item of materials, a quantity is determined and this should be kept in the stock at the beginning of any period. At the end of a period, the store keepers of each sub-store will requisition from the central stores the quantity of the materials consumed to bring the stock up to the predetermined quantity. In short, this type of stores operates in a similar way to a petty cash system, so this system of stores is also known as the imprest system of stores control.

Classification and Codification of Material

In case of large organisations, the number and types of materials used is considerable and unless each item is distinguished and stored separately it would be impossible to find them out when they are required for production or any other operation. It may happen that either one type of material is in excess or another type may be altogether non-existent. It is therefore, essential that a proper system of classification and codification is developed.

For example, material can be Classified into different categories according to their nature or type, viz., mild steel, tool steel, brass, bronze, copper, glass, timber, etc., and then again within such broad classification into rounds, bars, strips, angles, etc. There are two steps in the classification and codification of materials – determination of the number of items, their nature, other characteristics and classification of items of comparable nature or type into suitable groups or classes.

Various classes of coding are in practice and the common types are stated below:

- i. **Alphabetical Scheme:** Alphabets are only used for codification. Like Mild Steel Sheets are coded as MSS.
- ii. **Numeric Scheme:** In this scheme numericals are used instead of alphabets. For example, if steel is given main code of 300, mild steel may be coded as 310 and mild steel sheet may be coded as 311, mild steel bar may be coded as 312.
- iii. **Decimal Scheme:** It is similar to the numeric scheme in which the groups are represented by number and digits after the decimal indicate sub-groups of items. For example, where the steel is coded as 3.00 mild steel may be coded as 3.10 and mild steel sheet can be coded as 3.11 and mild sheet bar as 3.12 and so on.
- iv. **Block Scheme:** In this case block of number are allotted for classification of specific groups such as for material classification the block of number 1 to 999 may be reserved, for raw materials; 1000 to 1999 for stores and spares; 2000 to 2999 for finished goods.
- v. **Combination Scheme:** Here the code structure takes in account both alphabetic and numeric schemes and strikes a balance between the two. Mild steel coded as MS and the sheets, bars, strips, rounds of mild steel may be coded as MS01, MS02, MS03 and so on. This code is most commonly used because this system has got the advantage of both the alphabetic and numeric systems and is quite flexible in nature.

Advantages of Classification and Codification

- i. The procedure assists in the easy identification and location of the materials because of their classification.
- ii. It minimizes the recording of the nature / type of the materials with detailed description on every document relating to the transaction of materials.
- iii. Codification is a must in the case of mechanization of the stores accounting.
- iv. The method is simple to operate and definitely saves time and money in respect of both physical location / identification of materials as well as recording of the materials.

After the material classification and codification is done for all the materials, for each material code, minimum level, maximum level, re-order level and re-order quantity is to be fixed. It is the storekeeper's responsibility to ensure that inventory of any material is maintained between the minimum level and maximum level.

Maximum Level

The maximum level indicates the maximum quantity of an item of material that can be held in stock at any time. The stock in hand is regulated in such a manner that normally it does not exceed this level.

While fixing the level, the following factors are to be taken into consideration:

- i. Maximum requirement of the store for production purpose, at any point of time.
- ii. Rate of consumption and lead time.
- iii. Nature and properties of the store: for instance, the maximum level is necessarily kept low for materials that are liable to quick deterioration or obsolescence during storage.
- iv. Storage facilities that can be conveniently spared for the item without determinant to the requirements of other items of stores.
- v. Cost of storage and insurance.
- vi. Economy in prices: for seasonal supplies purchased in bulk during the season, the maximum level is generally high.
- vii. Financial considerations: Availability of funds and the price of the stores are to be kept in view. For costly items, the maximum level should be as low as possible. Another point to be considered is the future market trend. If prices are likely to rise, the concern may like large stock in reserve for long term future uses and in such a case, the level is pushed up.
- viii. Maximum level will depend on the Rules framed by the government for import or procurement. If due to these and other causes materials are difficult to obtain and supplies are irregular the maximum level should be set high.
- ix. The maximum level is also dependent on the economic ordering quantity.

$$\text{Maximum Level} = \text{Re-Order Level} + \text{Re-Order Quantity} - \left(\frac{\text{Minimum Rate of Consumption} \times \text{Minimum Re-Order Period}}{\text{Minimum Re-Order Period}} \right)$$

Minimum Level

The minimum level indicates the lowest of an item of material which must be maintained at all times so that there is no stoppage of production due to the material being not available. In fixing the minimum level, the following factors are to be considered:

- i. Nature of the item: For special material purchased against customer's specific orders, no minimum level is necessary. This applies to other levels also.
- ii. The minimum time required for replenishing supply. This is known as the lead time and are defined as the anticipated time lag between the dates of issuing orders and the receipts of materials. Longer the lead time, lower is minimum level, the re-order point remaining constant.
- iii. Rate of consumption (normal, minimum or maximum) of the material.

$$\text{Minimum Level} = \text{Re-Order Level} - (\text{Normal Rate of Consumption} \times \text{Normal Re-Order Period})$$

Re-Order Level

It is at the re-ordering level that the store keeper has to initiate the action to replenish the material. This level is fixed somewhere between the maximum and minimum levels in such a manner that the difference of quantity of the material between the Re-Ordering Level and Minimum Level will be sufficient to meet the requirements of production up to the time the fresh supply of materials is received.

The basic factors which are taken into consideration in fixing a Re-Ordering Level for a store item include minimum quantity of item to be kept, rate of consumption and lead time which are applied for computing of this level.

$$\begin{aligned}
 \text{Re-Ordering Level} &= \text{Minimum Level} + (\text{Normal Rate of Consumption} \times \text{Normal Re-Order Period}) \\
 &\text{or} \\
 &= \text{Minimum Level} + \text{Consumption during Lead Time} \\
 &\text{or} \\
 &= \text{Maximum Rate of Consumption} \times \text{Maximum Re-Order Period (Lead Time)}
 \end{aligned}$$

Danger Level

It is the level at which normal issue of raw materials are stopped and only emergency issues are only made. This is a level fixed usually below the minimum level. When the stock reaches this level very urgent action for purchases is indicated. This presupposes that the minimum level contains a cushion to cover such contingencies. The normal lead time cannot be afforded at this stage. It is necessary to resort to unorthodox hasty purchase procedure resulting in higher purchase cost.

The practice in some firms is to fix danger level below the Re-Ordering Level but above the minimum level. In such case, action for purchase of an item is taken when the stock reaches the re-ordering level, the danger level is of no significance except that a check with the purchases department may be made as soon as the danger level is reached to ensure that everything is all right and that delivery will be made on the scheduled date.

$$\text{Danger Level} = \text{Normal Rate of Consumption} \times \text{Maximum Re-Order Period for emergency purchases}$$

Perpetual Inventory System

Perpetual inventory system may be defined as 'a system of records maintained by the controlling department, which reflects the physical movements of stocks and their current balance'. Thus, it is a system of ascertaining balance after every receipt and issue of materials through stock records to facilitate regular checking and to avoid closing down the firm for stock taking. To ensure the accuracy of the perpetual inventory records (bin card and stores ledger), physical verification of stores is made by a programme of continuous stock taking.

Continuous Stock Taking is an essential feature of perpetual inventory system, which involves only the physical verification of the stock records with actual stocks.

In continuous stock taking, physical verification is spread throughout the year. Everyday 10 to 15 items are taken at random by rotation and checked so that the surprise element in stock verification may be maintained and each item may be checked for a number of times each year. On the other hand, the surprise element is missing in case of periodical checking, because checking is usually done at the end of the year. Continuous stock taking system constantly monitors inventory levels in real-time. Whereas, periodic stock taking conducts periodic physical counts of inventory at specific intervals.

ABC Analysis

ABC analysis, also known as Pareto analysis, is a technique used in inventory management to categorize items based on their significance.

The analysis is named after the Pareto Principle, which states that roughly 80% of the effects come from 20% of the causes. In the context of inventory management, it means that a small percentage of items often contribute to a significant portion of the total value.

Under this system, the materials stocked may be classified into a number of categories according to their importance, i.e., their value and frequency of replenishment during a period. The first category (also known as group 'A' items) may consist of only a small percentage of total items handled but combined value may be a large portion of the total stock value. The second category, naming it as group 'B' items, may be relatively less important. In the third category, consisting of group 'C' items, all the remaining items of stock may be included which are quite large in number but their value is not high.

This concept may be clear by the following example:

Category	No. of Items	% of the Total No. of Items	Value Amount (₹)	% of the Total Value Item	Average Value Amount (₹)
A	75	6	70,000	70	933.33
B	375	30	20,000	20	53.33
C	800	64	10,000	10	12.50
	1,250	100	1,00,000	100	

Category 'A' items represent 70% of the total investment but as little as only 6% of the number of items. Maximum control must be exercised on these items. Category 'B' is of secondary importance and normal control procedures may be followed. Category 'C' comprising of 64% in quantity but only 10% in value, needs a simpler, less elaborate and economic system of control.

Advantages of ABC Analysis:

- Closer and stricter control of those items which represent a major portion of total stock value is maintained.
- Investment in inventory can be regulated and funds can be utilized in the best possible manner. 'A' class items are ordered as and when need arises, so that the working capital can be utilized in a best possible way.
- With greater control over the inventories, savings in material cost will be realised.
- It helps in maintaining enough safety stock for 'C' category of items.
- Scientific and selective control helps in the maintenance of high stock turnover ratio.

VED Analysis

VED analysis is a technique used in inventory management to categorize items based on their criticality and importance in the production or operational processes. The acronym VED stands for Vital, Essential, and Desirable. This analysis helps organizations prioritize their efforts in managing inventory, especially when it comes to spare parts or materials needed for production.

Vital – The spares, stock-out of which even for a short time will stop the production for quite some time, and where in the stock-out cost is very high are known as Vital spares. For a car assembly company, ‘Engine’ is a vital part, without the engine the assembly activity will not be started.

Essential – The spares or material absence of which cannot be tolerated for more than few hours or a day and the cost of lost production is high and which is essential for production to continue are known as Essential items. For a car assembly company ‘Tyres’ is an essential item, without fixing the tyres the assembly of car will not be completed.

Desirable – The Desirable spares are those parts which are needed, but their absence for even a week or more also will not lead to stoppage of production. For example, CD player, for a car assembly company.

Some spares though small in value, may be vital for production, requires constant attention. Such spares may not attract attention to if the organisation adopts ABC analysis.

FSN Analysis

FSN analysis is another inventory management technique used to classify items based on their usage patterns. The acronym FSN represents Fast-moving, Slow-moving, and Non-moving items. This analysis helps organizations understand the velocity or movement of items within their inventory, allowing for better decision-making in terms of stock control and procurement.

Just-in-Time (JIT)

Just-In-Time (JIT) is a production and inventory management philosophy that originated in Japan and is widely used in manufacturing and other industries. The primary goal of JIT is to produce or deliver goods at the exact time they are needed, eliminating excess inventory and minimizing waste. The JIT inventory system focuses on “the right material, at the right time, at the right place, and in the exact amount” without the safety net of inventory.

Advantages

- i. Increased emphasis on supplier relationship. A company without inventory does not want a supply system problem that creates a part shortage. This makes supplier relationships extremely important.
- ii. Supplies come in at regular intervals throughout the production day. Supply is synchronized with production demand and the optimal amount of inventory is on hand at any time. When parts move directly from the truck to the point of assembly, the need for storage facilities is reduced.
- iii. Reduces the working capital requirements, as very little inventory is maintained.
- iv. Minimizes storage space.
- v. Reduces the chance of inventory obsolescence or damage.

Inventory Turnover Ratio

Inventory turnover signifies a ratio of the value of materials consumed during a given period to the average level of inventory held during that period. The ratio is worked out on the basis of the following formula:

$$\text{Inventory Turnover Ratio} = \frac{\text{Value of material consumed during the period}}{\text{Value of average stock held during the period}}$$

The purpose of the above ratio is to ascertain the speed of movement of a particular item. A high ratio indicates that the item is moving fast with a minimum investment involved at any point of time. On the other hand, a low ratio indicates the slow moving item. Thus, inventory turnover ratio may indicate slow moving dormant and obsolete stock highlighting the need for appropriate managerial actions.

2.1.3 Inventory Accounting & Valuation

Valuation of Material Receipts

Principles of valuation of receipt of materials as per CAS – 6 are as follows:

1. The material receipt should be valued at purchase price including duties and taxes, freight inwards, insurance and other expenditure directly attributable to procurement (net of trade discounts, rebates, taxes and duties refundable or to be credited by the taxing authorities) that can be quantified with reasonable accuracy at the time of acquisition.
2. Finance costs incurred in connection with the acquisition of materials shall not form part of material cost.
3. Self manufactured materials shall be valued including direct material cost, direct employee cost, direct expenses, factory overheads, share of administrative overheads relating to production but excluding share of other administrative overheads, finance cost and marketing overheads. In case of captive consumption, the valuation shall be in accordance with Cost Accounting Standard 4.
4. Spares which are specific to an item of equipment shall not be taken to inventory, but shall be capitalized with the cost of the specific equipment. Cost of capital spares and / or insurance spares, whether procured with the equipment or subsequently, shall be amortised over a period, not exceeding the useful life of the equipment,
5. Normal loss or spoilage of material prior to reaching the factory or at places where the services are provided shall be absorbed in the cost of balance materials net of amounts recoverable from suppliers, insurers, carriers or recoveries from disposal.
6. Losses due to shrinkage or evaporation and gain due to elongation or absorption of moisture etc., before the material is received shall be absorbed in material cost to the extent they are normal, with corresponding adjustment in the quantity.
7. The forex component of imported material cost shall be converted at the rate on the date of the transaction. Any subsequent change in the exchange rate till payment or otherwise shall not form part of the material cost.
8. Any demurrage or detention charges, or penalty levied by transport or other authorities shall not form part of the cost of materials.
9. Subsidy / Grant / Incentive and any such payment received / receivable with respect to any material shall be reduced from cost for ascertainment of the cost of the object to which such amounts are related.

Valuation of Material Issues

Principles of valuation of issue of materials as per CAS – 6 are as follows:

1. Issues shall be valued using appropriate assumptions on cost flow.
E.g., First In First Out, Last In First Out, Weighted Average Rate.

The method of valuation shall be followed on a consistent basis.

2. Where materials are accounted at standard cost, the price variances related to materials shall be treated as part of material cost.
3. Any abnormal cost shall be excluded from the material cost.
4. Wherever, material costs include transportation cost, determination of costs of transportation shall be governed by CAS 5 – Cost Accounting Standard on Determination of Average (Equalized) Cost of Transportation.
5. Material cost may include imputed costs not considered in financial accounts. Such costs which are not recognized in financial accounts may be determined by imputing a cost to the usage or by measuring the benefit from an alternate use of the resource.
6. Self manufactured components and sub-assemblies shall be valued including direct material cost, direct employee cost, direct expenses, factory overheads, share of administrative overheads relating to production but excluding share of other administrative overheads, finance cost and marketing overheads. In case of captive consumption, the valuation shall be in accordance with Cost Accounting Standard 4.
7. The material cost of normal scrap / defectives which are rejects shall be included in the material cost of goods manufactured. The material cost of actual scrap / defectives, not exceeding the normal shall be adjusted in the material cost of good production. Material Cost of abnormal scrap / defectives should not be included in material cost but treated as loss after giving credit to the realisable value of such scrap / defectives.

Materials issued from stores should be priced at the price at which they are carried in inventory. Material may be purchased from different suppliers at different prices in different situations, where as consumption the entire inventory may happen at a time or at different lots etc. So, issue of materials should be valued after considering the following factors:

- a. Nature of business and production process.
- b. Management policy relating to the closing stock valuation.
- c. Frequency of purchases and price fluctuations.

Several **methods of pricing of material issues** have been evolved; these may be classified into the following:

Cost Price Method

- i. First in First Out
- ii. Last in First Out
- iii. Base Stock Method

Specific price method

- i. Average Price Method
- ii. Simple Average Price Method
- iii. Weighted Average Price Method
- iv. Moving Simple Average Method
- v. Moving Weighted Average Method

Market Price Methods

- i. Replacement Method
- ii. Realisable Price Method

Notional Price Methods

- i. Standard Price Method
- ii. Inflated Price Method

Brief discussion of the above methods is as follow:

1. First in First Out Method (FIFO Method)

It is a method of pricing the issue of materials in the order in which they are purchased. In other words, the materials are issued in the order in which they arrive in the store. This method is considered suitable in times of falling price because the material cost charged to production will be high while the replacement cost of materials will be low. In case of rising prices this method is not suitable.

2. Last in First Out Method (LIFO Method)

Under this method the prices of last received batch (lot) are used for pricing the issues, until it is exhausted and so on. During the inflationary period or period of rising prices, the use of LIFO would help to ensure the cost of production determined approximately on the above basis is approximately the current one. Under LIFO stocks would be valued at old prices, but not represent the current prices.

3. Base Stock Method

A minimum quantity of stock under this method is always held at a fixed price as reserve in the stock, to meet a state of emergency, if arises. This minimum stock is known as Base Stock and is valued at a price at which the first lot of materials is received and remains unaffected by subsequent price fluctuations. The quantity in excess of the base stock may be valued either on the LIFO basis or FIFO basis. This method is not an independent method as it FIFO or LIFO. Its advantages and disadvantages therefore will depend upon the use of the other method.

4. Specific Price Method

This method is useful, especially when the materials are purchased for a specific job or work order, and as such these materials are issued subsequently to that specific job or work order at the price at which they were purchased. The cost of materials issued for production purposes to specific jobs represent actual and correct costs. This method is specific for non-standard products. This method is difficult to operate, especially when purchases and issues are numerous.

5. Simple Average Price Method

Under this method materials are issued at the average price which is calculated by dividing the total of unit purchase prices of different lots in stock on the date of issue by the number of prices used in the calculation and quantity of different lots is not considered.

This method is useful, when the materials are received in uniform lots of similar quantity and prices do not fluctuate considerably.

6. Weighted Average Price Method

This method removes the limitation of Simple Average Price Method in that it also takes into account the quantities which are used as weights in order to find the issue price. This method uses total cost of material available for issue divided by the quantity available for issue.

$$\text{Material Issue Price} = \frac{\text{Total Cost of Materials in Stock}}{\text{Total Quantity of Materials in Stock}}$$

7. Moving Simple Average Price Method

Under this method the rate for material issue is determined by dividing the total of the periodic simple average prices of a given number of periods by the number of periods. For determining the moving simple average price, it is necessary to fix up first period to be taken for determining the average. Suppose a three monthly period is decided upon and moving average rate for the month of April is to be computed. Under such situation, we have to make a simple list of the simple average price from January to March, add them up, and divide the total by three. To compute the moving average for May, we have to omit simple average rate pertains to January and add the rate relating to the April and divide the total by three.

8. Moving Weighted Average Price Method

Under this method, the issue, rate is computed by dividing the total of the periodic weighted average price of a given number of periods by the number of periods.

9. Replacement Method

Replacement price is defined as the price at which it is possible to purchase an item, identical to that which is being replaced or revalued. Under this method, materials issued are valued at replacement cost of the items. Advantage of this method is issue cost reflects the current market price. But the difficulties involved under this method is determination of market price of material before each issue.

10. Realisable Price Method

Realisable price means a price at which the material to be issued can be sold in the market. This price may be more or less than the cost price, at which it was originally purchased.

11. Standard Price Method

Under this method, materials are priced at some predetermined rate of standard price irrespective of the actual purchase cost of the materials. Standard cost is usually fixed after taking into consideration the current price, anticipated market trends. This method facilitates the control of material cost and task of judging the efficiency of purchase department, but it is very difficult to fix the standard price when the prices fluctuate frequently.

12. Inflated Price Method

In case of materials that suffers loss in weight due to natural or climatic factors e.g., evaporation etc the issue price of the materials is inflated to cover up the losses.

Valuation of Work in Progress

Unlike closing stock of finished goods, which is valued at cost or net realisable value, whichever is lower, work in progress is always valued on the basis of cost. The problem arises whether overheads should be included in the cost of work in progress.

There are three ways of valuing work in progress:

a. At prime cost

This is a conservative method of valuation. Overheads are not added to prime cost for valuing work in progress. Consequently, the exclusion of overheads leads to an understatement of costs for the subsequent period, while inflating the cost of production for the current period.

b. Prime Cost plus Variable Overheads

Under Marginal Costing Method, work in progress is valued at prime cost plus variable overheads. Fixed overheads are excluded on the basis that these are period costs and should be recovered from revenue, i.e., sales only.

c. At Total Cost

The valuation is done at full costs inclusive of both variable and fixed overheads. The logic behind this method is that work in progress should carry the proportionate cost of the overheads and cost of production of completed items should not be burdened. This method is most commonly used.

2.1.4 Physical Verification, Slow and Non-moving Stock and Treatment of Losses

Physical verification are of two types: Continuous verification and Periodic verification

Continuous physical verification, also known as perpetual inventory counting, is an inventory management practice where physical counts of items are conducted on an ongoing basis rather than periodically. This approach helps maintain accurate and up-to-date records of inventory levels, providing real-time information about the stock on hand. Continuous physical verification is often used in conjunction with a perpetual inventory system.

Periodic physical verification, also known as periodic inventory counting or periodic stocktaking, is an inventory management practice where physical counts of items are conducted at scheduled intervals. Unlike continuous physical verification, which involves ongoing and frequent counts, periodic physical verification is performed less frequently, such as annually, semi-annually, or quarterly.

Slow and Non-moving Stock and Treatment of Losses

Slow moving stock refers to those inventory items in the godown which has a low turnover ratio and generally varies between 1 to 3. Non-moving stock are those inventory items which has a turnover ratio of less than 1. These items may be purchased to meet emergency purposes. There may be reasons for accumulation of stocks which may result in low turnover ratio such as:

- i. Uncertainty of supply in near future.
- ii. There may be high cost for ordering.
- iii. Availability of stock at cheap price.
- iv. High cost of stock out.

As per Indian Accounting Standard 2 inventories shall be measured at the lower of cost and net realisable value. Net realisable value is the estimated selling price in the ordinary course of business less the estimated cost of completion and the estimated costs necessary to make the sale.

The cost of inventories shall comprise all costs of purchase, cost of conversion and other costs incurred in bringing the inventories to their present location and condition.

Here, a distinction has to be made for slow and non-moving inventories which are lying in stock with reference to their purpose of holding. The inventories which are finished goods and are ready for sale but for some reason or the other the finished goods remained in the godown and were not sold. So, if there is any impairment in the value of those stocks then it will be valued as per the Accounting Standard. If the slow and non-moving stocks are not for sale and have been purchased with an objective of use in the production then the impairment in the value of those stocks shall be ignored for cost accounting purpose.

2.1.5 Scrap, Spoilage, Defectives and Wastage

Abnormal and Normal Wastage of Materials

Wastage may be classified as normal and abnormal according to the circumstances. Normal wastages denote that part of the wastage which is generally bound to arise in a manufacturing processing on account of evaporation, shrinkage of basic raw materials or on account of typical manufacturing process being involved. Usually, such wastage remains within certain normal ratio or percentage of the input.

On the other abnormal wastage is that loss which does not arise in the ordinary course of manufacturing process but is the result of certain adverse circumstances such as power failure, major breakdown of machinery non-availability of the basic raw materials, etc. It is generally not possible to estimate the extent of such wastage before as they are much more than the normal ratio / percentage of loss compared to the input of basic materials.

Since the normal wastage of the materials is an unavoidable and uncontrollable issue, it should be recovered through good production. The cost of such normal wastages will be recovered as production overheads and apportioned on the number of units produced. Necessary, allowance should however be made for any amount which the wastage should realize when it is disposed of. On the contrary, the cost of abnormal wastage should be separately collected and charged off to the costing profit and loss account so as to vitiate the production cost of good units produced.

Waste

This is the residue such a smoke, dust, gases, slag, etc., which arises in course of manufacturing process and practically no measurable sale or utility value. In certain types of processes and operations, some material physically disappears on account of shrinkage, evaporation etc., with the result that the quantity of the output is less than the input. Such wastage is termed invisible waste where the residual instead of fetching any value, creates a problem for its dispose which entails further costs. Special arrangements have to be made for disposal and refuse, effluent, obnoxious gases etc.

Accounting treatment of waste: As waste has practically no value, its accounting is relatively simple. The effect of the waste is to reduce the quantity of output; in order to arrive at the unit cost of the process, operation or job, the total cost of the process, etc., is distributed over the reduced output, i.e., the units of good production only. The cost of abnormal waste, should, however, be excluded from the total cost and charged to the profit and loss account.

The actual waste is observed against standards and periodically reported to the management.

Scrap

This is also in the form of incidental material residue coming out of certain types of manufacturing processes but it is usually in small amounts and has low measurable utility or market value, recoverable without further processing. Numerous examples of scrap may be given; scrap may arise in the form of turnings, borings, trimmings, fillings, shavings etc., from metals on which machine operations are carried out; saw dust and trimmings in the timber industry; dead heads and bottom ends in foundries; and cuttings, pieces, and split in leather industries. Scrap should always be physically available unlike waste which may or may not be present in the form of a residue.

Accounting treatment of scrap is as follows:

a. Sales credited to revenue

In this method, the scrap is not considered a cost, and its value does not appear separately in the cost accounts. Only a quantitative record of the scrap returned to the storeroom from the shops is maintained, and the sale value realized from time to time is credited to the profit and loss account as miscellaneous revenue.

b. Credit to overheads

In this method and in the following method the scrap is assigned a cost. The cost is usually the sale value of the scrap less selling and distribution costs. If the scrap has no ready market but has only utility or use value, and is taken as a credit to manufacturing overheads. The effect of this credit is to reduce the overheads recovery rate. When predetermined overheads rates are in use, it is more expedient to credit an estimated allowance for the scrap instead of the amount of actual scrap.

c. Credit to jobs

The scrap is assigned a cost and is traced to the job which yielded the scrap. This affords a reasonable amount of credit to the jobs and widely different.

d. Transfer to other jobs

Scrap arising in one job may be issued for utilization in another job. Such transfers of scrap from one job to another should be affected through Material Transfer Notes. Alternatively, scrap may be returned to store room and subsequently issued to another job for utilisation. The latter method is more appropriate when some further processing is required on the scrap before it can be utilized for other jobs.

Control of Scrap

Scrap is also an unavoidable residue material arising in the process of manufacture. The basic difference between scrap and waste is that while waste may not have any value, scrap must necessarily have a value, though a comparatively small one. Scrap may be sold or re-used in some process. In some industries, arising of scraps of various types in significant quantities is a regular feature and, in such cases, it would be worthwhile having a proper administrative set-up for control of scrap. A scrap survey committee may be constituted which would be responsible for such matters as:

- i. Classifying the various types of scrap;
- ii. Assessing the quantum of each, and
- iii. Deciding upon the manner of their use or disposal.

Control of scrap should start from the designing stage of the products. At the designing stage, the type, shape and form of materials which all result in the minimum of waste or the least quantity of scrap in manufacturing process are decided. The quantity of scrap resulting from a process also depends upon the manufacturing equipment used and the efficiency of the operative who performs the work. In order to minimize scrap, production should be planned so that the best possible equipment is used and properly trained personnel are employed on the job.

Spoilage

When production does not come up to the standard specifications or quality it has to be rejected outright. The components or materials are so damaged in the manufacturing process that they cannot be brought back to the normal specifications by repairs or reconditioning. Some spoiled work may be sold as seconds but in most cases, the entire production is sold for small value in the form of scrap or treated as waste if it has no market value. Spoilage involves not only loss of materials but also of labour and manufacturing overheads incurred up to the stage when the spoilage incurred.

Accounting and Control of Spoilage

Spoilage arises when the production output is damaged in such a manner and to such an extent that it cannot be used for the original purpose for which it was designed but is to be disposed off in some suitable manner without

further processing. The distinction between scrap and spoiled work is that while normal scrap arises mostly as a result of the processing of materials, spoilage occurs due to some defect in operations or materials which may or may not be inherent in the manufacturing process or operation. Further, scrap has always a relatively low but some definite value, but the value of spoilage may range from low, if it is a waste, to comparatively high values if the spoilage is to be sold as seconds.

Spoilage involves not only the loss of material but also labour and manufacturing overheads.

Treatment of Other Items of Cost

1. Treatment of Packing Cost

Packing materials is of two types – primary and secondary. Primary containers are essential to put the goods in a saleable condition like ink in a bottle, jam in a jar, etc. Secondary containers are required for delivery / transportation like crates etc., they are returnable and reusable.

The cost of primary containers should be charged off as a production overheads and included in production cost. On the other hand, the cost of secondary containers should charge as a selling and distribution overheads. The cost of reusable container should be charged when they could not be used any more due to damage, wear and tear, etc. In some cases, the primary packing materials may be made decorative with a view to promote sales, and in such a case a part of the primary packing materials should be apportioned as a selling cost.

2. Carriage and Cartage Expenses

Carriage and cartage expenses are incurred in the course of movement of materials or goods. Materials may mean direct materials or indirect materials. The treatment of the carriage and cartage expenses differ with the kind of materials / goods transported. The carriage and cartage expenses relating to raw materials are treated as a part of direct materials cost and those relating to distribution of materials or finished goods are treated as distribution overheads. In case where the carriage and cartage are abnormal due to any reason the same is charged off to costing profit and loss account.

3. Treatment of Tools Cost

Tools may be classified as

- i. Large tools and
- ii. Small tools

Large tools are normally capitalized and depreciation charged to factory overheads. For small tools the following treatment may apply:

- a. Capitalization Method: In line with large tools.
- b. Revaluation Method: At the end of the year revaluation for unused life of the tools is made and the difference between original cost and revalued cost is charged as factory overheads.
- c. Write off Method: Whenever, such small tools are issued the department is debited with the cost. Alternatively, the cost of tools issued during a period is accumulated and distributed to various departments based on some suitable basis, such as hours worked

4. Treatment of Discount Allowed by Suppliers for Bulk Purchases

Discounts allowed on purchased are of two types, viz., cash discount, and quantity discount and trade discount. Cash discount is usually allowed for prompt payment and the quantity and trade discount for heavy purchases. The amount of the latter discount is already credited in the invoice and the net landed cost of the material exclusive of the discount is considered as the material cost.

5. Treatment of Variance detected at Stock Trading

If the variances are due to normal causes, i.e., due to normal dry age, shrinkage, evaporation, etc., these are valued at the ruling ledger rates of the items of material concerned and the amount is taken as an item of stores overheads and recovered from production as a percentage of direct material cost consumed. If the variances are due to abnormal causes, viz., theft, fraud, misappropriation etc., these are valued by writing off to costing profit and loss account.

2.1.6 Slow and Non-Moving Stock and Provision for write down of value

Slow moving stock refers to those inventory items in the godown which has a low turnover ratio which generally varies between 1 to 3. Non-moving stock are those inventory items which has a turnover ratio of less than 1. These items may be purchased to meet emergency purposes. There may be reasons for accumulation of stocks which may result in low turnover ratio such as:

- i. Uncertainty of supply in near future.
- ii. There may be high cost for ordering.
- iii. Availability of stock at cheap price.
- iv. High cost of stock out.

As per Indian Accounting Standard 2 inventories shall be measured at the lower of cost and net realisable value. Net realisable value is the estimated selling price in the ordinary course of business less the estimated cost of completion and the estimated costs necessary to make the sale.

The cost of inventories shall comprise all costs of purchase, cost of conversion and other costs incurred in bringing the inventories to their present location and condition.

Here, a distinction has to be made for slow and non-moving inventories which are lying in stock with reference to their purpose of holding. The inventories which are finished goods and are ready for sale but for some reason remained in the godown and were not sold. If there is any impairment in the value of such goods then it will be valued as per the Accounting Standard. If the slow and non-moving stocks are not for sale and have been purchased with an objective of use in the production then the impairment in the value of those stocks shall be ignored for cost accounting purpose.

Illustration 1

Calculate the Economic Order Quantity from the following information. Also state the number of orders to be placed in a year.

Consumption of materials per annum	:	10,000 kg
Order placing cost per order	:	₹ 50
Cost per kg of raw materials	:	₹ 2
Storage costs	:	8% on average inventory

Solution:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

A = Annual Demand (Units Consumed during the year) = 10,000 kg
 O = Ordering Cost per order = ₹ 50
 C = Carrying Cost per unit per annum = ₹ 2 × 8% = ₹ 0.16

$$EOQ = \sqrt{\frac{2 \times 10,000 \times 50}{0.16}} = 2,500 \text{ units}$$

$$\begin{aligned} \text{Number of orders to be placed in a year} &= \frac{\text{Total Consumption of Materials per annum}}{EOQ} \\ &= \frac{10,000}{2,500} = 4 \text{ orders per year} \end{aligned}$$

Illustration 2

The average annual consumption of a material is 18,250 units at a price of ₹ 36.50 per unit. The storage cost is 20% on an average inventory and the cost of placing an order is ₹ 50. How much quantity is to be purchased at a time?

Solution:

$$\begin{aligned} EOQ &= \sqrt{\frac{2 \times 18,250 \times 50}{36.50 \times 20\%}} \\ &= \sqrt{\frac{18,25,000}{7.30}} = 500 \text{ units} \end{aligned}$$

A = Annual Consumption = 18,250 units
 O = Ordering Cost per order = ₹ 50
 C = Carrying Cost per unit per annum = 36.50 × 20% = ₹ 7.30

Illustration 3

The components A and B are used as follows:

Normal usage	300 units per week each
Maximum usage	450 units per week each
Minimum usage	150 units per week each
Re-order Quantity	A 2,400 units; B 3,600 units
Re-order period	A 4 to 6 weeks, B 2 to 4 weeks

Calculate for each component:

(a) Re-order Level; (b) Minimum Level; (c) Maximum Level; (d) Average Stock Level.

Solution:

	Particulars	Component A	Component B
a)	Re-order Level = Maximum Usage × Maximum Re-order period	$450 \times 6 = 2,700$ units	$450 \times 4 = 1,800$ units
b)	Minimum Level = Re-order Level – (Normal Usage × Normal Re-order period)	$2,700 - (300 \times \frac{4+6}{2})$ = 1,200 units	$1,800 - (300 \times \frac{2+4}{2})$ = 900 units
c)	Maximum Level = Re-order Level + Re-order Quantity – (Minimum Usage × Minimum Re-order period)	$= 2,700 + 2,400 - (150 \times 4)$ = 4,500 units	$= 1,800 + 3,600 - (150 \times 2)$ = 5,100 units
d)	Average Stock Level = $\frac{\text{Minimum Level} + \text{Maximum Level}}{2}$	$= \frac{1,200 + 4,500}{2}$ = 2,850 units	$= \frac{900 + 5,100}{2}$ = 3,000 units

Illustration 4

Compute the inventory turnover ratio from the following:

Opening Stock	₹ 10,000
Closing Stock	₹ 16,000
Material Consumed	₹ 78,000

Solution

$$\text{Inventory Turnover Ratio} = \frac{\text{Value of material consumed during the period}}{\text{Value of average stock held during the period}}$$

$$\begin{aligned} \text{Value of average stock held during the period} &= \frac{\text{Opening Stock} + \text{Closing Stock}}{2} \\ &= \frac{10,000 + 16,000}{2} = 13,000 \\ &= \frac{78,000}{13,000} = 6 \text{ times} \end{aligned}$$

Illustration 5

Prepare a statement showing the pricing of issues, on the basis of

- Simple Average and
- Weighted Average methods from the following information pertaining to Material D

2022 March	1	Purchased 100 units @ ₹ 10 each
	2	Purchased 200 units @ ₹ 10.20 each
	5	Issued 250 units to Job X vide M.R. No. 12
	7	Purchased 200 units @ ₹ 10.50 each
	10	Purchased 300 units @ ₹ 10.80 each
	13	Issued 200 units to Job Y vide M.R. No. 15
	18	Issued 200 units to Job Z vide M.R. No. 17
	20	Purchased 100 units @ ₹ 11 each
	25	Issued 150 units to Job K vide M.R. No. 25

Solution:

a. Simple Average Method

Stores Ledger Account

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
2022									
01/03	100	10	1,000				100	10	1,000
02/03	200	10.20	2,040				300		3,040
05/03				250	10.10	2,525	50		515
07/03	200	10.50	2,100				250		2,615
10/03	300	10.80	3,240				550		5,855
13/03				200	10.50	2,100	350		3,755
18/03				200	10.65	2,130	150		1,625
20/03	100	11	1,100				250		2,725
25/03				150	10.90	1,635	100		1,090

Working Notes

1. Calculation of Simple Average Price for

$$\text{Issue on 05/03/2022} = \frac{10 + 10.20}{2} = ₹ 10.10$$

$$\text{Issue on 13/03/2022} = \frac{10.20 + 10.50 + 10.80}{3} = ₹ 10.50$$

$$\text{Issue on 18/03/2022} = \frac{10.50 + 10.80}{2} = ₹ 10.65$$

$$\text{Issue on 25/03/2022} = \frac{10.80 + 11}{2} = ₹ 10.90$$

b. Weighted Average Method

Stores Ledger Account

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹*	Amount ₹
2022									
01/03	100	10	1,000				100	10	1,000
02/03	200	10.20	2,040				300	10.13	3,040
05/03				250	10.13	2,533	50	10.13	507
07/03	200	10.50	2,100				250	10.43	2,607
10/03	300	10.80	3,240				550	10.63	5,847
13/03				200	10.63	2,126	350	10.63	3,721
18/03				200	10.63	2,126	150	10.63	1,595
20/03	100	11	1,100				250	10.78	2,695
25/03				150	10.78	1,617	100	10.78	1,078

Illustration 6

The stock of material held on 1-4-2022 was 400 units @ ₹ 50 per unit. The following receipts and issues were recorded. You are required to prepare the Stores Ledger Account, showing how the values of issues would be calculated under Base Stock Method, both through FIFO and LIFO base being 100 units.

2-4-2022	Purchased 100 units @ ₹ 55 per unit
6-4-2022	Issued 400 units
10-4-2022	Purchased 600 units @ ₹ 55 per unit
13-4-2022	Issued 400 units
20-4-2022	Purchased 500 units @ ₹ 65 per unit
25-4-2022	Issued 600 units
10-5-2022	Purchased 800 units @ ₹ 70 per unit
12-5-2022	Issued 500 units
13-5-2022	Issued 200 units
15-5-2022	Purchased 500 units @ ₹ 75 per unit
12-6-2022	Issued 400 units
15-6-2022	Purchased 300 units @ ₹ 80 per unit

Solution:

Stores Ledger Account (under Base Stock through FIFO Method)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
2022									
01/04							100	50	5,000
							300	50	15,000
02/04	100	55	5,500				100	50	5,000
							300	50	15,000
							100	55	5,500
06/04				300	50	15,000	100	50	5,000
				100	55	5,500			
10/04	600	55	33,000				100	50	5,000
							600	55	33,000
13/04				400	55	22,000	100	50	5,000
							200	55	11,000
20/04	500	65	32,500				100	50	5,000
							200	55	11,000
							500	65	32,500
25/04				200	55	11,000	100	50	5,000
				400	65	26,000	100	65	6,500
10/05	800	70	56,000				100	50	5,000
							100	65	6,500
							800	70	56,000
12/05				100	65	6,500	100	50	5,000
				400	70	28,000	400	70	28,000
13/05				200	70	14,000	100	50	5,000
							200	70	14,000
15/05	500	75	37,500				100	50	5,000
							200	70	14,000
							500	75	37,500
12/06				200	70	14,000	100	50	5,000
				200	75	15,000	300	75	22,500
15/06	300	80	24,000				100	50	5,000
							300	75	22,500
							300	80	24,000

Stores Ledger Account (under Base Stock through LIFO Method)

Cost Accounting

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
2022									
01/04							100	50	5,000
							300	50	15,000
02/04	100	55	5,500				100	50	5,000
							300	50	15,000
							100	55	5,500
06/04				100	55	5,500	100	50	5,000
				300	50	15,000			
10/04	600	55	33,000				100	50	5,000
							600	55	33,000
13/04				400	55	22,000	100	50	5,000
							200	55	11,000
20/04	500	65	32,500				100	50	5,000
							200	55	11,000
							500	65	32,500
25/04				500	65	32,500	100	50	5,000
				100	55	5,500	100	55	5,500
10/05	800	70	56,000				100	50	5,000
							100	55	5,500
							800	70	56,000
12/05				500	70	35,000	100	50	5,000
							100	55	5,500
							300	70	21,000
13/05				200	70	14,000	100	50	5,000
							100	55	5,500
							100	70	7,000
15/05	500	75	37,500				100	50	5,000
							100	55	5,500
							100	70	7,000
							500	75	37,500
12/06				400	75	30,000	100	50	5,000
							100	55	5,500
							100	70	7,000
							100	75	7,500
15/06	300	80	24,000				100	50	5,000

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
							100	55	5,500
							100	70	7,000
							100	75	7,500
							300	80	24,000

Illustration 7

Prepare a Stores Ledger Account from the following information adopting FIFO method of pricing of issues of Materials

- 2022 March
1. Opening Balance 500 tonnes @ ₹ 200
 3. Issue 70 tonnes
 4. Issue 100 tonnes
 5. Issue 80 tonnes
 13. Received from suppliers 200 tonnes @ ₹ 190
 14. Returned from Department A 15 tonnes
 16. Issued 180 tonnes
 20. Received from supplier 240 tonnes @ ₹ 195
 24. Issue 300 tonnes
 25. Received from supplier 320 tonnes @ ₹ 200
 26. Issue 115 tonnes to Department B
 27. Returned from Department B 35 tonnes
 28. Received from supplier 100 tonnes @ ₹ 200

Solution:

Stores Ledger Account (FIFO Method)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
2022									
01/03							500	200	1,00,000
03/03				70	200	14,000	430	200	86,000
04/03				100	200	20,000	330	200	66,000
05/03				80	200	16,000	250	200	50,000
13/03	200	190	38,000				250	200	50,000
							200	190	38,000
14/03	15	200	3,000				250	200	50,000
							200	190	38,000
							15	200	3,000
16/03				180	200	36,000	70	200	14,000

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
							200	190	38,000
							15	200	3,000
20/03	240	195	46,800				70	200	14,000
							200	190	38,000
							15	200	3,000
							240	195	46,800
24/03				70	200	14,000	225	195	43,875
				200	190	38,000			
				15	200	3,000			
				15	195	2,925			
25/03	320	200	64,000				225	195	43,875
							320	200	64,000
26/03				115	195	22,425	110	195	21,450
							320	200	64,000
27/03	35	195	6,825				110	195	21,450
							320	200	64,000
							35	195	6,825
28/03	100	200	20,000				110	195	21,450
							320	200	64,000
							35	195	6,825
							100	200	20,000

Illustration 8

From this information provided as under, you are required to prepare a statement showing how the issues would be priced if LIFO method is followed.

- 2022 February
1. Opening Balance 100 units @ ₹ 10 per unit
 2. Received 200 units @ ₹ 10.50 per unit
 3. Received 300 units @ ₹ 10.60 per unit
 4. Issued 400 units to Job A vide M.R. No. 015
 6. Issued 120 units to Job B vide M.R. No. 020
 7. Received 400 units @ ₹ 11 per unit
 8. Issued 200 units to Job B vide M.R. No. 031
 12. Received 300 units @ ₹ 11.40 per unit
 13. Received 200 units @ ₹ 11.50 per unit
 17. Issued 400 units to Job D vide M.R. No. 040

Solution:

Stores Ledger Account (LIFO Method)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
2022									
01/02							100	10	1,000
02/02	200	10.50	2,100				100	10	1,000
							200	10.50	2,100
03/02	300	10.60	3,180				100	10	1,000
							200	10.50	2,100
							300	10.60	3,180
04/02				300	10.60	3,180	100	10	1,000
				100	10.50	1,050	100	10.50	1,050
06/02				100	10.50	1,050	80	10	800
				20	10	200			
07/02	400	11	4,400				80	10	800
							400	11	4,400
08/02				200	11	2,200	80	10	800
							200	11	2,200
12/02	300	11.40	3,420				80	10	800
							200	11	2,200
							300	11.40	3,420
13/02	200	11.50	2,300				80	10	800
							200	11	2,200
							300	11.40	3,420
							200	11.50	2,300
17/02				200	11.50	2,300	80	10	800
				200	11.40	2,280	200	11	2,200
							100	11.40	1,140

Illustration 9

Prepare Stores Ledger Account showing pricing of material issues on Replacement Price basis from the following particulars:

Opening balance 400 units @ ₹ 4 per unit

10-3-2022 Received 100 units @ ₹ 4.10 per unit

15-3-2022 Issued 300 units to Job XY vide M.R. No. 14

17-3-2022 Received 200 units @ ₹ 4.30 per unit

20-3-2022 Issued 250 units to Job AB vide M.R. No. 20

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25-3-2022	Received 400 units @ ₹ 4.50 per unit
26-3-2022	Issued 200 units to Job JK vide M.R. No. 27
27-3-2022	Received 100 units @ ₹ 4.60 per unit
30-3-2022	Issued 300 units to Job PQ vide M.R. No. 32

Replacement Price on various dates:

15-3-2022	₹ 4.20
20-3-2022	₹ 4.40
26-3-2022	₹ 4.60 &
30-3-2022	₹ 4.80

Solution:

Stores Ledger Account (Replacement Price Method)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
2022									
01/03							400	4	1,600
10/03	100	4.10	410				500		2,010
15/03				300	4.20	1,260	200		750
17/03	200	4.30	860				400		1,610
20/03				250	4.40	1,100	150		510
25/03	400	4.50	1,800				550		2,310
26/03				200	4.60	920	350		1,390
27/03	100	4.60	460				450		1,850
30/03				300	4.80	1,440	150		410

Illustration 10

Stocks are issued at a standard price and the following transactions occurred for a specific material:

1st January	Opening Stock	10	tonnes @ ₹ 240 per tonne
4th January	Purchased	5	tonnes @ ₹ 260 per tonne
5th January	Issued	3	tonnes
12th January	Issued	4	tonnes
13th January	Purchased	3	tonnes @ ₹ 250 per tonne
19th January	Issued	4	tonnes
26th January	Issued	3	tonnes
30th January	Purchased	4	tonnes @ ₹ 280 per tonne
31st January	Issued	3	tonnes

The debit balance of price variation on 1st January was ₹ 20. Show the stock account for the material for the month

of January, indicating how you would deal with the difference in material price variance, when preparing the Profit and Loss Account for the month.

Solution:

$$\text{Standard Price} = \frac{10 \times 240 + 20}{10} = ₹ 242$$

Stores Ledger Account (Standard Price Method)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
01/01							10	240	2,400
04/01	5	260	1,300				15		3,700
05/01				3	242	726	12		2,974
12/01				4	242	968	8		2,006
13/01	3	250	750				11		2,756
19/01				4	242	968	7		1,788
26/01				3	242	726	4		1,062
30/01	4	280	1,120				8		2,182
31/01				3	242	726	5		1,456

Valuation of Closing Stock at Standard Price = $5 \times 242 = ₹ 1,210$

Valuation of Closing Stock (as per store ledger) = ₹ 1,456

Material Price Variance = $1,210 - 1,456 = ₹ 246$ (A) will be charged to Profit and Loss A/c

Illustration 11

Receipts and issues of an item of stores are made as follows:

There was no balance before 9th January.

Date	Receipts Quantity	Price (₹)	Issues Quantity
January 9 th	10	17.00	
19 th	25	10.00	
20 th			10
29 th			20
30 th	15	8.00	
February 13 th	20	12.00	
27 th	10	16.90	
28 th			40
March 30 th	20	20.00	
31 st			20

i. What is the simple average of February receipts?

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- ii. What are the moving monthly simple average price for January – February and February – March?
- iii. If a weighted average is used for pricing issues how does the value of the balance in stock change during January?
- iv. If a weighted average price is calculated at the end of each month and is then used for pricing the issue of that month, what will be the value of the month end balance?

Solution:

i. **Simple Average of February Receipts** = $\frac{12 + 16.90}{2} = ₹ 14.45$

ii. **Simple Average of January Receipts** = $\frac{17 + 10 + 8}{3} = ₹ 11.67$

Moving Monthly Average of January – February = $\frac{14.45 + 11.67}{2} = ₹ 13.06$

Moving Monthly Average of February – March = $\frac{14.45 + 20}{2} = ₹ 17.225$

iii. Stores Ledger Account (Weighted Average Method)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
09/01	10	17	170				10	17	170
19/01	25	10	250				35	12	420
								$\left(\frac{420}{35}\right)$	
20/01				10	12	120	25	12	300
29/01				20	12	240	5	12	60
30/01	15	8	120				20	9	180
								$\left(\frac{180}{20}\right)$	

iv. Stores Ledger Account (Issue at Weighted Average Price at month end)

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
09/01	10	17	170				10	17	170
19/01	25	10	250				35	12	420
								$\left(\frac{420}{35}\right)$	

Date	Receipts			Issue			Balance		
	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹	Qty	Rate ₹	Amount ₹
30/01	15	8	120				50	10.80 $\left(\frac{540}{50}\right)$	540
January Issue				30	10.80	324	20	10.80	216
13/02	20	12	240				40	11.40 $\left(\frac{456}{40}\right)$	456
27/02	10	16.90	169				50	12.50 $\left(\frac{625}{50}\right)$	625
February Issue				40	12.50	500	10	12.50	125
30/03	20	20	400				30	17.50 $\left(\frac{525}{30}\right)$	525
March Issue				20	17.50	350	10	17.50	175

Illustration 12

Two components A and B are used as follows:

Normal usage = 50 per week each

Re-order quantity = A – 300; B – 500

Maximum usage = 75 per week each

Minimum usage = 25 per week each

Re-order period = A – 4 to 6 weeks; B – 2 to 4 weeks

Calculate for each component

- Re-order Level
- Minimum Level
- Maximum Level
- Average Stock Level

Solution:

	Particulars	Component A	Component B
a)	Re-order Level = Maximum Usage × Maximum Re-order period	$75 \times 6 = 450$ units	$75 \times 4 = 300$ units
b)	Minimum Level = Re-order Level – (Normal Usage × Normal Re-order period)	$450 - (50 \times 5)$ = 200 units	$300 - (50 \times 3)$ = 150 units
c)	Maximum Level = Re-order Level + Re-order Quantity – (Minimum Usage × Minimum Re-order period)	$= 450 + 300 - (25 \times 4)$ = 650 units	$= 300 + 500 - (25 \times 2)$ = 750 units
d)	Average Stock Level = $\frac{\text{Minimum Level} + \text{Maximum Level}}{2}$	$= \frac{200 + 650}{2}$ = 425 units	$= \frac{150 + 750}{2}$ = 450 units

Illustration 13

Anil Ltd. buys its annual requirement of 36,000 units in six installments. Each unit costs ₹ 1 and the ordering cost is ₹ 25. The inventory carrying cost is estimated at 20% of unit value. Find the total annual cost of the existing inventory policy. How much money can be saved by using EOQ?

Solution:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

A = Annual requirement = 36,000 units

O = Ordering Cost per order = ₹ 25

C = Carrying cost per unit per annum = $1 \times 20\% = ₹ 0.20$

$$EOQ = \sqrt{\frac{2 \times 36,000 \times 25}{0.20}} = 3,000 \text{ units}$$

Comparative Cost Statement of Existing Purchase Policy with proposed EOQ Purchase Policy

	Existing Purchase Policy		Proposed EOQ Purchase Policy	
	Ordering Quantity = $\frac{36000}{6} = 6,000$ units		Ordering Quantity = 3,000 units	
		₹		₹
Purchase Cost	$36,000 \times 1$	36,000	$36,000 \times 1$	36,000
Ordering Cost	6×25	150	12×25	300
Carrying Cost		600		300
Total Cost		36,750		36,600

Net Savings = ₹ 36,750 – ₹ 36,600 = ₹ 150

Illustration 14

The annual demand for an item is 3,200 units. The unit cost is ₹ 6 and inventory carrying charges is 25% p.a. If the cost of one procurement is ₹ 150, determine:

- EOQ
- No. of orders per year
- Time between two consecutive orders

Solution:

$$\text{a. EOQ} = \sqrt{\frac{2AO}{C}} \quad \begin{array}{l} A = \text{Annual requirement} = 3,200 \text{ units} \\ O = \text{Ordering Cost per order} = ₹ 150 \\ C = \text{Carrying cost per unit per annum} = 6 \times 25\% = ₹ 1.50 \end{array}$$

$$\text{EOQ} = \sqrt{\frac{2 \times 3,200 \times 150}{1.50}} = 800 \text{ units}$$

$$\text{b. Number of orders per year} = \frac{3,200}{800} = 4$$

$$\text{c. Time between two consecutive orders} = \frac{12 \text{ months}}{\text{No. of orders}} = \frac{12 \text{ months}}{4} = 3$$

Illustration 15

A company manufactures a special product which requires a component 'Alpha'. The following particulars are collected for the year 2021:

- Annual demand for Alpha 8,000 units
- Cost of placing an order ₹ 200 per order
- Cost per unit of Alpha ₹ 400
- Carrying cost % p.a. 20

The company has been offered a quantity discount of 4% on the purchase of 'Alpha' provided the order size is 4,000 components at a time.

Required:

- Compute the economic order quantity
- Advise whether the quantity offer can be accepted.

Solution:

$$\text{a. EOQ} = \sqrt{\frac{2AO}{C}} \quad \begin{array}{l} A = \text{Annual requirement} = 8,000 \text{ units} \\ O = \text{Ordering Cost per order} = ₹ 200 \\ C = \text{Carrying cost per unit per annum} = 400 \times 20\% = ₹ 80 \end{array}$$

$$\text{EOQ} = \sqrt{\frac{2 \times 8,000 \times 200}{80}} = 200 \text{ units}$$

b. Evaluation of Profitability of Different Options of Order Quantity

	When EOQ is order		When Quantity Discount is offered	
	No. of Orders = $\frac{8,000}{200} = 40$		No. of Orders = $\frac{8,000}{4,000} = 2$	
		(₹)		(₹)
Purchase Cost	$8,000 \times 400$	32,00,000	$8,000 \times 400 \times 96\%$	30,72,000
Ordering Cost	40×200	8,000	2×200	400
Carrying Cost	$\frac{1}{2} \times 200 \times 400 \times 20\%$	8,000	$\frac{1}{2} \times 4,000 \times 400 \times 96\% \times 20\%$	1,53,600
Total Cost		32,16,000		32,26,000

Advise:

The total cost of inventory is lower if EOQ is adopted. Hence, the company is advised not to accept the quantity discount.

Illustration 16

From the following particulars with respect to a particular item of materials of a manufacturing company, calculate the best quantity to order:

Ordering quantities (tonnes)	Price per tonne Amount (₹)
Less than 250	6.00
250 but less than 800	5.90
800 but less than 2,000	5.80
2,000 but less than 4,000	5.70
4,000 and above	5.60

The annual demand for the material is 4,000 tonnes. Stock holding costs are 20% of material cost p.a. The delivery cost per order is ₹ 6.00

Solution:

Computation of Total Inventory Cost for different Ordering Quantities

Particulars	Ordering Quantities (tonne)				
	200	250	800	2,000	4000
1. Annual Demand (tonne)	4,000	4,000	4,000	4,000	4,000
2. No. of Orders [(1)/ordering quantity]	20	16	5	2	1
3. Price per tonne (₹)	6.00	5.90	5.80	5.70	5.60
4. Average Quantity (tonne) $\frac{\text{Ordering Quantities}}{2}$	100	125	400	1,000	2,000
5. Cost per Order (₹)	6.00	6.00	6.00	6.00	6.00

6. Rate of Interest	20%	20%	20%	20%	20%
Purchase Cost (1) × (3) (₹)	24,000	23,600	23,200	22,800	22,400
Ordering Cost (2) × (5) (₹)	120	96	30	12	6
Carrying Cost (₹) (4) × (3) × (6)	120	147.50	464	1,140	2,240
Total Inventory Cost (₹)	24,240	23,843.50	23,694	23,952	24,646

From the above computations the best quantity to order is 800 units.

Illustration 17

The particulars relating to 1,200 kgs of a certain raw material purchased by a company during June, were as follows:

Lot prices quoted by supplier and accepted by the company for placing the purchase order:

Lot size upto 1,000 kgs @ ₹ 22 per kg

Between 1,000 – 1,500 kgs @ ₹ 20 per kg

Between 1,500 – 2,000 kgs @ ₹ 18 per kg

Trade discount – 20%

Additional charge for containers @ ₹ 10 per drum of 25 kgs

Credit allowed on return of containers @ ₹ 8 per drum

GST @ 12% on raw material and 5% on drums

Total freight paid by the purchaser ₹ 240.

Insurance @ 2.5% (on net invoice value) paid by the purchaser

Stores overheads applied @ 5% on total purchase cost of material

The entire quantity was received and issued to production

The containers are returned in due course. Draw up a suitable statement to show:

- Total cost of material purchased and
- Unit cost of material issued to production

Solution:

Statement showing computation of total cost of material purchased and unit cost of material issued for production.

Particulars	Unit Cost		Total Cost (1,200 kg)	
		₹		₹
Basic price of raw material		20.00	20 × 1,200	24,000.00
Less: Trade Discount @20%	20 × 20%	4.00	24,000 × 20%	4,800.00
		16.00		19,200.00
Add: Drum Charges				
(No. of Drums = 1200 ÷ 25 = 48)	$\frac{₹ 10}{25 \text{ kg}}$	0.40	48 × 10	480.00
		16.40		19,680.00

Cost Accounting

Add: GST	$(16 \times 12\% + 0.40 \times 5\%)$	1.94	$(19,200 \times 12\% + 480 \times 5\%)$	2,328.00
Net Invoice Price		18.34		22,008.00
Add: Insurance	$18.34 \times 2.5\%$	0.4585	$22,008 \times 2.5\%$	550.20
Add: Freight	$\frac{\text{₹ 240}}{1,200 \text{ kg}}$	0.20		240.00
		18.9985		22,798.20
Less: Credit for drums returned	$\frac{\text{₹ 8}}{25 \text{ kg}}$	0.32	48×8	384.00
Total Cost of Material Purchased		18.6785		22,414.20
Add: Stores Overheads	$18.6785 \times 5\%$	0.9339	$22,414.20 \times 5\%$	1,120.71
Material Cost issued to production		19.6124		23,534.91

Illustration 18

From the following data for the year ended 31st December, 2021, calculate the inventory turnover ratio of the two items, and put forward your comments on them.

	Material A Amount (₹)	Material B Amount (₹)
Opening stock on 1-1-2021	10,000	9,000
Purchase during the year 2021	52,000	27,000
Closing stock on 31-12-2021	6,000	11,000

Solution:

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Material Used}}{\text{Average Stock}}$$

Cost of Material Used = Opening Stock + Purchase – Closing Stock

	Material A Amount (₹)	Material B Amount (₹)
Opening stock on 1-1-2021	10,000	9,000
Add: Purchase during the year 2021	52,000	27,000
	62,000	36,000
Less: Closing stock on 31-12-2021	6,000	11,000
Raw Material Consumed	56,000	25,000
Average Stock	$\frac{10,000 + 6,000}{2} = 8,000$	$\frac{9,000 + 11,000}{2} = 10,000$
Inventory Turnover Ratio	$\frac{56,000}{8,000} = 7 \text{ times}$	$\frac{25,000}{10,000} = 2.5 \text{ times}$

Material inventory turnover ratio indicates the efficiency of the management with which they are able to utilize their inventory. It indicates the existence or non-existence of non-moving items, dormant items, slow moving items etc in inventory. If the ratio is high, the efficiency is said to be high and on the other hand if the ratio is low, the efficiency is said to be low.

In view of above, in the instant case, the usage of Material A is better than Material B.

Illustration 19

From the details given below, calculate:

- i. Re-ordering Level
- ii. Maximum Level
- iii. Minimum Level
- iv. Danger Level

Re-ordering quantity is to be calculated on the basis of following information:

- a. Cost of placing a purchase order is ₹ 20
- b. Number of units to be purchased during the year 5,000
- c. Purchase price per unit inclusive of transportation cost is ₹ 50
- d. Annual cost of storage per unit is ₹ 5
- e. Details of lead time: Average 10 days, Maximum 15 days, Minimum 6 days.
For emergency purchases 4 days
- f. Rate of consumption: Average: 15 units per day
Maximum: 20 units per day

Solution:

A = Annual Consumption = 5,000 units

$$EOQ = \sqrt{\frac{2AO}{C}}$$

O = Ordering Cost = ₹ 20

C = Carrying Cost per unit per annum = ₹ 5

$$EOQ = \sqrt{\frac{2 \times 5,000 \times 20}{5}} = 200 \text{ units}$$

Reordering Quantity = EOQ = 200 units

- i. Re-order Level = Maximum Usage × Maximum Re-order period
= 20 × 15 = 300 units
 - ii. Maximum Level = Re-order Level + Re-order Quantity – (Min. Usage × Min. Re-order period)
= 300 + 200 – (10 × 6) = 440 units
- (Average Usage = $\frac{\text{Minimum Usage} + \text{Maximum Usage}}{2}$)
- (or, 15 = $\frac{\text{Minimum Usage} + 20}{2}$)
- (or, Minimum Usage = (15 × 2) - 20 = 10 units)

Cost Accounting

- iii. Minimum Level = Re-order Level – (Average Usage × Average Re-order period)
= $300 - (15 \times 10) = 150$ units
- iv. Danger Level = Average Usage × Lead Time for Emergency Purchase
= $15 \times 4 = 60$ units

Illustration 20

M/s. Tubes Ltd are the manufacturers of picture tubes for TV. The following are the details of their operation during the year 2021:

Average monthly market demand	2,000 Tubes
Ordering cost	₹ 100 per order
Inventory carrying cost	2% per annum
Cost of tubes	₹ 500 per tube
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tubes per week
Lead time to supply	2 – 6 weeks

Compute from the above:

- Economic order quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting?
- Re-order Level
- Minimum level of stock
- Maximum level of stock

Solution:

$$\text{EOQ} = \sqrt{\frac{2AO}{C}}$$

A = Annual usage of tubes = Normal usage per week × 52 weeks
or, A = $100 \times 52 = 5,200$ tubes

O = Ordering Cost per order = ₹ 100

C = Carrying Cost per unit per annum = $500 \times 2\% = ₹ 10$

$$(i) \text{ EOQ} = \sqrt{\frac{2 \times 5,200 \times 100}{10}} = 322 \text{ tubes}$$

Calculation of Total Inventory Cost

	EOQ Purchase Policy	Discount given by Supplier
Ordering Quantity	102 tubes	1,500 tubes
No. of Order per annum	$\frac{5,200}{102} \approx 51$	$\frac{5,200}{1,500} \approx 4$

Purchase Cost (₹)	$5,200 \times 500$	26,00,000	$5,200 \times 500 \times 95\%$	24,70,000
Add: Ordering Cost (₹)	51×100	5,100	4×100	400
Add: Carrying Cost (₹)	$\frac{1}{2} \times 102 \times 500 \times 20\%$	5,100	$\frac{1}{2} \times 1500 \times 500 \times 20\% \times 95\%$	71,250
Total (₹)		26,10,200		25,41,650

Since the total cost under quarterly supply of 1,500 units with 5% discount is lower than that when order size is 102 units, the offer should be accepted. While accepting this offer capital blocked on order size of 1,500 units per quarter has been ignored.

$$\begin{aligned} \text{ii. Re-order Level} &= \text{Maximum Usage} \times \text{Maximum Re-order period} \\ &= 200 \times 6 = 1,200 \text{ tubes} \end{aligned}$$

$$\begin{aligned} \text{iii. Minimum Level of Stock} &= \text{Re-order Level} - (\text{Average Usage} \times \text{Average Re-order period}) \\ &= 1,200 - (100 \times 4) = 800 \text{ tubes} \end{aligned}$$

$$\begin{aligned} \text{iv. Maximum Level of Stock} &= \text{Re-order Level} + \text{Re-order Quantity} - (\text{Minimum Usage} \times \text{Minimum Re-order period}) \\ &= 1,200 + 322 - (50 \times 2) = 1,422 \text{ tubes} \end{aligned}$$

Employee Cost

2.2

Introduction

As such, the expenditure associated with compensating workers is commonly referred as labour cost, reflecting the effort they contribute to the production of goods or the delivery of services. Whereas employee cost is a broader term that encompasses various forms of compensation such as wages, salary, bonuses, incentives, etc., disbursed to an employee and recorded as labour cost against a specific cost object. Employee cost¹⁰ occupies a significant portion of the total cost of a product manufactured or services rendered.

Paragraph 4.7 of CAS 7 defines employee cost as benefits paid or payable for the services rendered by employees (including temporary, part time and contract employees) of an entity.

Employee cost includes payment made in cash or kind.

For example

Salaries, wages, allowances and bonus / incentives, Contribution to provident and other funds, Employee welfare and other benefits

Classification of Employee (labour) Cost

Employee (labour) cost is classified into direct cost and indirect cost. The main difference between them lies in their traceability to the production process and the nature of the work performed by the employees. Direct employee (labour) costs are related to employees who are directly involved in the production process, while indirect employee (labour) costs are related to employees who support the production process but are not directly involved in it. Direct labour costs fluctuate with production, whereas indirect labour costs can be fixed or variable depending on the employee and the organization's size and process level

A contrast of the two types of cost is presented below;

- Direct Employee (Labour) Cost:
 - Direct labour costs are associated with employees who are directly involved in the production process or core manufacturing operations
 - These costs are also classified as production costs
 - Examples of direct labour costs include the wages paid to workers in manufacturing, construction, or retail sales.

¹⁰ In this study note the terms, 'labour cost' and 'employee cost' are used synonymously as Cost Accounting Standard (CAS) - 7 issued by the Council of the Institute of Cost Accountants of India deals with 'Employee cost' while the term 'Labour cost' is used in various books on cost accounting to mean the same.

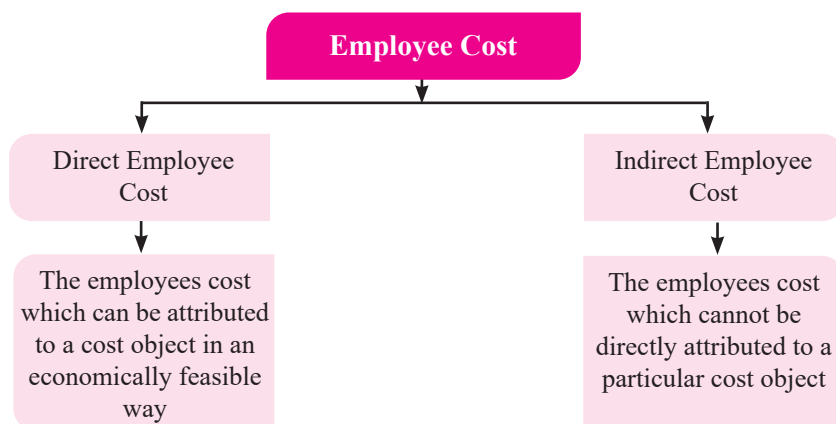
- Indirect Employee (Labour) Cost:
 - Indirect labour costs are associated with employees who perform duties that aid others in producing goods and performing services, but are not directly involved in the core activities of the entity
 - These costs are also classified as non-production costs
 - Indirect labour costs can be fixed or variable, depending on the employee
 - Examples of indirect labour costs include the salaries of supervisors, repairmen, inspectors, maintenance employees, and employees in purchasing, retail, manufacturing offices, timekeeping, and canteens

Paragraph 4.5 of CAS 7 defines direct employee cost as costs, which can be attributed to a Cost object in an economically feasible way.

Indirect labour, on the other, includes all other labour costs related to production (e.g., salary of plant supervisor). Like indirect materials, this is considered a factory overheads cost.

Paragraph 4.10 of CAS 7 defines indirect employee cost as employee cost, which cannot be directly attributed to a particular cost object

This is pictorially represented as follows;



Principles for Measuring Employee Costs (CAS – 7)

Para 5 of CAS – 7 (Cost Accounting Standard on Employee Cost) provides the guideline criteria for determining labour cost or employee cost which are outlined as follows:

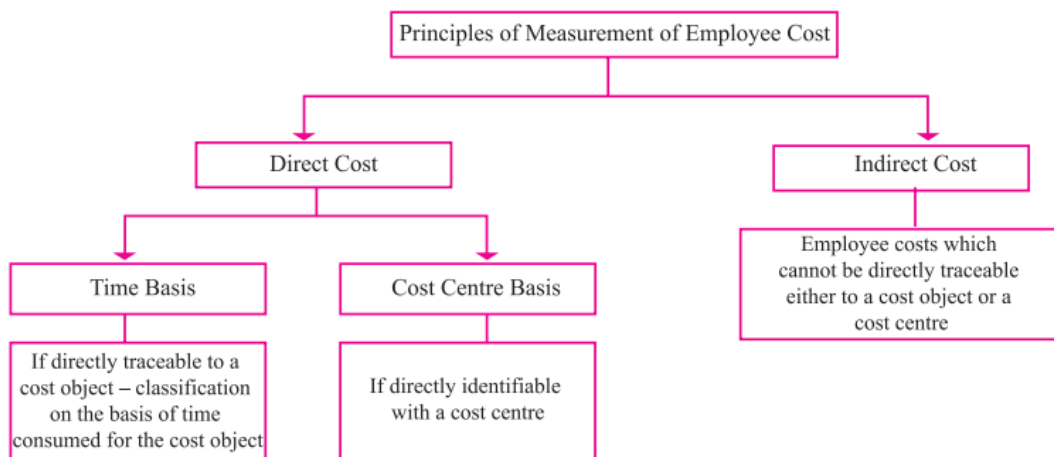
1. Employee cost is computed by considering gross pay, including all allowances, and factoring in the employer's cost of providing benefits.
2. Bonus payments, whether mandated by statutory regulations or profit-sharing arrangements, are treated as components of employee cost. Ex-gratia payments made in lieu of or in addition to bonuses are also considered part of employee cost.
3. Remuneration for managerial personnel, including executive directors on the board and other officers as per statutory regulations, is regarded as part of the employee cost for the relevant year. This applies whether the remuneration is determined as a percentage of profits, wholly or partially.

Note: Remuneration for non-executive directors is excluded from employee cost but is included in administrative overheads.

Cost Accounting

4. Costs associated with voluntary retirement, retrenchment, termination, etc., are amortized over the period benefiting from such costs.
5. Employee cost excludes any imputed costs.
6. The cost of idle time is calculated by multiplying idle hours by the applicable hourly rate for the idle employee or group of employees.
7. When accounting for employee cost at standard cost, variances resulting from normal reasons related to employee cost are considered part of employee cost. Variances arising from abnormal reasons are treated as abnormal costs.
8. Any subsidies, grants, incentives, or similar payments received or receivable related to employee cost are subtracted from the determination of the cost of the associated cost object.
9. Material and quantifiable abnormal costs do not constitute part of employee cost.
10. Penalties and damages paid to statutory authorities or other third parties are not included in employee cost.
11. The cost of providing benefits such as free housing and conveyance to an employee is calculated based on the total cost of all resources consumed in offering such benefits.
12. Any recoveries from employees for benefits provided, e.g., housing, are deducted from the employee cost.
13. Changes in cost accounting principles for determining employee cost should only occur if required by law, for compliance with cost accounting standards, or if the change results in a more appropriate preparation or presentation of an enterprise's cost statements.

The above-mentioned issues are represented pictorially as follows;



Labour Cost Management

Effective labour cost management is crucial for optimizing business expenses and maintaining profitability. By strategically analyzing and controlling wages, benefits, and productivity, organizations can enhance efficiency while ensuring fair compensation for employees. The following are the steps in effectively managing labour cost.

1. **Production Planning:** Effective control over the labour cost can be achieved through proper production planning. Production planning includes activities like planning, scheduling, routing, machine loading, product and process engineering, work study etc.

2. **Labour Budget:** Budget and budgetary control are effective tools for cost control and cost reduction. A labour budget can be prepared which will set the target for the labour cost which will again facilitate comparing between the budgeted labour cost and the actual labour cost.
3. **Labour Standards:** Standards can be set for labour cost against which the actual labour cost can be compared. Standard labour cost is the cost, which should have been incurred for producing a particular quantity of production.
4. **Labour Performance Report:** There should be a system of periodic labour efficiency and utilization reports. These reports will give awareness about the efficiency and productivity of the labour.
5. **Incentive Schemes:** Improving the labour productivity is one of the important ways to reduce the labour cost per unit. Productivity can be improved by motivating the workers offering monetary and nonmonetary incentives can help to improve the productivity substantially.
6. **Labour Cost Accounting:** There should be a proper cost accounting system, which will identify the direct and indirect labour cost. Similarly, the cost accounting department should be able to generate and maintain records for time keeping, time booking, idle and overtime, impact of incentive schemes, per unit of labour, cost due to labour turnover and other relevant records.

Labour cost control which is the focus area of labour cost management is referred to as one of the most significant aspects of cost accounting. Labour cost management is a complex process because it represents a sensitive area involving human behavior. The proportion of labour cost within the overall cost of a product or service can be a crucial factor in pricing decisions and profitability analysis at times. Thus, economic utilization of labour is a dire need of any industry. Management is interested in the accumulation and analysis of labour cost because they serve as a basis for:

1. Control over labour cost;
2. Managerial decisions; and
3. Inventory costing, fixation of selling price and profit determination which requires that the cost of product be ascertained by assigning direct labour and an equitable portion of indirect labour costs to products.

Conclusively, it may be said that labour is the physical and/or mental effort expended to manufacture products. And labour cost is the price paid for using human resources. Labour cost management is the mainly focused on the control aspect of the cost of labour such that the cost of production remains within control limits.

The comprehensive landscape (see chart below) of labour cost management involves the coordinated efforts of several organizational departments. The personnel department, engineering department, time-keeping department, payroll department, and the cost accounting department collectively contribute to the effective management of labour costs.

The roles played by each department can be briefly conceptualized as follows:

1. **Personnel Department:** The personnel department is involved in hiring, training, and managing the workforce. It plays a critical role in determining staffing levels, workforce planning, and implementing policies related to employee compensation and benefits. Effective collaboration with this department ensures alignment between organizational goals and human resource strategies.
2. **Engineering Department:** The engineering department is responsible for optimizing processes and workflows to enhance productivity. By improving efficiency and reducing waste, the engineering department indirectly influences labour costs. It may be involved in designing workflows that minimize labour-intensive tasks or implementing technology to automate certain processes, ultimately impacting the overall cost of labour.

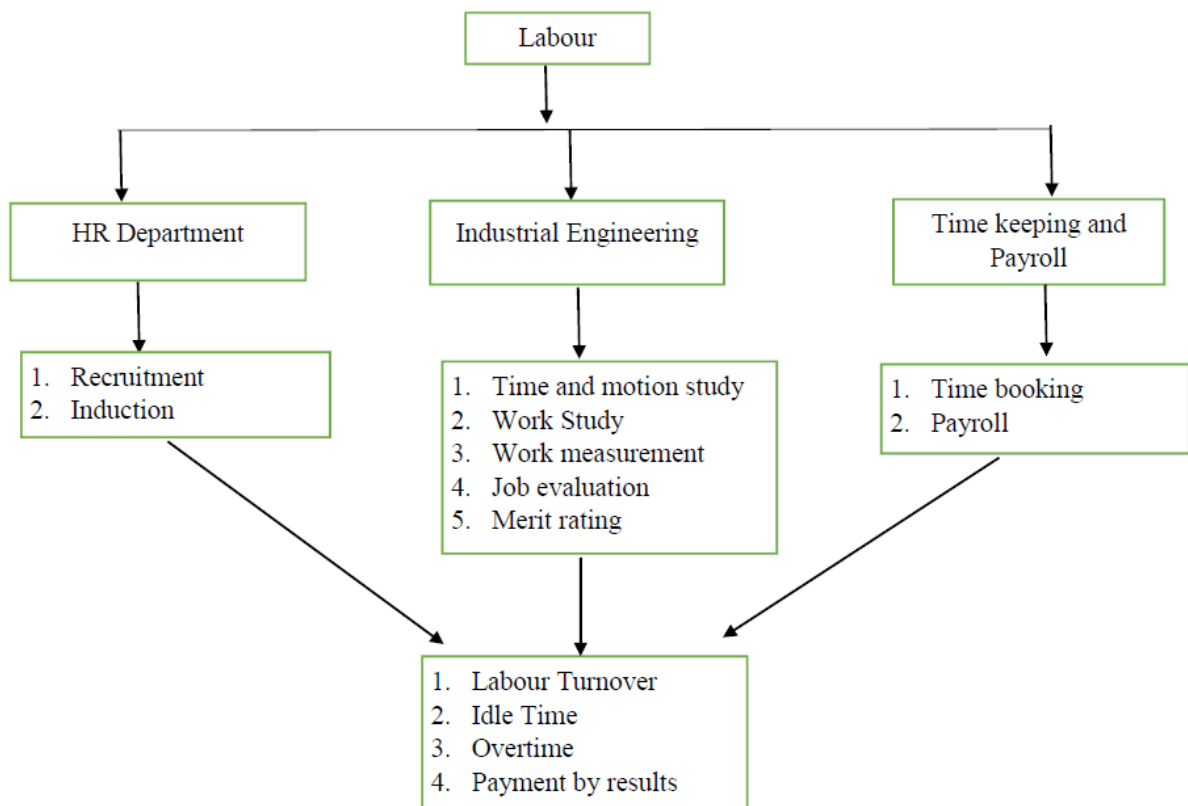
3. **Time-Keeping Department:** The time-keeping department is tasked with accurately recording and tracking employee work hours. Precise timekeeping is essential for calculating wages, salaries, and overtime accurately. It provides the necessary data for labour cost calculations, ensuring that the organization pays employees for the actual time worked.
4. **Payroll Department:** The payroll department is directly responsible for disbursing employee compensation. It processes wages, bonuses, incentives, and deductions in accordance with labour contracts and regulations. Collaboration with the payroll department is crucial for ensuring accurate and timely payment of labour costs.
5. **Cost Accounting Department:** The cost accounting department is at the core of labour cost management. It classifies, analyzes, and monitors various components of labour costs, such as wages, benefits, and overtime. It establishes standard costs, conducts variance analysis, and provides insights into the financial implications of labour-related decisions. The cost accounting department plays a central role in budgeting, forecasting, and reporting on labour costs.

Factors for Controlling Employee Cost

By focusing on the factors mentioned below, businesses can effectively manage employee costs, maintain profitability, and ensure efficient operations.

1. **Assessment of manpower requirements:** Accurately estimating the number of employees needed for a specific task or role, helps in optimizing workforce planning and avoiding overstaffing or understaffing
2. **Control over time-keeping and time-booking:** Efficient time management systems help in tracking employee attendance, identifying idle time, and ensuring that employees are accountable for their time
3. **Time and Motion Study:** This study helps in understanding the time taken for specific tasks and identifying areas for improvement in work processes
4. **Control over idle time and overtime:** Monitoring employee attendance and ensuring that employees are productively engaged helps in reducing idle time and overtime costs
5. **Control over employee turnover:** Retaining employees by offering competitive benefits, providing opportunities for professional development, and creating a positive work environment helps in reducing turnover costs
6. **Streamlining workforce planning:** Efficient planning and resource allocation help in balancing the need for skilled workers with the available budget
7. **Implementing time and attendance systems:** Automated systems help in tracking employee attendance, identifying absenteeism, and ensuring that employees are paid accurately for their work
8. **Enhancing workforce productivity:** Investing in productivity-boosting software, training, and development programs helps in improving employee performance and efficiency
9. **Automation and technology solutions:** Utilizing automation and technology to streamline processes and reduce manual work helps in reducing labour costs
10. **Employee training and skill development:** Providing employees with opportunities for skill development and training helps in improving their performance, efficiency, and job satisfaction, ultimately reducing employee costs

As discussed above labour cost management, as such, is an arena where specifically three departments have to put in their efforts. The whole gamut of labour cost and its management is covered by the role and function of the Human Resource department, Industrial engineering department and the Time keeping and Payroll department. This may be pictorially represented below:



The Human Resource (HR) Department

This department plays a crucial role in labour cost management. It is responsible for forecasting and analyzing personnel expenses, preparing different cost scenarios, and cooperating with the finance function to make informed decisions based on forecasts. HR is also tasked with reporting personnel expenses and ensuring that they are managed strategically, keeping in line with approved targets and allowing managers to grow the business. Additionally, HR can help maximize the return on investment (ROI) on labour costs by analyzing positions, labour trends, and overtime spend, thus adding a significant financial benefit to the company. By leveraging labour cost data, HR can understand the impact of labour costs on the business and facilitate productive conversations about workforce planning and the impact of increased employee count on the business. One of the most important functions of HR is recruitment. HR can leverage labour cost data to make informed decisions about recruitment, such as forecasting and analyzing personnel expenses, preparing different cost scenarios, and reporting personnel expenses.

Industrial Engineering Department

The Industrial Engineering department plays a pivotal role in labour cost management by applying systematic approaches to enhance productivity, streamline processes, and optimize resource allocation. Through time and motion studies, process analysis, and efficiency improvements, Industrial Engineers contribute to minimizing labour costs while maintaining or improving output quality. Their expertise in process optimization helps organizations strike a balance between workforce efficiency and cost-effectiveness, ultimately supporting sustainable labor cost management strategies. The Industrial Engineering (IE) department plays a crucial role in labor cost management through several key functions. Of the many functions the following three require special mention.

1. **Workforce planning and Allocation:** Industrial Engineers analyze production requirements and determine the optimal allocation of manpower to meet production targets. This involves assessing skill levels, workload distribution, and ensuring the right number of workers is assigned to each task, contributing to efficient labor utilization.
2. **Time and Motion Studies:** IE professionals conduct time and motion studies to analyze the efficiency of work processes. By identifying and eliminating inefficiencies, bottlenecks, and unnecessary movements, Industrial Engineers contribute to increased productivity and reduced labor costs per unit of output.
3. **Process Optimization:** The IE department is responsible for optimizing production processes, incorporating lean principles and minimizing waste. Streamlining workflows and improving overall process efficiency led to reduced labor input, contributing to cost savings.

In the following lines some specific issues related to this particular department are discussed.

- **Work study**

Work study is a systematic and scientific approach to the analysis and improvement of work processes within an organization. It is a set of techniques and methodologies aimed at optimizing the utilization of resources, enhancing productivity, and minimizing waste. Work study involves the examination of various factors, including time, motion, methods, and manpower, to achieve greater efficiency and effectiveness in the workplace. The primary objectives of work study include improving the utilization of resources (such as time, manpower, and equipment), minimizing waste, and optimizing work methods. The key components of work study include:

- o **Time Study:** Involves the measurement and analysis of the time required to perform specific tasks or activities at a predetermined level of performance
- o **Motion Study:** Focuses on the analysis and improvement of the movements involved in performing a task. Aims to eliminate unnecessary motions, reduce fatigue, and optimize work methods to increase overall efficiency.
- o **Method Study:** Examines and evaluates existing work methods to identify opportunities for improvement.
- o **Work Measurement:** Encompasses both time study and motion study, providing a quantitative basis for evaluating and establishing standard times for work activities.

- **Time Study:**

- o Time study is a method used to determine the amount of time a worker should ideally take to perform a specific task at a defined level of performance.
- o It involves breaking down the job into elements, measuring the time required to complete each element, and establishing a standard time for the entire task.
- o The goal of time study is to set realistic and achievable production standards, which can be used for planning, scheduling, and performance evaluation.

- **Motion Study:**

- o Motion study focuses on the analysis and improvement of the movements required to perform a task. It aims to eliminate unnecessary motions and streamline the sequence of actions.
- o By studying the motions involved in a job, motion study seeks to design more efficient work methods, reduce fatigue, and enhance overall productivity.

- o The principles of motion economy, developed by Frank B. Gilbreth¹¹, are often applied in motion study to simplify tasks and optimize movements.

It is important to note that time study and motion study are interrelated components of work study. Time study provides quantitative data on the duration of tasks, while motion study focuses on the qualitative aspects of work, specifically the movements involved. Combining time and motion studies allows for a more holistic approach to optimizing work processes. Efficient movements can contribute to shorter task times, and shorter task times can improve overall efficiency. The synergy between time study and motion study within the framework of work study enables organizations to achieve higher productivity, reduce costs, and enhance the quality of output.

• **Work Measurement**

Work measurement is a systematic and scientific method used in industrial engineering to analyze, quantify, and optimize the time required to perform a specific task or job. The primary goal is to establish standardized time norms for various work activities, providing a basis for efficient resource allocation, production planning, and performance evaluation. Work measurement is an essential tool for organizations aiming to enhance operational efficiency, reduce costs, and maintain consistent and high-quality output. It forms the foundation for informed decision-making in various industries, supporting the ongoing pursuit of productivity and performance improvements. It involves the application of predetermined motion and time standards to measure and evaluate work performance.

The effective time so established in work measurement can be used for the following purposes:

- a) Incentive wage schemes which require data about the time allowed and time taken for a particular job.
- b) Improving utilization of men, machines and materials.
- c) Assisting in production control.
- d) Assisting in setting labour standards.
- e) Cost control and reduction.

• **Job Evaluation**

It is necessary for the management of any organisation to establish proper wage and salary structure for various jobs. For doing this in a scientific manner, it is necessary to determine the relative value of jobs and hence a job evaluation is done. It is a technique of analysis and assessment of jobs to determine their relative value within the firm. Job evaluation is a systematic process used by organizations to assess and determine the relative value or worth of different jobs within the company. The purpose is to establish a fair and equitable structure for compensation and create an organized hierarchy of jobs based on their inherent characteristics.

Methods of Job Evaluation

Three of the more important methods of job evaluation are discussed below:

- i. **Point Ranking Method:** In this method each job is analysed in terms of various job factors or characteristics. The characteristics are skills required, effort involved, working conditions, hazards, responsibility and so on. In other words, the job factors are the requirements needed for performing the job effectively. Each job factor is given weightage or points depending upon its value for the job. For example, for certain jobs, maximum value is assigned to experience while for some jobs, education may be the most crucial factor. Finally, each job is ranked in the order of points or weights secured by them. The wage structure can be suitably designed according to the points assigned to each job. The method is quite sound in principle but difficulties may be faced assigning the weights to each job.

11. Motion Study: A Method for Increasing the Efficiency of the Workman by Frank B. Gilbreth, 1911.

- ii. **Ranking Method:** In this method, jobs are ranked in order of importance on the basis of skills required, experience requirements, working conditions etc. Jobs are rearranged in an order, which can be either from the lowest to the highest or in the reverse. Wage scales are determined in terms of ranks. Though this method is quite simple to operate and less costly as well as easy for understanding, it is suitable when the size of the organisation is small and jobs are few and well defined. In a large organisation, where jobs are quite complex, this method is not beneficial.
- iii. **Grading Method:** This method is an improvement over the ranking method. Under this method, each job is analysed in terms of a predetermined grade and then assigned a grade or class. Grades are established after making an investigation of job factors, such as complexity in the job, supervision, responsibility, education etc.

- **Merit Rating**

Job evaluation is the rating of the job in order to bring rationality in the wage and salary structure in the organisation. On the other hand, merit rating is the comparative evaluation and analysis of individual merits of the employees. The merit rating aims at evaluation and ranking the individual employees in order to plan and implement rational promotional policies in the organisation. Merit rating has the following objectives:

- a) To evaluate the merit of an employee for the purpose of promotion, increment, reward and other benefits.
- b) To establish and develop a wage system and incentive scheme.
- c) To determine the suitability of an employee for a particular job.
- d) To analyze the merits or limitations of a worker and help him to develop his capability and competence for a job.
- e) To examine characteristics like cooperation, quality of work done, attendance and regularity, education, skill, experience, character and integrity and initiative.

Thus, it can be understood that merit rating is extremely useful for organisations for evaluating the employees. However, the main limitations are that the rating can be subjective which will give rise to the disputes and there is a possibility that past performance of an employee may be given too much importance.

Time Keeping, Time Booking and Payroll

Timekeeping, time booking, and payroll management, akin to the personnel department, significantly contribute to labour cost control by meticulously recording each worker's clock-in and clock-out times during regular working hours. This department plays a crucial role in reporting individual workers' time for specific departments, operations, or production orders. Accurate attendance records not only uphold punctuality and discipline within the company but also positively impact employee morale. Timekeeping is not just a statutory requirement; it is essential for precise record-keeping.

The key functions and benefits of timekeeping for labour costing and control can be summarized as follows:

- a) Facilitates the calculation of wages for workers paid on a time-rate basis by showing the total hours worked by each individual.
- b) Promotes punctuality and discipline among workers, preventing potential indiscipline and frustration in the absence of a reliable timekeeping system.
- c) Supports the computation of benefits like pension, gratuity, leave with pay, provident fund, promotion, and salary scale linked to the continuity of service through accurate attendance records.
- d) Enables the calculation of labour hours, aiding in overheads apportionment and absorption based on labour hours.

- e) Satisfies statutory requirements under labour laws.
- f) Provides data for additional analysis, such as establishing standard time, identifying idle time, and assessing labour efficiency. Researchers and government authorities can use timekeeping records for various purposes.

Time keeping and time booking – a contrast

Time Keeping and Time Booking are essential processes in organizations for managing employee attendance, wage calculations, and labour costs. While Time Keeping is concerned with attendance and wage calculations, Time Booking focuses on recording the time spent by employees on various jobs, processes, or operations. Both processes help organizations effectively manage their workforce and maintain accurate records for payroll and cost control purposes.

In the following table the distinguishing features of time keeping and time booking are presented

Time Keeping	Time Booking
Concerned with attendance and wage calculations of employees	Focuses on recording the time actually spent by a worker on various jobs, processes, or operations
Aimed at ensuring effective utilization of labour time and computing total wages payable to workers	Necessary for ascertaining labour cost of every job, providing time basis for apportionment of overheads expenses, and controlling idle time.
Involves marking the start and end times of a worker's shift Requires a separate time keeper	Involves recording the time when a job was started and finished by the worker Helps in computing the labour cost of each job or operation
Focuses on regular punctuality and discipline in the factory	Facilitates the fixation of differential piece rates and meeting statutory requirements

Thus, time keeping is simply maintaining attendance of the workers i.e., the time of arrival and the time of departure and thereby the time spent by the worker in the organisation is measured, whereas time booking is not only maintaining the time spent by the workers in the organisation, but also the time spent on each and every job including the idle time with reasons are recorded

Requirements for an effective time-keeping system

1. The timekeeping system must prevent any possibility of one employee acting as a proxy for another under any circumstances.
2. It should include a provision for recording the time of piece employees, ensuring the maintenance of regular attendance and discipline.
3. Both the arrival and departure times of employees should be recorded to accurately capture their total working hours, facilitating the calculation of wages.
4. The method of time recording should be primarily mechanical to minimize the likelihood of disputes between employees and the timekeeper.
5. Late arrivals should be documented, and the timekeeper should rigorously enforce this discipline.

6. The system should prioritize simplicity, smooth operation, and efficiency, eliminating unnecessary queues for attendance marking.
7. Regular reviews of the system should be conducted to identify and rectify any errors or loopholes, ensuring its continued effectiveness.

Methods of Time Keeping

The methods of time keeping are as follows:

1. **Attendance Records:** This is the simplest method of marking attendance of workers. In this method, every worker signs in an attendance register against his name. Leaves taken by workers as well as late reporting is marked on the attendance register itself. The main limitation of this system is that in case there is a large number of workers, there may be large queues for signing the muster.
2. **Disc Method:** In this approach, every employee is assigned a metal disc or token marked with a hole containing their identification number. The employee submits or the timekeeper receives the token, and the timekeeper then notes the corresponding identification number in the register. Similar to the attendance register method, this approach has drawbacks such as recording errors and the potential for proxy attendance. The main limitation of this method is that there is a possibility of marking the attendance of a worker by a proxy. Secondly, if the number of workers is large, there will be a delay in recording time due to manual operation of this system.
3. **Time Recording Clocks or Clock Cards:** This is an automated method of timekeeping where each worker uses a card to clock in and out. The card automatically records the time and date. A new card is issued each week (or month for monthly wage payments) to enable weekly or monthly wage calculations. There's no need to issue a new card monthly; the same card can be used until the worker leaves or retires. However, a limitation common to all timekeeping methods is that while they record time in and out, they don't provide details on how the worker spends their time during the workday. To capture productive time, separate time booking records must be maintained. These records can also be integrated with timekeeping records to eliminate the need for dual record-keeping.
4. **Bio-metric Attendance System:** According to Bio-metric attendance system, attendance of the employees is marked by recognizing an employee based on physical and behavioural traits. An employee's unique identity like finger print, face and retina image etc., is kept in a database which is matched at the time of marking of attendance before the attendance device for this purpose. Bio-metric attendance system includes finger print recognition system; face recognition system, Time and attendance tracking technology etc. This system reduces the risk of time manipulation and proxy attendance. However, it may not be possible for small organisations due to cost associated with set-up and maintenance of this system.

Time Booking

In time keeping we have seen that the basic objective of time keeping is to mark the attendance time, i.e., time-in and time-out. Time keeping aims at keeping a check on the number of hours spent by a worker in the factory. However, it does not record the productive time of the workers. It means the time keeping methods do not provide information about how the time is spent by the workers in the factory. For example, the time keeping record will show that the worker has reported for duty at 8 am and left at 6 pm, thus, he has spent 10 hours in the company. But the analysis of these 10 hours is not provided by the time keeping. In view of this there is a need to have a system, which will tell about the productive time spent by the workers in the factory. The method, which supplies this information, is known as 'Time Booking Methods' and the recording the time spent by a worker in each job, process or operation is known as 'Time Booking'.

The objective of time booking is as follows:

- i. To determine the productive time spent by the worker on the job or operation. This helps in finding out the idle time and controls the same.
- ii. To determine the quantity and value of work done.
- iii. To determine earnings like wages and bonus.
- iv. To determine the efficiency of workers.

Methods of Time Booking

The following methods are used for time booking:

1. **Daily Time Sheet:** In this method, each worker records the time spent by him on the work during the day, for which a sheet is provided to each worker. The time is recorded daily and hence accuracy is maintained. However, the main limitation of this method is lot of paper work is involved as daily sheets are maintained on daily basis by each worker.
2. **Weekly Time Sheets:** The only difference between the daily time sheet and weekly time sheet is that these time sheets are maintained on weekly basis. This means that each worker prepares these sheets weekly rather than daily. This helps in reducing the paper work to a great extent.

The only care to be taken is that since the information is filled up on daily basis, there may be inaccuracies and hence filling the information should be done on daily basis only.
3. **Job Ticket:** Job tickets are given to all workers where time for commencing the job is recorded as well as the time when the job is completed. The job tickets are given for each job and the recording of the time as mentioned above helps to ascertain the time taken for each job. After completing one job, the worker is given another job.
4. **Labour Cost Card:** This card is meant for a job, which involves several operations or stages of completion. Instead of giving one card to each worker, only one card is passed on to all workers and time taken on the job is recorded by each one of them. This card shows the aggregate labour cost of the job or the product.
5. **Time and Job Card:** This card is a combined record, which shows both, the time taken for completion of the job as well as the attendance time. Therefore, there is no need to keep separate record of both, time taken and attendance time.

Payroll Department

The role of the payroll department is crucial in the overall calculation and control of labour costs. This department is responsible for preparing the payroll based on clock cards, job or time tickets, or time sheets. The payroll provides details on each worker's wages, including gross wages, deductions, and net wages. Collaboration with the time office, personnel department, cost accounting department, and the relevant work department is essential for accurate calculations. The key functions of the payroll department include:

- a. Computing employee wages.
- b. Creating detailed wage sheets showing gross wages, various deductions, and other payroll liabilities.
- c. Maintaining individual employee payroll records.
- d. Preparing department-wise summaries of wages.
- e. Compiling labour statistics for management.
- f. Establishing an effective internal check system to prevent fraud and irregularities in wage payments.

- g. Deducting and preventing ghost workers.

The cost accounting department is responsible for analyzing labour costs for computation and control purposes. It accumulates and classifies all cost data, with labour cost being a significant component. This department categorizes labour costs into direct and indirect, compares actual labour costs with budgeted costs, computes unit labour costs, and compiles data for further analysis. The generated data aids management in decision-making.

The activities related to payroll and their corresponding responsibilities are outlined as follows:

Activities	Responsibilities
Attendance and time details.	Time-keeping department.
Preparation of list of employees and other details.	Personnel / HR department.
Computation of wages and other incentives.	Payroll department.
Payment to employees.	Cost Accounting Department.
Discharge of statutory liabilities.	Cost Accounting Department.

In summary, the payroll department plays a vital role in ensuring accurate and compliant wage payments, while the cost accounting department focuses on analyzing labour costs for effective management decision-making. The outlined payroll procedure delineates the activities and their corresponding responsibilities in the payroll process.

Labour Turnover, Overtime and Idle Time

Labour Turnover

Labour turnover refers to the net departure of employees over a defined period of time. In every organization, employees leave and new ones are recruited, creating the phenomenon of labour turnover. It is the change in the composition of the labour force in an organisation. It can be divided into voluntary vs. involuntary and avoidable vs. unavoidable labour turnover. It can be measured by relating the engagements and losses in the labour force to the total number employed at the beginning of the period. All the losses must be taken into account regardless of the cause for leaving.

High labour turnover, occurring frequently, leads to decreased productivity, disrupted workflow, and increased labour costs. The causes of high turnover fall into three categories:

- 1. Personnel Causes:** Employees leaving for personal reasons, such as job dissatisfaction, dislike for the environment, family responsibilities, career changes, retirement, or death.
- 2. Unavoidable Causes:** Circumstances that necessitate management to ask some workers to leave, including retrenchment due to seasonal trade, material shortages, or disciplinary reasons.
- 3. Avoidable Causes:** Reasons requiring management attention for effective remedial measures to keep turnover low, such as job unsuitability, low pay, unsatisfactory working conditions, poor relations with co-workers or superiors, disputes between trade unions, lack of amenities, and other social and economic factors.

These causes can also be grouped into financial, social and economic, and psychological factors related to human relationships. Managing and addressing these factors can contribute to minimizing labour turnover.

Measurement of Labour Turnover

It is essential for any organisation to measure the Labour Turnover. This is necessary for having an idea about the turnover in the organisation and also to compare the labour turnover of the previous period with the current one. The following methods are available for measurement of the labour turnover:

1. **Additions Method:** Under this method, number of employees added during a particular period is taken into consideration for computing the Labour Turnover. The method of computing is as follows:

$$\text{Labour Turnover} = \frac{\text{Number of Additions}}{\text{Average Number of Workers during the period}} \times 100$$

2. **Separation Method:** In this method, instead of taking the number of employees added, number of employees left during the period is taken into consideration. The method of computation is as follows:

$$\text{Labour Turnover} = \frac{\text{Number of Separation}}{\text{Average Number of Workers during the period}} \times 100$$

3. **Replacement Method:** In this method neither the additions nor the separations are taken into consideration. The number of employees replaced is taken into consideration for computing the labour turnover.

$$\text{Labour Turnover} = \frac{\text{Number of Replacement}}{\text{Average Number of Workers during the period}} \times 100$$

4. **Flux Method:** Under this method Labour Turnover is computed by taking into consideration the additions as well as separations. The turnover can also be computed by taking replacements and separations also. Computation is done as per the following methods:

$$\text{Labour Turnover} = \frac{\frac{1}{2} \times (\text{Number of Additions} + \text{Number of Separations})}{\text{Average Number of Workers during the period}} \times 100$$

Cost of labour turnover

The rising labour turnover presents a dual challenge, adversely affecting both workforce productivity and leading to increased costs. The costs associated with labour turnover can be categorized into two main groups:

- **Preventive Costs** – Preventive Costs refer to the expenditures incurred by an organization with the primary objective of maintaining worker satisfaction and discouraging employees from leaving their employment. These costs are essentially investments made to create a positive work environment, foster employee engagement, and address factors that might contribute to high turnover. Examples of preventive costs include:
 - a. **Employee Benefits:** Offering attractive benefits such as health insurance, retirement plans, and wellness programs to enhance job satisfaction and loyalty.
 - b. **Training and Development:** Providing ongoing training and development opportunities to enhance employee skills, job satisfaction, and career growth, making them more likely to stay with the organization.
 - c. **Workplace Wellness Programs:** Implementing initiatives to support the well-being of employees, both physically and mentally, contributing to overall job satisfaction and reducing the likelihood of turnover.
 - d. **Competitive Compensation:** Ensuring that salaries and other forms of compensation are competitive within the industry, preventing employees from seeking better-paying opportunities elsewhere.
 - e. **Employee Recognition Programs:** Acknowledging and rewarding employees for their contributions, fostering a positive work culture and reinforcing their sense of value within the organization.

By investing in these preventive measures, organizations aim to create a workplace that employees find fulfilling and satisfying, reducing the inclination to leave for better opportunities.

- **Replacement Costs** – Replacement Costs encompass the financial outlays associated with the recruitment and training of new employees, as well as the subsequent impacts on productivity and efficiency resulting from the inexperience of the newly acquired workforce. These costs are incurred when turnover occurs and a vacant position needs to be filled. Examples of replacement costs include:
 - a. **Recruitment Expenses:** Costs related to advertising job openings, conducting interviews, and screening candidates during the hiring process.
 - b. **Training and orientation:** Expenses associated with training new hires to ensure they are equipped with the necessary skills and knowledge to perform their roles effectively.
 - c. **Productivity loss:** The decrease in overall productivity and efficiency as new employees acclimate to their roles, resulting in potential disruptions to workflow.
 - d. **Wastage:** Resources wasted during the transition period, including any work left incomplete by departing employees and potential errors made by the inexperienced new hires.

By understanding and quantifying these replacement costs, organizations can better appreciate the financial impact of high turnover and develop strategies to minimize these expenditures through effective retention efforts.

Treatment of Labour Turnover

The following are the two ways in which labour turnover is treated in cost accounting

- Preventive costs are treated as overheads expenses and apportioned to departments on the basis of number of persons employed in each department.
- Replacement costs may arise either due to faults of departments or due to faulty management policy. In the first case the cost is charged as overheads to the concerned department. In the latter case, the overheads cost is apportioned to different departments, on the basis of number of persons employed in each department

Illustration 21

During October 2022, the following information is obtained from the Personnel Department of a manufacturing company. Labour force at the beginning of the month 1,900 and at the end of the month 2,100. During the month 25 people left while 40 persons were discharged. 280 workers were engaged out of which only 30 were appointed in the vacancy created by the number of workers separated and the rest on account of expansion scheme. Calculate the Labour Turnover by different methods.

Solution:

Computation of Labour Turnover

$$(a) \text{ Additions Method} = \frac{\text{Number of Additions}}{\text{Average Number of Workers during the period}} \times 100 = \frac{280}{2,000} \times 100 = 14\%$$

$$(b) \text{ Separation Method} = \frac{\text{Number of Separation}}{\text{Average Number of Workers during the period}} \times 100 = \frac{(25+40)}{2,000} \times 100 = \frac{65}{2,000} \times 100 = 3.25\%$$

$$(c) \text{ Replacement Method} = \frac{\text{Number of Replacements}}{\text{Average Number of Workers during the period}} \times 100 = \frac{30}{2,000} \times 100 = 1.5\%$$

$$(d) \text{ Flux Method} = \frac{\frac{1}{2} \times (\text{Number of Additions} + \text{Number of Separations})}{\text{Average Number of Workers during the period}} \times 100 = \frac{\frac{1}{2} \times (280 + 65)}{2,000} \times 100 = 8.63\%$$

$$\begin{aligned} \text{Average Number of Workers during the period} &= \frac{\text{Opening Number of Workers} + \text{Closing Number of Workers}}{2} \\ &= \frac{1,900 + 2,100}{2} = 2,000 \end{aligned}$$

Illustration 22

The extracts from the payroll of M/s. Maheswari Bros. are as follows:

Number of employees at the beginning of 2022	150
Number of employees at the end of 2022	200
Number of employees resigned	20
Number of employees discharged	5
Number of employees replaced due to resignation and discharges	20

Calculate the Labour Turnover rate for the factory by different methods.

Solution:

1. Separation Method $= \frac{\frac{25}{150 + 200}}{2} \times 100 = 14.29\%$
2. Replacement Method $= \frac{\frac{20}{150 + 200}}{2} \times 100 = 11.43\%$
3. Flux Method $= \frac{\frac{25+20}{150 + 200}}{2} \times 100 = 25.71\%$

Illustration 23

The management of XYZ Ltd is worried about the increasing Labour Turnover in the factory and before analyzing the causes and taking remedial steps; they want to have an idea of the profit foregone as a result of Labour Turnover during the last year. Last year's sales amounted to ₹ 83,03,300 and the profit / volume ratio was 20%. The total number of actual hours worked by the direct labour force was 4.45 lakhs. As a result of the delays by the personnel department in filling vacancies due to Labour Turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which, half of the hours were unproductive. The cost incurred consequent on labour turnover revealed, on analysis the following. Settlement cost due to leaving: ₹ 43,820 and recruitment costs: ₹ 26,740. Selection costs: ₹ 12,750 and training costs: ₹ 30,490.

Assuming that the potential production lost as a consequence of Labour Turnover could have been sold at prevailing prices, find out the profit foregone last year on account of Labour Turnover.

Solution:

Profit foregone = Loss in Contribution + Additional Cost incurred as a result of labour turnover

i. Actual Productive Hours during last year = 4,45,000 – 15,000 [i.e. 50% × 30,000 hours] = 4,30,000 hours

ii. Sales during last year = ₹ 83,03,300

iii. Productive Hours Lost in Current Year = 1,00,000 hours

∴ Loss in Sales during the current year = $\frac{₹ 83,03,300}{4,30,000} \times 1,00,000 = ₹ 19,31,000$

And Loss in Contribution = 20% × ₹ 19,31,000 = ₹ 3,86,200

Computation of Profit Foregone during the current year

	Amount (₹)
Contribution Lost	3,86,200
Settlement Cost due to leaving	43,820
Recruitment Cost	26,740
Selection Cost	12,750
Training Cost	30,490
Profit Foregone	5,00,000

Overtime

Overtime refers to the scenario in which an employee works beyond their regular working hours. The overtime rate is consistently higher than the standard rate and is typically set at double the normal rate. The Factories Act and Shops and Establishments Act establish the standard working hours, define overtime, specify the overtime rate, and set limits on the maximum hours of overtime permissible. The causes of overtime are discussed in the next few lines.

- Causes of Overtime
- Increased workload or production demands.
- Tight project deadlines.
- Staff shortages or absences.
- Seasonal fluctuations in business activity.
- Urgent customer orders or projects.
- Unforeseen emergencies or unexpected demand spikes.

Overtime wage is the total additional compensation for extra hours worked, while the overtime premium specifically denotes the extra amount paid as an incentive for working beyond regular hours. But for the purpose of this study note the terms are used to mean the same thing and also CAS 7 does not make any distinction between the two terms.

As per CAS – 7, overtime premium is defined as “The extra amount payable beyond the normal wages and salaries for beyond the normal working hours”.

Overtime premium comprises two components: the standard cost and an additional payment or premium, known as overtime cost. The standard cost is assigned to the Production Order or cost center/unit where the employee is engaged. The handling of overtime cost is contingent on the specific circumstances.

Managing overtime effectively involves balancing operational needs with employee well-being and addressing the potential drawbacks associated with extended working hours.

The disadvantages of overtime are as follows:

- **Cost Increase:** Higher labour costs due to increased overtime rates.
- **Health and Safety Concerns:** Increased likelihood of accidents or errors due to tiredness.
- **Quality Issues:** Diminished work quality as fatigue sets in.
- **Impact on Work-Life Balance:** Strain on employees' personal lives and time commitments.
- **Employee Turnover:** Overtime can contribute to dissatisfaction and higher turnover rates.
- **Impact on Regular Operations:** Regular work schedules may be disrupted, affecting routine operations.
- **Reduced Innovation and Creativity:** Fatigue may hinder creative thinking and problem-solving.
- **Training and Orientation Costs:** Increased turnover may lead to additional recruitment and training expenses.

Treatment of Overheads Premium

Para 6.6 of CAS 7 states that 'Overtime premium shall be assigned directly to the cost object or treated as overheads depending on the economic feasibility and the specific circumstance requiring such overtime'.

Overtime premium is the time spent beyond the normal working hours which is usually paid at a higher rate than the normal time rate. The overtime premium is to be assigned in one of the following ways:

- Where the overtime working is caused by a "rush order" of the customer or other special requirement of a job, the overtime premium is assigned to the job or product.
- In all other cases, it is usual to treat the overtime premium as overheads and absorb the same as part of overheads.

As such, the general rule for the treatment of Overheads premium in cost accounting is

1. If the overtime is resorted to at the desire of the customer, then the entire amount of overtime including overtime premium should be charged to the job directly.
2. If it is due to a general pressure of work to increase the output, the premium as well as overtime wages may be charged to general overheads.
3. If it is due to the negligence or delay of workers of a particular department, it may be charged to the concerned department.
4. If it is due to circumstances beyond control, it may be charged to Costing Profit & Loss Account.

Idle Time

Idle time refers to the period during which employees or machinery are not actively engaged in productive work but are still being paid. It represents unproductive time that does not contribute to the completion of tasks or the overall output of an organization. Idle time refers to the period of time when an asset, such as a machine or an employee, is available for use but remains unproductive. The following are some important aspects of idle time.

- Idle time has a cost because employees will still be paid their basic wage or salary for these unproductive hours and so there should be a record of idle time. It can be classified as normal or abnormal, depending on whether it is expected or unexpected

- Idle time can be caused by factors that are either controlled or uncontrolled by management, such as machine breakdowns, lack of work, or inefficient scheduling.
- It is important to comprehend the causes of idle time as it indicates gaps in productivity and efficiency.
- While some level of idle time is inevitable, managers should aim to minimize it rather than eliminate it.

Para 4.8 of CAS – 7 (Cost Accounting Standard on ‘Employee Cost’) defines idle time as ‘the difference between the time for which employees are paid / payable to employees and the employees’ time booked against cost objects’.

Para 5.6 of the CAS – 7 states the principle of measurement of idle time and states that ‘cost of Idle time is ascertained by the idle hours multiplied by the hourly rate applicable to the idle employee or a group of employees’.

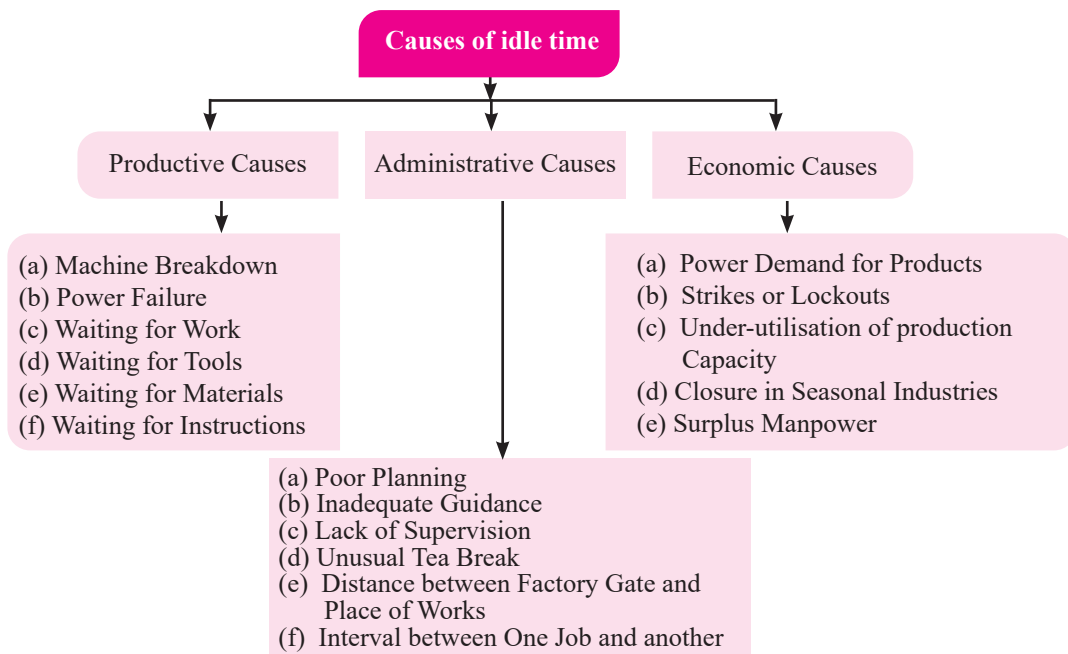
Thus,

$$\text{Cost of Idle Time} = \text{Idle Hours} \times \text{Hourly Rate}$$

The idle time cost can also be represented as a ratio. The idle time ratio is useful because it shows the proportion of available hours which were lost as a result of idle time.

$$\text{Idle Time Ratio} = \frac{\text{Idle Hours}}{\text{Total Hours}} \times 100$$

The causes of idle time may be classified under three broad heads as depicted in the following figure;



Treatment of normal and abnormal idle time

Normal idle time is a routine and expected part of the production process, included in standard costs, and absorbed into the overall cost of production. Normal idle time is considered inherent and unavoidable in any production setting. Employees may need breaks, and machinery may require maintenance, resulting in normal idle time. The treatment of abnormal idle time can be summarized as follows;

- Included in the standard cost calculations as it is part of the planned production time.
- Spread across the production units to determine the standard cost per unit.
- Usually absorbed into the cost of production as it is deemed a regular and unavoidable occurrence.

On the other hand, abnormal idle time is an unexpected and non-routine occurrence, treated separately, and charged as a direct cost to the specific cause or job affected by the idle time. It is considered unusual and non-routine, stemming from unforeseen disruptions in the production process. Treatment of abnormal idle time may be summed up as follows;

- Treated as a separate cost item rather than being absorbed into the standard cost.
- Typically charged as a direct cost to the specific job or production unit affected by the abnormal idle time.
- The cause of abnormal idle time is investigated to identify opportunities for preventive measures in the future.

As per CAS – 7, Idle time cost shall be assigned direct to the cost object or treated as overheads depending on the economic feasibility and specific circumstances causing such idle time. Treatment of different categories of idle time, as specified in CAS -7, are as follows:

- Unavoidable idle time above would be for significant periods. In cost accounts, this is allowed to remain merged in the production order or standing order number on which, the worker was otherwise employed.
- Normal idle time is booked to factory or works overheads. For the purpose of effective control, each type of idle time, i.e., idle time classified according to the causes is allocated to a separate standing order number.
- Abnormal idle time would usually be heavy in amount involves longer periods and would mostly be beyond the control of the management. Payment for such idle time is not included in cost and is adjusted through costing profit and loss account or included in profit and loss account, when the accounts are integrated.

The above issues may be summed up in the following table

Item	Charged to
1) Cost of Normal and Controllable Idle Time	Factory Overheads
2) Cost of Normal but Uncontrollable Idle Time	JOBS (by inflating the rates of wages)
3) Cost of Abnormal and Uncontrollable or Unavoidable Idle Time	Costing Profit and Loss Account

Remuneration Plans

General principles in designing the system of remuneration to employee

Remuneration is the reward for labour under normal circumstances and is generally based on either time spent or on the result produced. The former is called “time-related” remuneration and the latter is known as “Piece-related” remuneration. The fixation of method of remuneration in a proper manner is vitally important for any organisation because it deals with the most sensitive item of the input, i.e., Labour.

The general principles which should be considered in designing a proper method of labour remuneration is summarised below:

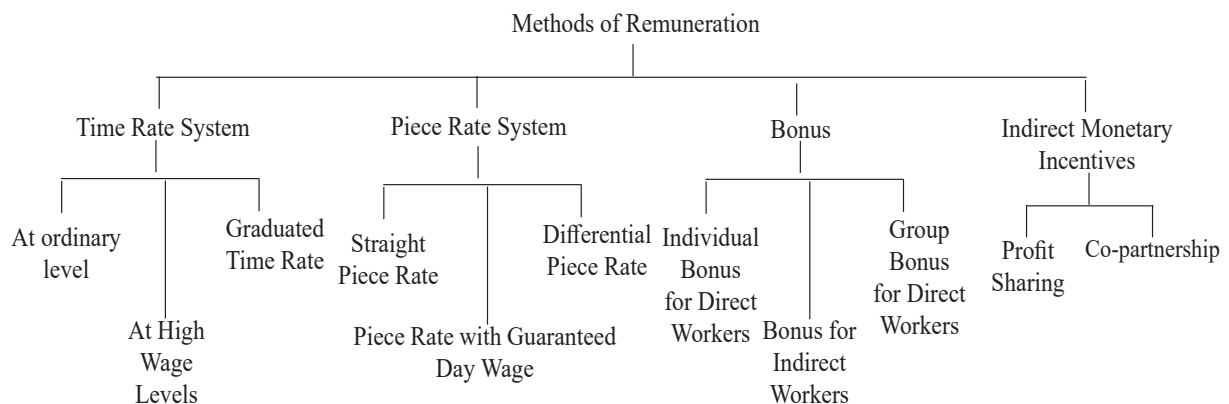
- a) The basis should be simple to understand and the various segments of the system, should clearly mention in detail.
- b) The employees should be able to accept the method without any doubts or hesitation in their mind.

- c) The method should be flexible enough to adopt any changes or variation which may become inevitable at a later stage.
- d) The method should be able to cut down / stabilize the labour turnover which is often caused by unsatisfactory or unacceptable method of remuneration.
- e) The method should assure fair wages to the employees so that both the employers and the employees can gain by such methods, the former by way of higher productivity and the latter by way of higher earnings.
- f) Incentive payments should be a part of the method of remuneration with a view to increase the labour productivity.
- g) The method should be able to minimize the level of absentees so that avoidable wastages in labour cost can be reduced.
- h) The method should ultimately result into higher production and improved quality of the output.

Methods of Wage Payment

One of the important components of labour cost control is the wages system. A system of wage payment, which takes care of both, i.e., providing guarantee of minimum wages as well as offering incentive to efficient workers helps to motivate the workers to a great extent. It should also be remembered that high wages do not necessarily mean high labour cost because it may be observed that due to high wages the productivity of workers is also high and hence the per unit cost of production is actually decreased. On the other hand, if low wages are paid, it may result in lower productivity and hence higher wages do not necessarily mean high cost.

The following is a schematic presentation of the various methods of remuneration.



** There are also some non-monetary incentives like job security, social and general welfare, sports, medical facilities etc which are also considered as important incentive schemes but are not considered in cost accounting

The methods are detailed in the following lines:

A. Time Rate Method

a) Time Rate at Ordinary Levels

Under this method, rate of payment of wages per hour is fixed and payment is made accordingly on the basis of time worked irrespective of the output produced. However, overtime is paid as per the statutory

provisions. The main benefit of this method for the workers is that they get guarantee of minimum income irrespective of the output produced by them. If a worker is not able to work due to genuine reasons like illness or physical disability, he will continue to get the wages on the basis of time taken for a particular job. This method is used in the following situation:

- i) Where the work requires high skill and quality is more important than the quantity.
- ii) Where the output / service is not quantifiable. i.e., where output / service cannot be measured.
- iii) Where the work done by one person is dependent upon other person, in other words where a individual worker has no control over the work.
- iv) Where the speed of production is governed by time in process or speed of a machine.
- v) Where the workers are learner or inexperienced.
- vi) Where continuous supervision is not possible.

The main advantage of this method is that the worker is assured of minimum income irrespective of the output produced. He can focus on quality as there is no monetary incentive for producing more output. However, the main limitation of this method is that it does not offer any incentive to the efficient workers. Efficient and inefficient workers are paid at the same rate of wages and hence there is possibility that even an efficient worker may become inefficient due to lack of incentive.

b) Time Rate at High Wage Levels

This system is a variation of time rate at ordinary levels in the sense that in this system, workers are paid at time rate but the rate is much higher than that is normally paid in the industry or area. In this method, the workers are paid according to the time taken and overtime is nor normally allowed. This method offers a very strong incentive to workers and it can attract talented workers in the industry. However, care should be taken that productivity also increases; otherwise, the cost will go on increasing.

c) Graduated Time Rate

Under this method payment is made at time rate, which varies according to personal qualities of the workers. The rate also changes with the official cost of living index. Thus, this method is suitable for both employer and employees.

B. Piece Rate Method

It's important to note that the effectiveness of a piece rate system depends on the nature of the work, the industry, and the way in which the system is implemented and managed. Employers need to carefully consider these factors and strike a balance between providing incentives for productivity and ensuring fair and equitable compensation for workers

This method is also called as payment by results where the workers are paid as per the production achieved by them. Thus, if a worker produces higher output, he can earn higher wages.

Under the piece rate system of wage payment, the workers receive a flat rate of wages either for time worked or for units manufactured.

The advantages of the piece rate system are as follows;

Advantages and disadvantages of Piece Rate System

Advantages of Piece Rate System

- **Incentive for Productivity:** Encourages higher productivity as employees are motivated to produce more to earn more.
- **Individual Performance Recognition:** Recognizes and rewards individual efforts, making it easier to identify and reward high performers.
- **Direct Link Between Effort and Earnings:** Establishes a clear link between employee effort and earnings, promoting a sense of fairness.
- **Simple and Transparent:** Simple to administer and transparent, as payment is directly tied to output.
- **Cost Control for Employers:** Helps employers control labour costs, as payment is based on actual production.

Disadvantages of Piece Rate System:

- **Quality Sacrifice:** Workers may prioritize quantity over quality to maximize output, potentially leading to lower product or service quality.
- **Stress and Fatigue:** Encourages overexertion and stress, as workers may push themselves to achieve higher output levels.
- **Difficulty in Setting Fair Rates:** Determining fair piece rates can be challenging, as it needs to balance the interests of both employees and employers.
- **Lack of Teamwork:** May discourage teamwork, as employees may focus on individual output rather than collaborative efforts.
- **Potential for Exploitation:** In some cases, piece rate systems may be exploited by employers to pay lower rates or set unrealistic production targets.
- **Resistance from Workers:** Workers may resist piece rate systems if they feel that the rates are unfair or if they are concerned about job security.

a) Straight Piece Rate

In this method, rate per unit is fixed and the worker is paid according to this rate. For example, if the rate per unit is fixed at ₹ 10, and the output produced is 300 units, the remuneration to the worker will be ₹ 10 × 300 units = ₹ 3,000. This method thus offers a very strong incentive to the workers and is particularly suitable where the work is repetitive. The benefits of this method are as follows:

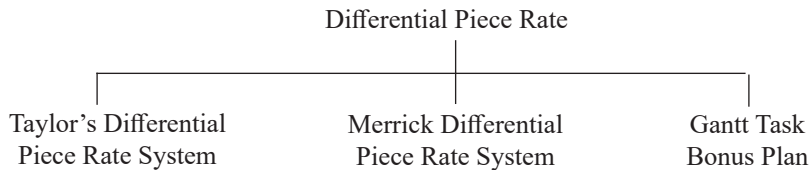
- i) The method is simple and provides a very strong incentive to the workers by linking the monetary reward directly to the results.
- ii) Productivity can be increased substantially if the rate of pay includes a really adequate incentive.
- iii) Higher productivity will result in lowering the cost per unit.

However, the main limitation of this method is that if a worker is not able to work efficiently due to reasons beyond his control, he will be penalized in the form of lower wages.

b) Differential Piece Rate

Differential Piece Rate System is a compensation approach that rewards workers with higher rates per

standard hour as they achieve higher levels of productivity. The system is effective when production processes are repetitive, methods are standardized, and individual worker output can be clearly identified. The efficiency of workers is evaluated by comparing their actual production with established standards, and those exceeding the standards qualify for higher wages. The following are the major systems of differential piece rate system:



• Taylor's Differential Piece Rate System

F.W. Taylor suggested that efficient workers should be encouraged to the maximum possible extent, the inefficient workers should be penalized. In order to do this, he has suggested two rates for the two classes of workers. Thus, according to Taylor, if the workers are efficient, they should be paid @ 120% of the normal piece rate and if they are inefficient, they should be paid @ 80% of the normal piece rate. For measuring efficiency, each worker will be given a standard production quantity to be produced in the time allowed and the actual production should be compared with the same. If a worker exceeds the standard, he will be regarded as efficient while if he fails to do so, he will be regarded as inefficient. The merits and Limitations of the system are as follows:

Merits

- i) There is a very strong incentive to the workers, which helps to achieve higher productivity.
- ii) Due to the incentive, best workers are attracted to the company.
- iii) This method is quite simple and hence easy to understand.

Limitations

- i) Slow workers and beginners are penalized severely. Similarly, workers get penalized for reasons beyond their control, e.g., medical reasons, accidents etc. Therefore, it is said that there is no human element in this system.
- ii) In an anxiety to produce more, quality may be neglected in order to achieve higher quantity of production.

Illustration 24

From the following particulars, calculate the earnings of workers X and Y and also comment on the labour cost.

Standard time allowed: 20 units per hour

Normal time rate: ₹ 30 per hour

Differential rate to be applied:

80% of piece rate when below standard

120% of piece rate at or above standard

In a particular day of 8 hours, X produces 140 units while Y produces 165 units.

Solution:

Particulars	Worker X	Worker Y
Standard Production in 8 Hours	$20 \times 8 = 160$ units	$20 \times 8 = 160$ units
Actual Production	140 units	165 units
	Below Standard = 80% of Normal Piece Rate	Above Standard = 120% of Normal Piece Rate
Piece Rate = $\frac{\text{Rate per hour}}{\text{Production per hour}}$	$\frac{\text{₹ } 30}{20 \text{ units}} = \text{₹ } 1.50 \text{ per unit}$	$\frac{\text{₹ } 30}{20 \text{ units}} = \text{₹ } 1.50 \text{ per unit}$
Earnings	$= 140 \times 1.50 \times 80\% = \text{₹ } 168$	$165 \times 1.50 \times 120\% = \text{₹ } 297$
Labour Cost per unit	$\frac{\text{₹ } 168}{140 \text{ units}} = \text{₹ } 1.20$	$\frac{\text{₹ } 297}{165 \text{ units}} = \text{₹ } 1.80$

Comment: Labour cost increase from ₹ 1.20 per unit to ₹ 1.80 per unit. Taylor's system is resisted on this ground as well as on the ground that it is very harsh on the workers.

• Merrick Differential Piece Rate System

Merrick's system is modification of Taylor's system and is comparatively less harsh on the workers. The scale of remunerations is as follows:

Production Rates of Payment

Upto 83% of production	-	Normal piece rate
83% to 100% of production	-	110% of ordinary piece rate
Above 100% of production	-	120% of ordinary piece rate

• Gantt Task Bonus Plan

In this method, there is a combination of time rate, bonus and piece rate plan. The remuneration is computed as shown below:

Production below standard	-	Guaranteed time rate
Production at standard	-	Bonus of 20% (normally) of time rate
Production above standard	-	High piece rate for the entire output

This method assures minimum wages for even too less efficient workers and hence is a preferred method of payment of wages. It also offers reasonably good incentive to efficient workers. However, the main limitation is that the method is complicated to understand by the workers and hence may create confusion amongst them.

Illustration 25

X, Y and Z are three workers in a manufacturing company and their output during a particular 40 hours week was 96, 111 and 126 units respectively. The guaranteed rate per hour is ₹ 10 per hour, low piece rate is ₹ 4 per unit, and high piece rate is ₹ 6 per unit. High task (standard) is 100 units per week. Normal Piece Rate to be taken at ₹ 6 per unit. Compute the total earnings and labour cost per unit under Taylor, Merrick and Gantt Task Bonus Plan.

Solution:

(a) Earnings under Taylor Plan

Particulars	X	Y	Z
Standard Production in 40 hours	100 units	100 units	100 units
Actual Production	96 units	111 units	126 units
	Below Standard = 80% of Normal Piece Rate	Above Standard = 120% of Normal Piece Rate	Above Standard = 120% of Normal Piece Rate
Earnings	$= 96 \times 6 \times 80\%$ $= ₹ 460.80$	$= 111 \times 6 \times 120\%$ $= ₹ 799.20$	$= 126 \times 6 \times 120\%$ $= ₹ 907.20$
Labour Cost per unit	$\frac{₹ 460.80}{96 \text{ units}} = ₹ 4.80$	$\frac{₹ 799.20}{111 \text{ units}} = ₹ 7.20$	$\frac{₹ 907.20}{126 \text{ units}} = ₹ 7.20$

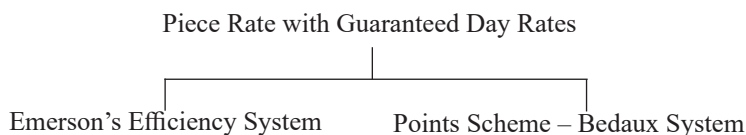
(b) Earnings under Merrick Plan

Particulars	X	Y	Z
Standard Production in 40 hours	100 units	100 units	100 units
Actual Production	96 units	111 units	126 units
Efficiency	$\frac{96}{100} \times 100 = 96\%$	$\frac{111}{100} \times 100 = 111\%$	$\frac{126}{100} \times 100 = 126\%$
	110% of Ordinary Piece Rate	120% of Ordinary Piece Rate	120% of Ordinary Piece Rate
Earnings	$= 96 \times 6 \times 110\%$ $= ₹ 633.60$	$= 111 \times 6 \times 120\%$ $= ₹ 799.20$	$= 126 \times 6 \times 120\%$ $= ₹ 907.20$
Labour Cost per unit	$\frac{₹ 633.60}{96 \text{ units}} = ₹ 6.60$	$\frac{₹ 799.20}{111 \text{ units}} = ₹ 7.20$	$\frac{₹ 907.20}{126 \text{ units}} = ₹ 7.20$

(c) Earnings under Gantt Task Bonus Plan

Particulars	X	Y	Z
Standard Production in 40 hours	100 units	100 units	100 units
Actual Production	96 units	111 units	126 units
	Below Standard = Guaranteed Time Rate	Above Standard = High Piece Rate	Above Standard = High Piece Rate
Earnings	$= 40 \times 10 = ₹ 400$	$= 111 \times 6 = ₹ 666$	$= 126 \times 6 = ₹ 756$
Labour Cost per unit	$\frac{₹ 400}{96 \text{ units}} = ₹ 4.17$	$\frac{₹ 666}{111 \text{ units}} = ₹ 6$	$\frac{₹ 756}{126 \text{ units}} = ₹ 6$

c) Piece Rate with Guaranteed Day Rates



- **Emerson's Efficiency System**

Under this system minimum time wages are guaranteed. Bonus in addition to minimum day wages is given to the worker beyond a certain efficiency level. A worker who is able to attain efficiency measured by his output which is equal to or above this standard efficiency is deemed to be an efficient worker who deserves encouragement.

The scheme provides for payment of bonus at various levels of efficiency ranging from 66.67% to 150% in the following manner:

- for a performance below 66.67% efficiency, only time rate wages are paid without any bonus.
- for a performance between 66.67% and 100% efficiency, bonus varies between 0.01% and 20%.
- above 100% efficiency level, bonus of 20% of basic wages + 1% for each 1% increase in efficiency is admissible.

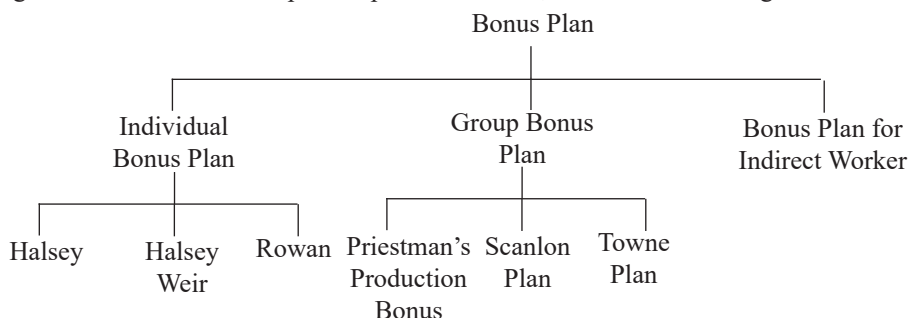
Emerson's efficiency system is superior to other differential piece rate as it encourages the slow worker to do better than before. It does not presuppose a high degree of average performance.. The wages are guaranteed on time basis.

- **Points Scheme – Bedaux System**

Under this system the quantum of work that can be performed by a worker is expressed in Bedaux Points or B's. These points represent the standard time expressed in terms of minutes that are necessary to perform a job. The standard numbers of points in terms of minutes are determined after analysing each operation or job in detail. Each such minute consists of the time required to complete a fraction of the operation or the job and also an allowance for rest due to fatigue. The workers who are not able to complete the tasks allotted to them within the standard time are paid only the normal daily rate of wages. Those workers who are able to increase their efficiency rate which is equal to the wages for time saved as indicated by excess of B's earned (i.e., standard time for work done – over actual time) are paid 75% of the time saved.

C. Bonus Systems

A schematic diagram of the various bonus plans is presented below, details of which are given in the next paragraphs.



a) Individual Bonus Plan

We have seen earlier that in the time rate system, the workers are paid according to the time taken while in case of piece rate system, the output produced by the worker decides his wages as rate per unit is fixed rather than rate per hour. In the premium bonus plan, the gain arising out of increased productivity is shared by both, the employer and employee.

The bonus to be paid to the workers is computed on the basis of savings in the hours, i.e., the difference between the time allowed and time taken. The time allowed is the standard time, which is fixed by conducting a time and motion study by the work study engineers. While fixing the standard time, due allowance is given for physical and mental fatigue as well as for normal idle time. The actual time taken is compared with this standard time and bonus is payable to the worker if the time taken is less than the standard time.

Time Allowed (TA), Time Taken (T)

Time Saved (TS = TA – T), Rate per hour (R)

The individual bonus schemes commonly used are as follows.

- **Halsey Premium Plan**

This plan was introduced by F.A. Halsey, an American engineer. In this plan, bonus is paid on the basis of time saved. Standard time is fixed for a job and if the actual time taken is less than the same, the worker becomes eligible for bonus. However, bonus is paid equal to wages of 50% of the time saved. A worker is assured of time wages if he takes longer time than the allowed time. The formula for computing the total wages is as follows.

$$\text{Total Earnings} = T \times R + \frac{50}{100} \times TS \times R$$

- **Halsey – Weir Plan**

Under this method, there is only one difference as compared to the Halsey Plan and that is instead of 50% bonus for the time saved, it is $33\frac{1}{3}\%$ of the time saved. Accordingly, the formula for this method is modified as follows:

$$\text{Total Earnings} = T \times R + 33\frac{1}{3}\% \times TS \times R$$

- **Rowan Plan**

This premium bonus plan was introduced by Mr. James Rowan. It is similar to that of Halsey Plan in respect of time saved, but bonus hours are calculated as the proportion of the time taken which the time saved bears to the time allowed and they are paid for at time rate. The formula for computation of total earnings is as follows:

$$\text{Total Earnings} = T \times R + \frac{TS}{TA} \times T \times R$$

- **Barth Variable Sharing Plan**

In this system, the total earnings are calculated as follows:

$$\text{Total Earnings} = R \times \sqrt{TA \times T}$$

b) **Group Bonus Plan**

The plans described above are all individual bonus plans. Many times, output of individuals cannot be measured. Similarly, the output of individual is dependent on the performance of the group. In such cases, rather implementing individual bonus systems, group bonus system is implemented. The total amount of bonus, which is determined according to productivity, can then be shared equally or in agreed proportion between the group members. The main objects of group bonus system are as follows:

- Creation of team spirit
- Elimination of excessive waste of materials and time
- Recognition of group efforts
- Improving productivity

Some of the group premium plans are described below:

- **Priestman's Production Bonus** - Under this plan, a standard production is fixed for the entire factory for a particular period in consultation with workers. The actual production is compared with the standard production at the end of the period. If the actual production exceeds the standard production, all workers are paid bonus in proportion to the increase in output.

Workers are assured time wages if actual output does not exceed the standard output. Workers try hard to produce more because they are to get bonus only when actual output is more than the standard output.

- **Scanlon Plan** - Under this plan, a constant proportion (i.e., ratio of wages to sales value) of the added value of output is paid to the workers who are responsible for the addition of the value. The added value is the change in market value (including profit) resulting from an alteration in the form, location or availability of a product or service, excluding the cost of purchased materials or services used in production.
- **Towne Plan** - The objective of this plan is to encourage cost reduction by foremen and workers. However, bonus is paid upon a reduction in labour cost alone. A standard labour cost per unit for a particular period is determined and if actual labour cost per unit is less than the standard labour cost, 50% of the saving in labour cost is distributed among workers and foremen in proportion to their wages.

c) Bonus System for Indirect Workers

Indirect workers do not take part in the production process directly but they play important role in the production process. It is difficult to chalk out a bonus system for indirect workers, as there is a difficulty in measuring their output. However, it is advisable to plan a bonus system for indirect workers in order to motivate them for better productivity. Bonus to indirect workers is paid on the basis of output of the department, saving in time or expenditure against the budgeted, product quality, reduction of waste and scrap and reduction of labour turnover.

D. Indirect Monetary Incentives

These methods aim at giving additional remuneration based on the prosperity of the concern. The following schemes fall in this category:

- a) **Profit Sharing:** In this system, the profits of the organisation are shared by workers in agreed proportion. The payment of Bonus Act, 1965 in India makes it mandatory to pay minimum bonus of 8.33% of salary and maximum bonus of 20% of salary to the workers.
- b) **Co-partnership:** In this system, the workers get an opportunity to participate in the ownership of the organisation and to receive the part of share of profits. The employees are given assistance to purchase shares of the economy. Thus, the employees get dividend and bonus also. These schemes help to boost the morale of workers to a great extent.

E. Non-Monetary Incentives

These incentives are given in addition to monetary incentives for further boosting the moral of the employees. Though these benefits do not result in additional remuneration, they help to improve productivity by boosting the morale of the employees.

Treatment of some of the Employees Cost items in Costing

i) Supervisor's salary / Foreman's salary

The foreman is mainly concerned with the supervision of man and machines in the workshop and so his salary is 'works indirect expenses' and must be charged to works expenses account and included in works overheads. It is apportioned on the basis of degree of supervision required on such machine or men.

If he devotes equal time for all the machines his salary should be equally charged off against all of them. In case he devoted more time to a particular machine or to a particular batch of workers, proportionately higher share of his salary should be borne by that particular machine or batch of workers.

ii) Bonus under Payment of Bonus Act, 1965

The Payment of Bonus Act, 1965 provides that to the eligible employees a minimum bonus @ 8% of gross annual earning will have to be paid irrespective of profits made or losses incurred. If there is adequate profit a higher bonus is paid but upto the maximum limit of 20% of gross earnings. Therefore, it is clear that the minimum bonus is a definite charge against profit because even in case of loss this bonus is payable and according to the classification of labour direct or indirect should be included in direct labour cost or production overheads. The portion of bonus over and above the minimum is based on profit and should be charged off to costing profit and loss account and not taken into the cost at all. However, some accountants argued that this portion of bonus should also be taken into the cost in appropriate heads of Direct Labour or Production Overheads. But the former treatment should be taken as more sensible.

iii) Leave Travel Assistance

Leave Travel Assistance is paid to practically all the employees presently and therefore can be considered as a regular element of labour or staff cost as the case may be. This expenditure is of a fixed nature and can be easily predetermined. Depending on whether the assistance is payable to direct labour, indirect labour or staff the expenditure should be treated as Direct Labour Cost, Production Overheads Cost or Administrative Overheads Cost and should be appropriately charged.

iv) Night Shift Allowance

It is customary practice that the persons working in night shifts are paid some extra and such an allowance is known as night shift allowance. Such additional expenditure caused by general pressure of work in excess of normal capacity are charged to general production overheads because otherwise job performed during days will be cheaper than the jobs completed during night which by no means a fair proposition. If the additional expenditure is incurred extremely as a result of pressing demands from customers such expenditure should directly be charged to the job concerned. On the other hand if the night shifts are run for a fault of the particular department the night shift allowance should be charged as the departmental overheads applicable to the concerned department.

v) Fringe Benefits

Fringe benefits are those expenses which are spent by an employer against the individual employees for their welfare. Normally such expenses do not form part of their pay packer, e.g., ESI contribution made by an employer. Such expenses may be recovered separately as a percentage on labour cost or at an hourly rate. Alternatively, those may be treated as overheads and apportioned to cost centres on the basis of wages/salary cost.

vi) Work on Holidays and Weekly off Days

Usually work on such days is to be paid at a higher rate than the normal days' grace. The extra payment involved is treated in the same manner as in the cases of overtime premium as started before (refer treatment of overtime). Normal wages are charged direct to the work orders / job / process handled during the period.

vii) Attendance Bonus

This is paid to workers based on satisfactory attendance over a stated period and is a fringe benefit. The cost is to be collected under a standing order number and charged as a departmental overheads as the expenses cannot be allocated to cost units directly.

In case the cost is disproportionate from months to months, a proportionate amount may be charged in each period to avoid variation in cost.

When the cost is of a regular nature it may be booked as direct wages and charged by an inflated rate over the Direct Labour Cost. But this is however, not a sound policy.

viii) **Employer's contribution to Employees' Provident Fund**

This is an obligatory charge under the Employees Provident Fund Act of 1952 and the scheme framed there under. This should be treated as part of direct wages of workers. The direct wages paid should be inflated for the cost involved and the products of jobs charged at an inflated rate. An alternative treatment can be made as such that the contribution for the indirect workers is an item of overheads.

ix) **Lost time due to a major overhauling of a machine as result of severe breakdowns**

Manufacturing concerns having a number of machines in the factory usually follow a maintenance schedule whereby the entire factory is overhauled once a year. The related cost of such period consisting mainly of fixed cost is estimated and apportioned as a manufacturing / factory overheads over the annual production. But a sudden and severe breakdown may upset the production plan and call for major overhaul of machine. Such an occurrence is certainly abnormal and all costs related to the breakdown and overhaul should be collected through a separate standing order number and transferred to the costing profit and loss account thereby into distorting the normal cost of production.

Employee cost reporting and measurement of efficiency

Employee Cost Reporting

- 1. Presentation of Direct Employee Costs:** In the cost statement, direct employee costs will be displayed as a distinct cost category. Direct employees are those directly engaged in product manufacturing, either manually or through machines. Examples include assembly line workers in an automobile factory or textile industry workers operating spindles or looms. Their costs, which are easily traceable to the product, will be presented separately in the cost statement.
- 2. Treatment of Indirect Employee Costs:** Indirect employee costs will be incorporated into cost statements as part of overheads associated with specific functions such as manufacturing, administration, or marketing. Indirect employee costs are not directly assignable to a specific product but are essential components of overheads. Employees contributing indirectly to production, like product designers and supervisors, are considered part of production overheads. Salaries of those involved in administrative, personnel, and accounting roles are categorized as administrative overheads. Similarly, salaries of employees engaged in marketing, sales, and distribution activities fall under selling and distribution overheads.
- 3. Detailed Breakdown of Resources Consumed:** The cost statement will provide a comprehensive breakdown of resources consumed due to employee costs, categorized by types such as permanent and temporary salaries, part-time and contract employee wages, piece-rate payments, overtime payments, and employee benefits sorted by categories. This breakdown is particularly important when these items significantly contribute to the overall employee cost. Direct employee costs, as outlined by CAS – 7, will be separately highlighted in the cost statement.

Measurement of Efficiency

Labour Efficiency Ratio

The Labour Efficiency Ratio, also known as the productivity ratio, measures the effectiveness of labour utilization in a given period. It is calculated by comparing the actual output or production achieved by a workforce to the standard or expected output. A higher ratio indicates more efficient utilization of labour resources, while a lower ratio may suggest inefficiencies or underperformance.

Monitoring the Labour Efficiency Ratio is crucial for businesses aiming to optimize workforce productivity, enhance operational performance, and identify areas for improvement in their production processes.

$$\text{Labour efficiency ratio} = \frac{\text{Expected time to produce the output (in hours)}}{\text{Actual time to produce the output (in hours)}} \times 100\%$$

When the output is generated within the anticipated time frame, the efficiency ratio stands at 100%. If the output is generated at a faster pace than initially anticipated, the efficiency ratio surpasses 100%.

Example

During July 2022, a factory produced 3,600 units of a product. The expected production time is 3 direct labour hours for each unit. The actual number of direct labour hours worked in the month was 10,000 hours.

$$\text{Efficiency ratio} = \frac{(3,600 \times 3 \text{ hours})}{10,000 \text{ hours}} \times 100\% = 108\%$$

It is important to note that, when a labour efficiency ratio is calculated, the actual hours worked should exclude any hours recorded as idle time.

Capacity Utilization Ratio

Employees may not be consistently involved in active tasks while at the workplace. Instances of employee “idle” time can occur for various reasons, including waiting for the next assignment or during production interruptions caused by machinery breakdowns.

A capacity utilisation ratio is a ratio that measures the actual hours actively working as a percentage of the actual hours that were available for working

$$\text{Capacity utilisation ratio} = \frac{\text{Hours spent in active working}}{\text{Total hours available for work}} \times 100$$

Example

A production department has 6 employees who each work 40 hours a week. In a particular week, the recorded idle time was 25 hours.

$$\text{Total hours available for work} = 6 \text{ employees} \times 40 \text{ hours} = 240 \text{ hours.}$$

$$\text{Capacity utilisation ratio} = \frac{(240 - 25)}{240} \times 100\% = 89.6\%$$

Production Volume Ratio

Labour activity can also be measured by a production volume ratio which is calculated as follows:

$$\text{Production volume ratio} = \frac{\text{Expected time to produce the output}}{\text{Total hours available for work}} \times 100$$

Otherwise, the production volume ratio can be calculated as follows:

$$\text{Production volume ratio} = \text{Labour efficiency ratio} \times \text{Capacity utilisation ratio}$$

Illustration 26

During May 2023, there were 21 working days of 8 hours per day. The workforce consists of 10 employees, who all do the same work.

Due to problems in the production system and a machine breakdown, 240 hours were recorded as idle time during the month.

During May, the workforce produced 5,400 units of output. The expected time per unit of output is 15 minutes (= 0.25 hours).

Required

For May 2023, Calculate, (a) the efficiency ratio (b) the capacity utilisation ratio (c) the production volume ratio

Solution:

To calculate the efficiency ratio, the hours worked should exclude idle time.

$$\text{Labour efficiency ratio} = \frac{\text{Expected time to produce the output (in hours)}}{\text{Actual time to produce the output (in hours)}} \times 100\%$$

Hours worked = (21 days × 8 hours × 10 employees) – 240 hours idle time = 1,680 – 240 = 1,440 hours

Therefore,

$$\text{Labour efficiency ratio} = \frac{(5400 \text{ units} \times 0.25 \text{ hrs}) = 1350 \text{ hrs}}{1440 \text{ hrs}} \times 100\% = 93.75\%$$

$$\text{Capacity utilisation ratio} = \frac{\text{Active hours worked}}{\text{ours available}} = \frac{1,440 \text{ hours}}{1680 \text{ hours}} \times 100\% = 85.71\%$$

$$\text{Production volume ratio} = \frac{\text{Expected time to produce 5,400 units}}{\text{Total hours available}} = \frac{1,350 \text{ hours}}{1680 \text{ hours}} \times 100\% = 80.35\%.$$

Check,

$$\begin{aligned} \text{Production volume ratio} &= \text{Efficiency ratio} \times \text{Capacity utilisation ratio} \\ &= \text{Production volume ratio } 93.75\% \times 85.71\% \\ &= 80.35\%. \end{aligned}$$

Numerical Illustrations

Illustration 27

Time allowed for a job is 48 hours; a worker takes 40 hours to complete the job. Time rate per hour is ₹ 15. Compute the total earnings of the worker under any four methods.

Solution:

Time Allowed (TA) = 48 hours,

Time Taken (T) = 40 hours,

Time Saved (TS = TA – T) = 8 hours,

Rate per hour (R) = ₹ 15

(a) Halsey Plan

$$\begin{aligned} \text{Earnings} &= T \times R + \frac{50}{100} \times TS \times R \\ &= 40 \times 15 + \frac{50}{100} \times 8 \times 15 \\ &= 600 + 60 &= ₹ 660 \end{aligned}$$

(b) Halsey – Weir Plan

$$\begin{aligned} \text{Earnings} &= T \times R + 33\frac{1}{3}\% \times TS \times R \\ &= 40 \times 15 + \frac{1}{3} \times 8 \times 15 \\ &= 600 + 40 \\ &= ₹ 640 \end{aligned}$$

(c) Rowan Plan

$$\begin{aligned}
 \text{Earnings} &= T \times R + \frac{TS}{TA} \times T \times R \\
 &= 40 \times 15 + \frac{8}{48} \times 40 \times 15 \\
 &= 600 + 100 \\
 &= ₹ 700
 \end{aligned}$$

(d) Barth Variable Sharing Plan

$$\text{Earnings} = R \times \sqrt{TA \times T} = 15 \times \sqrt{48 \times 40} = 15 \times 43.82 = ₹ 657.30$$

Illustration 28

Calculate the total earnings and effective rate of earnings per hour of three operators under Rowan System and Halsey System from the following particulars.

The standard time fixed for producing 1 dozen articles is 50 hours. The rate of wages is ₹1 per hour. The actual time taken by three are as follows:

- A 45 hours
- B 40 hours
- C 30 hours

Solution:

Particulars	A	B	C
Time Allowed (TA)	50 hours	50 hours	50 hours
Time Taken (T)	45 hours	40 hours	30 hours
Time Saved (TS)	5 hours	10 hours	20 hours
Rate per hour (R)	₹ 1	₹ 1	₹ 1
Earnings under Rowan Plan = $T \times R + \frac{TS}{TA} \times T \times R$			
Earnings	$45 \times 1 + \frac{5}{50} \times 45 \times 1$ = 45 + 4.50 = ₹ 49.50	$40 \times 1 + \frac{10}{50} \times 40 \times 1$ = 40 + 8 = ₹ 48	$30 \times 1 + \frac{20}{50} \times 30 \times 1$ = 30 + 12 = ₹ 42
Effective Rate (i.e., Earnings per hour)	$= \frac{₹49.50}{45 \text{ hours}} = ₹ 1.10$	$= \frac{₹48}{40 \text{ hours}} = ₹ 1.20$	$= \frac{₹42}{30 \text{ hours}} = ₹ 1.40$
Earnings under Halsey Plan = $T \times R + \frac{50}{100} \times TS \times R$			
Earnings	$45 \times 1 + \frac{50}{100} \times 5 \times 1$ = 45 + 2.50 = ₹ 47.50	$40 \times 1 + \frac{50}{100} \times 10 \times 1$ = 40 + 5 = ₹ 45	$30 \times 1 + \frac{50}{100} \times 20 \times 1$ = 30 + 10 = ₹ 40
Effective Rate (i.e., Earnings per hour)	$= \frac{₹47.50}{45 \text{ hours}} = ₹ 1.06$	$= \frac{₹45}{40 \text{ hours}} = ₹ 1.125$	$= \frac{₹40}{30 \text{ hours}} = ₹ 1.33$

Illustration 29

A workman takes 9 hours to complete a job on daily wages and 6 hours on a scheme of payment by results. His hourly rate is 25 paise. The material cost of the product is ₹ 4 and factory overheads are recovered at 150% of the total direct wages. Calculate the factory cost of the product under following methods:

- a) Time rate system b) Halsey Plan c) Rowan Plan

Solution:

Computation of Factory Cost under three systems:

Particulars	(a) Time Rate System	(b) Halsey Plan	(c) Rowan Plan
	Amount (₹)	Amount (₹)	Amount (₹)
Material	4.00	4.00	4.00
Labour (working note)	2.25	1.88	2.00
Prime Cost	6.25	5.88	6.00
Overheads	$150\% \times 2.25 = 3.38$	$150\% \times 1.88 = 2.82$	$150\% \times 2 = 3$
Factory Cost	9.63	8.70	9.00

Working Note

1. Computation of Earnings (i.e., Labour Cost) under three systems

Particulars	(a) Time Rate System	(b) Halsey Plan	(c) Rowan Plan
Earning	$T \times R$	$T \times R + \frac{50}{100} \times TS \times R$	$T \times R + \frac{TS}{TA} \times T \times R$
Time Taken (T)	9 hours	6 hours	6 hours
Time Allowed (TA)	-	9 hours	9 hours
Time Saved (TS)	-	3 hours	3 hours
Rate (R)	₹ 0.25	₹ 0.25	₹ 0.25
Earnings (i.e., Labour Cost)	$9 \times 0.25 = ₹ 2.25$	$6 \times 0.25 + \frac{50}{100} \times 3 \times 0.25$ $= 1.50 + 0.375 = ₹ 1.88$	$6 \times 0.25 + \frac{3}{9} \times 6 \times 0.25$ $= 1.50 + 0.50 = ₹ 2.00$

Illustration 30

A worker under the Halsey method of remuneration has a day rate of ₹ 12 per week of 48 hours, plus a cost-of-living bonus of 10 paise per hour worked. He is given 8 hours task to perform, which he performs in 6 hours, he is allowed 30% of the time saved as premium bonus. What would be his earnings under Halsey Plan and Rowan Plan.

Solution:

Time Allowed (TA) = 8 hours

Time Taken (T) = 6 hours

Time Saved (TS = TA – T) = 2 hours

Rate per hour = $\frac{₹ 12}{48 \text{ hours}} = ₹ 0.25$

Earnings under Halsey Plan = $T \times R + 30\% \times TS \times R = 6 \times 0.25 + 30\% \times 2 \times 0.25 = 1.50 + 0.15 = ₹ 1.65$

Add: Cost of Living Bonus (6 hours × 10 paise per hour) = ₹ 0.60

Gross Earnings under Halsey Plan = ₹ 2.25

$$\begin{aligned}\text{Earnings under Rowan Plan} &= T \times R + \frac{TS}{TA} \times T \times R \\ &= 6 \times 0.25 + \frac{2}{8} \times 6 \times 0.25 = 1.50 + 0.375 = ₹ 1.88\end{aligned}$$

Add: Cost of Living Bonus (6 hours × 10 paise per hour) = ₹ 0.60

Gross Earnings under Rowan Plan = ₹ 2.48

Illustration 31

In a factory guaranteed wages at the rate of ₹ 1.80 per hour are paid in a 48-hour week. By time and motion study it is estimated that to manufacture one unit of a particular product 20 minutes are taken, the time allowed is increase by 25%. During the week A produced 180 units of the product. Calculate his wages under the following methods:

- Time Rate
- Piece Rate with a guaranteed weekly wage
- Halsey Premium Bonus
- Rowan Premium Bonus

Solution:

Time Taken (T) = 48 hours

Rate per hour (R) = ₹ 1.80 Actual Production = 180 units

(a) **Earnings under Time Rate** = $T \times R = 48 \times 1.80 = ₹ 86.40$

(b) **Earnings under Piece Rate with a guaranteed weekly wage**

Normal time taken to manufacture one unit = 20 minutes

Add: Allowance @ 25% = 5 minutes

∴ Standard Time (or Time Allowed) for one unit = 25 minutes

∴ Number of Pieces to manufacture per hour = $\frac{60}{25}$

Piece Rate = $\frac{\text{Rate per hour}}{\text{Number of Pieces to manufacture per hour}} = \frac{₹ 1.80 \text{ per hour}}{60/25 \text{ pieces per hour}} = ₹ 0.75 \text{ per piece}$

Earnings under Piece Rate = 180 units × ₹ 0.75 per piece = ₹ 135

(c) **Earnings under Halsey Premium Bonus Plan**

Time Allowed (TA) for 180 units = $180 \text{ units} \times \frac{25}{60} = 75 \text{ hours}$

Time Saved (TS = TA – T) = 75 – 48 = 27 hours

Earnings under Halsey Plan = $T \times R + 50\% \times TS \times R$
 $= 48 \times 1.80 + 50\% \times 27 \times 1.80 = 86.40 + 24.30 = ₹ 110.70$

$$\begin{aligned}
 \text{(d) Earnings under Rowan Premium Bonus Plan} &= T \times R + \frac{TS}{TA} \times T \times R \\
 &= 48 \times 1.80 + \frac{27}{75} \times 48 \times 1.80 \\
 &= 86.40 + 31.104 \\
 &= ₹ 117.50
 \end{aligned}$$

Illustration 32

Calculate the earnings of workers A and B under Straight Piece Rate system and Taylor's Differential Piece Rate system from the following particulars:

Normal rate per hour ₹ 1.80

Standard time per unit 20 seconds

Differentials to be applied are:

80% of the piece rate below the standard;

120% of the piece rate at or above standard.

A produced 1,300 units per day of 8 hours and B 1,500 units per day of 8 hours.

Solution:

Standard time to manufacture one unit = 20 seconds

Number of units to manufacture in one minute = $\frac{60}{20} = 3$ units

Number of units to manufacture in one hour = $60 \times 3 = 180$ units

Rate per hour = ₹ 1.80

∴ Rate per piece = $\frac{\text{Rate per hour}}{\text{Number of units to manufacture in one hour}} = \frac{₹ 1.80}{180 \text{ Units}} = ₹ 0.01$

Standard Production in 8 hours = $180 \times 8 = 1,440$ units

Earnings under Straight Piece Rate:

Earnings of A = $1,300 \times 0.01 = ₹ 13.00$

Earnings of B = $1,500 \times 0.01 = ₹ 15.00$

Earnings under Taylor's Differentials Piece Rate

Particulars	A	B
Standard Production	1,440 units	1,440 units
Actual Production	1,300 units	1,500 units
Efficiency	$= \frac{1,300}{1,440} \times 100 = 90.28\%$	$= \frac{1,500}{1,440} \times 100 = 104.17\%$
	Below Standard = 80% of Normal Piece Rate	Above Standard = 120% of Normal Piece Rate

Earnings	$= 1,300 \times 0.01 \times 80\% = ₹ 10.40$	$= 1,500 \times 0.01 \times 120\% = ₹ 18.00$
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Illustration 33

The following particulars apply to a particular job:

Standard production per hour	6 units
Normal rate per hour	₹ 1.20
Mohan produced	32 units
Ram produced	42 units
Prasad produced	50 units

Calculate the wages of these workers under Merrick Differential Piece Rate system [Assume a day has 8 working hours]

Solution:

Calculation of wages of workers under Merrick Differential Piece Rate System

Particulars	Mohan	Ram	Prasad
Normal Piece Rate	₹ 0.20	₹ 0.20	₹ 0.20
Standard Production per day 6 units x 8 hours	48 units	48 units	48 units
Actual Production	32 units	42 units	50 units
Efficiency	$\frac{32}{48} \times 100 = 66\frac{2}{3}\%$	$\frac{42}{48} \times 100 = 87.50\%$	$\frac{50}{48} \times 100 = 104\frac{1}{6}\%$
Earnings	Normal Piece Rate	110% of Normal Piece Rate	120% of Normal Piece Rate
Earnings	$0.20 \times 32 = ₹ 6.40$	$110\% \times 0.20 \times 42 = ₹ 9.24$	$120\% \times 0.20 \times 50 = ₹ 12$

$$\text{Normal Piece Rate} = \frac{\text{Normal Rate per hour}}{\text{Standard Production per hour}} = \frac{₹ 1.20}{6 \text{ Units}} = ₹ 0.20$$

$$\text{Efficiency} = \frac{\text{Actual Production}}{\text{Standard Production}} \times 100$$

Illustration 34

In a manufacturing concern the daily wage rate is ₹2.50. The standard output in a 6 day week is 200 units representing 100% efficiency. The daily wage rate is paid without bonus to those workers who show up to $66\frac{2}{3}\%$ of the efficiency standard. Beyond this there is a bonus payable on a graded scale as below:

82% efficiency	5% bonus
90% efficiency	9% bonus
100% efficiency	20% bonus

Further increase of 1% bonus for every 1% further rise in efficiency. In a 6 day week A produced 180 units; B 164 units; C 200 units; D 208 units and E 130 units.

Cost Accounting

Calculate the earnings of these workers.

Solution:

Particulars	A	B	C	D	E
Standard Output (units)	200	200	200	200	200
Actual Output (units)	180	164	200	208	130
Efficiency	$\frac{180}{200} \times 100$ = 90%	$\frac{164}{200} \times 100$ = 82%	$\frac{200}{200} \times 100$ = 100%	$\frac{208}{200} \times 100$ = 104%	$\frac{130}{200} \times 100$ = 65%
Bonus %	9%	5%	20%	24%	Nil
Normal daily wage (6 days x ₹ 2.50)	₹ 15	₹ 15	₹ 15	₹ 15	₹ 15
Add: Bonus	15 x 9% = ₹ 1.35	15 x 5% = ₹ 0.75	15 x 20% = ₹ 3	15 x 24% = ₹ 3.60	Nil
Total Wages	₹ 16.35	₹ 15.75	₹ 18	₹ 18.60	₹ 15

Illustration 35

Workmen of a particular grade working on 8 hour shift duty are guaranteed a wage of ₹ 32. An incentive scheme is in operation according to which production bonus is earned directly proportional to performance but only after 100% performance is reached. Four workmen A, B, C and D produced 48, 60, 75 and 90 units respectively in 6 hours working on a job which has standard time of 6 minutes per unit as measured work content. Remaining 2 hours of the shift are spent in doing unmeasured work for which no incentive bonus can be paid. Find for each workman:

- The production performance level achieved;
- Total earnings for the day.

Solution:

Standard working hours per day 6 hours or 360 minutes

Standard Time required per unit 6 minute p.u.

∴ Standard Production / output per day $\frac{360 \text{ minutes}}{6 \text{ minutes p.u.}} = 60 \text{ units}$

Hourly wages rate = $\frac{₹ 32}{8 \text{ hours}} = ₹ 4 \text{ per hour}$

Statement Showing computation of performance achieved and total earnings per day of four workers

Particulars	A	B	C	D
Standard output	60 units	60 units	60 units	60 units
Actual output	48 units	60 units	75 units	90 units
a) Performance Level (efficiency)	$\frac{48}{60} \times 100 = 80\%$	$\frac{60}{60} \times 100 = 100\%$	$\frac{75}{60} \times 100 = 125\%$	$\frac{90}{60} \times 100 = 150\%$
Wages of Measured Work	6 hours @ ₹4 = ₹24	6 hours @ ₹4 = ₹24	6 hours @ ₹4 = ₹24	6 hours @ ₹4 = ₹24
B onus	Nil	Nil	25% x ₹ 24 = ₹ 6	50% x ₹ 24 = ₹ 12

Wages of Unmeasured work	2 hours @ ₹4= ₹8	2 hours @ ₹4= ₹ 8	2 hours @ ₹4= ₹ 8	2 hours @ ₹4= ₹ 8
b) Total Earnings	₹ 32	₹ 32	₹ 38	₹ 44

Illustration 36

The following particulars for the first week of September, 2021 relate to X and Y two workers employed in a factory:

Particulars	X	Y
a) Job Completed (units)	3,600	4,200
b) Out of above output rejected and unsalable	540	420
c) Time allowed	12 Mts / dozen	3 Hrs / 200 units
d) Basic wage rate per hour	₹ 5	₹ 6
e) Hours worked	45	50

The normal working hours per week are fixed at 42 hours. Bonus is paid @ $\frac{2}{3}$ of the basic wage rate for gross time worked and gross output produced without deduction for rejected output. The rate of overtime for first 4 hours is paid at time plus $\frac{1}{3}$ and for next 4 hours is paid at time plus $\frac{1}{2}$.

From the above data calculate for each employed

- Number of bonus hours and amount of bonus earned;
- Total wages earned including basic wages overtime premium and bonus;
- Direct wages cost per 100 saleable units.

Solution:

Sl No.	Particulars	X (₹)	Y (₹)
1.	No. of units produced	3,600	4,200
2.	Rejected units	540	420
3.	Saleable units	3,060,	3,780
4.	Normal Rate per hour	₹ 5	₹ 6
5.	Standard Time	$\frac{12 \text{ minutes}}{12 \text{ Units}} \times \frac{3,600 \text{ Units}}{60 \text{ minutes}} = 60 \text{ hours}$	$\frac{3 \text{ hours}}{200 \text{ Units}} \times 4,200 \text{ units} = 63 \text{ hours}$
6.	Actual Time worked	45 hours	50 hours
7.	Overtime worked	45 – 42 = 3 hours	50 – 42 = 8 hours
8.	Bonus Hours	60 – 45 = 15 hours	63 – 50 = 13 hours
9.	Amount Bonus	$15 \times 5 \times \frac{2}{3} = ₹ 50$	$13 \times 6 \times \frac{2}{3} = ₹ 52$
10.	Overtime Wage	$3 \times 5 \times \frac{4}{3} = ₹ 20$	$4 \times 6 \times \frac{4}{3} + 4 \times 6 \times \frac{3}{2} = ₹ 68$
11.	Basic Wage	42 × 5 = ₹ 210	42 × 6 = ₹ 252

12.	Total Wage (9+10+11)	₹ 280	₹ 372
13.	Direct Wage Cost for 100 saleable units	$\frac{₹ 280}{3,060} \times 100 = ₹ 9.15$	$\frac{₹ 372}{3,780} \times 100 = ₹ 9.84$

Illustration 37

From the following particulars work out the earnings for the week of a worker under

- Straight Piece Rate
- Differential Piece Rate
- Halsey Premium System
- Rowan System

Number of working hours per week	48
Wages per hour	₹ 3.75
Normal time per piece	24 minute
Normal output per week	120 pieces
Actual output per week	150 pieces
Differential piece rate	80% of the piece rate when output is below standard and 120% at or above standard

Solution:

$$\text{a) Piece rate} = \frac{\text{Normal Wage (at hourly rate)}}{\text{Normal output per week}} = \frac{48 \text{ hours} \times ₹ 3.75 \text{ per hour}}{120 \text{ Units}} = ₹ 1.50 \text{ per piece}$$

$$\text{or Piece rate} = \frac{24 \text{ minute}}{60 \text{ minute}} \times ₹ 3.75 = ₹ 1.50$$

$$\text{Earnings under Straight Piece Rate} = ₹ 1.50 \times 150 = ₹ 225$$

$$\text{b) Efficiency} = \frac{\text{Actual Output}}{\text{Normal Output}} \times 100 = \frac{150}{120} \times 100 = 125\%$$

$$\text{Earnings under Differential Piece Rate} = ₹ 1.50 \times 150 \times 120\% = ₹ 270$$

$$\text{c) Earning Under Halsey Premium System} = T \times R + \frac{50}{100} \times TS \times R$$

$$T \text{ (Time Taken)} = 48 \text{ hours}$$

$$R \text{ (Rate per hour)} = ₹ 3.75$$

$$TA \text{ (Time Allowed)} = 150 \times \frac{24}{60} = 60 \text{ hours}$$

$$TS \text{ (Time Saved)} = TA - T = 60 - 48 = 12 \text{ hours}$$

$$\begin{aligned} \therefore \text{Earnings} &= 48 \times 3.75 + \frac{50}{100} \times 12 \times 3.75 \\ &= 180 + 22.50 \\ &= ₹ 202.50 \end{aligned}$$

$$\begin{aligned} \text{d) Earning Under Rowan System} &= T \times R + \frac{TS}{TA} \times T \times R \\ &= 48 \times 3.75 + \frac{12}{60} \times 48 \times 3.75 = 180 + 36 = ₹ 216 \end{aligned}$$

Illustration 38

Ten men work as a group. When the weekly production of the group exceeds standard (200 pieces per hour) each man in the group is paid a bonus for the excess production in addition to his wages at hourly rates. The bonus is computed thus:

The percentage of production in excess of the standard amount is found and one-half of this percentage is considered as the men's share. Each man in the group is paid as bonus this percentage of a wage rate of ₹ 3.20 per hour. There is no relationship between the individual workman's hourly rate and the bonus rate. The following is the week's records.

	Hours Worked	Production (units)
Monday	90	22,100
Tuesday	88	22,600
Wednesday	90	24,200
Thursday	84	20,100
Friday	88	20,400
Saturday	40	10,200
Total	480	1,19,600

- Compute the rate and amount of bonus for the week;
- Compute the total pay of Jones who worked $41\frac{1}{2}$ hours and was paid ₹ 2 per hour basic and of Smith who worked $44\frac{1}{2}$ hours and was paid ₹ 2.50 per hour basic.

Solution:

Standard Production in Actual Time	= 480 x 200 = 96,000 units
Actual Production	= 1,19,600 units
Excess of Actual Production over standard	= 1,19,600 – 96,000 = 23,600 units
Percentage of excess over standard	= $\frac{23,600}{96,000} \times 100 = 24.58\%$
Percentage of Bonus	= $\frac{1}{2} \times 24.58\% = 12.29\%$
Bonus Rate per hour	= ₹ 3.20 x 12.29% = ₹ 0.393
Total Bonus for week	= 480 x 0.393 = ₹ 188.64

Computation of Total Earnings of Jones & Smith:

Particulars		Jones (₹)		Smith (₹)
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Basic Wages	41.50 x 2	83.00	44.50 x 2.50	111.25
Bonus	41.50 x 0.393	16.31	44.50 x 0.393	17.49
Total Earnings		99.31		128.74

Illustration 39

A manufacturer introduces a new machinery into his factory with the result that production per worker is increased. The workers are paid by results and it is agreed for every 2% increases in average individual output, an increase of 1% on the rate of wages will be paid.

At the time the machinery is installed the selling price of the products falls $8\frac{1}{3}\%$. Show the new saving in production costs which would be required to offset the losses expected from the turnover and bonus paid to workers.

	I st period	II nd period
No. of workers	175	125
Number of articles produced	16,800	14,000
Wages paid	₹ 33,600	
Total Sales	₹ 75,600	

Solution:

Number of units per worker in Period I	$= \frac{16,800}{175} = 96$
Number of units per worker in Period II	$= \frac{14,000}{125} = 112$
Increase in production per worker	$= 112 - 96 = 16 \text{ units}$
Percentage increase in output in Period II	$= \frac{16}{96} \times 100 = 16\frac{1}{2}\%$
Wages in Period I	$= ₹ 33,600$
Wages in Period II (at Period I labour rate)	$= \frac{₹ 33,600}{175} \times 125 = ₹ 24,000$
Increase in Wages	$= 24,000 \times 8\frac{1}{3}\% = ₹ 2,000$
Sales in Period I	$= ₹ 75,600$
Sales in Period II (at Period I sales price)	$= \frac{₹ 75,600}{16,800} \times 14,000 = ₹ 63,000$
Decrease in Sales in Period II	$= ₹ 63,000 \times 8\frac{1}{3}\% = ₹ 5,250$
Total loss due to increase in wages and reduction in sales	$= 2,000 + 5,250 = ₹ 7,250$
To offset the loss, the saving in other must be	₹ 7,250

Illustration 40

A work measurement study was carried out in a firm for 10 hours and the following information was generated.

Units produced : 350

Idle time	:	15%
Performance rating	:	120%
Allowance time	:	10% of standard time

What is the standard time for task?

Solution:

Calculation of Standard time for the task

Total time 10 hours x 60	= 600 minutes
Less: Idle Time 15% x 600	= 90 minutes
Actual Time	= 510 minutes
Normal Time	= 510 x 120% = 612 minutes
Add: Allowance time	
[10% or $\frac{1}{10}$ on standard time i.e., $\frac{1}{9}$ on normal time]	$= \frac{1}{9} \times 612$ = 68 minutes
Standard Time	= 680 minutes

Alternatively

Standard Time – Allowance Time = Normal Time

or, Standard Time – 10% of Standard Time = 612

or, 90% Standard Time = 612

or, Standard Time = $\frac{612}{90\%} = 680$ minutes

Illustration 41

In a factory bonus to workman is paid according to Rowan Plan. Time allotted for a job is 40 hours and the normal rate of wages is ₹ 1.25 per hour. The factory overheads charges are 50 paise per hour for the hours taken.

The factory cost of a work order, executed by a worker is ₹ 161.875. The cost of material in each case is ₹ 100.

Calculate the hours of time taken by the workman to complete the work order.

Solution:

Let 'T' be the time taken by the worker

$$\text{Earnings under Rowan Plan} = T \times R + \frac{TS}{TA} \times T \times R$$

T = Time Taken, TA = Time Allotted or Allowed, TS = Time Saved = TA – T, R = Rate per hour

$$\text{or, Earnings} = T \times 1.25 + \frac{40 - T}{40} \times T \times 1.25$$

$$\text{or,} = \frac{50T + 50T - 1.25T^2}{40}$$

$$\text{or,} = \frac{100 - 1.25T^2}{40}$$

Cost Accounting

Factory Cost = Material Cost + Wages + Factory Overheads

$$\text{or, } 161.875 = 100 + \frac{100T - 1.25T^2}{40} + 0.5T$$

$$\text{or, } 6,475 = 4,000 + 100T - 1.25T^2 + 20T$$

$$\text{or, } 1.25T^2 - 120T + 2,475 = 0$$

Dividing the equation by 1.25

$$\text{or, } T^2 - 96T + 1,980 = 0$$

$$\text{or, } T^2 - 66T - 30T + 1,980 = 0$$

$$\text{or, } T(T - 66) - 30(T - 66) = 0$$

$$\text{or, } (T - 66)(T - 30) = 0$$

or, T66 [Since, Time taken should not be more than Time Allotted]

So, T = 30. Hence, Time taken by the worker = 30 hours

Illustration 42

Two fitters, a labourer and a boy undertake a job on piece rate basis for ₹ 1,290. The time spent by each of them is 220 ordinary working hours. The rates of pay on time rate basis, are ₹ 1.50 per hour for each of the two fitters, ₹ 1 per hour for the labourer and ₹ 0.50 per hour for the boy.

The amount of piece work premium and the share of each worker, when the piece work premium is divided proportionately to the wages paid.

Compute the selling price of the above job on the basis of the following additional data:

Cost of the direct material ₹ 2,010; works overheads at 20% of prime cost; selling overheads at 10% of works cost and profit at 25% on cost of sales.

Solution:

Statement showing computation of earnings of each worker

Particulars	Fitter 1 (₹)	Fitter 2 (₹)	Labourer (₹)	Boy (₹)	Total (₹)
Basic Wage	220 x 1.5 = 330	220 x 1.5 = 330	220 x 1 = 220	220 x 0.5 = 110	990
Add: Bonus	100	100	67	33	300
Total Wage	430	430	287	143	1,290

$$\text{Bonus} = \text{Total Wage} - \text{Basic Wage} = 1,290 - 990 = ₹ 300$$

$$\text{Bonus of Fitter 1 and Fitter 2} = \frac{330}{990} \times 300 = ₹ 100 \text{ each}$$

$$\text{Bonus of Labourer} = \frac{220}{990} \times 300 = ₹ 67$$

$$\text{Bonus of Boy} = \frac{110}{990} \times 300 = ₹ 33$$

Computation of Selling Price of Job

Particulars	Amount (₹)
-------------	------------

Materials	2,010
Labour	1,290
Prime Cost	3,300
Add: Works Overheads @ 20% x 3,300	660
Factory Cost	3,960
Add: Selling and Distribution Overheads @ 10% x 3,960	396
Cost of Sales or Total Cost	4,356
Add: Profit @ 25% x 4,356	1,089
Selling Price	5,445

Illustration 43

Two workmen, Vishnu and Shiva, produce the same product using the same material. Their normal wage rate is also the same. Vishnu is paid bonus according to the Rowan System, while Shiva is paid bonus according to Halsey System. The time allowed to make the product is 100 hours. Vishnu takes 60 hours while Shiva takes 80 hours to complete the product. The factory overheads rate is ₹ 10 per man-hour actually worked. The factory cost for the product for Vishnu is ₹ 7,280 and for Shiva it is ₹ 7,600.

You are required:

- to find the normal rate of wages;
- to find the cost of materials;
- to prepare a statement comparing the factory cost of the products as made by the two men.

Solution:

Let Cost of Material be 'M' and Wage Rate per hour be 'R'

Particulars	Vishnu (Rowan Plan)	Shiva (Halsey Plan)
Material	M	M
Labour	$60 \times R + \frac{40}{100} \times 60 \times R = 84 R$	$80 \times R + \frac{50}{100} \times 20 \times R = 90 R$
Prime Cost	M + 84 R	M + 90 R
Add: Overheads	$60 \times 10 = 600$	$80 \times 10 = 800$
Factory Cost	7,280	7,600
So	$M + 84R + 600 = 7,280$ or, $M + 84R = 6,680$	$M + 90R + 800 = 7,600$ or, $M + 90R = 6,800$

So, Equation (1) $\Rightarrow M + 84R = 6,680$

And, Equation (2) $\Rightarrow M + 90R = 6,800$

Equation (2) – Equation (1)

or, $6R = 120$

or, $R = 20$

Cost Accounting

- a) Wage Rate per hour = ₹ 20 per hour
 putting $R = 20$ in equation (1) $\Rightarrow M = 6,680 - 84 \times 20 = 6,680 - 1,680 = 5,000$
- b) Material Cost = ₹ 5,000
- c) Statement comparing the factory cost of the products as made by the two workmen

Particulars	Vishnu (₹)	Shiva (₹)
Material	5,000	5,000
Wages	1,680	1,800
Overheads	600	800
Factory Cost	7,280	7,600

Computation of Wages

Vishnu	Shiva
Rowan Plan = $T \times R + \frac{TS}{TA} \times T \times R$ $T = 60$ hrs, $TA = 100$ hrs, $TS = 100 - 60 = 40$ hrs	Halsey Plan = $T \times R + \frac{50}{100} \times TS \times R$ $T = 80$ hrs, $TS = 100 - 80 = 20$ hrs

Illustration 44

Measurement of Employee Cost

Basic pay ₹ 5,00,000; Lease rent paid for accommodation provided to an employee ₹ 2,00,000, amount recovered from employee ₹ 40,000, Employer's Contribution to P.F. ₹ 75,000, Employee's Contribution to P.F. ₹ 75,000; Reimbursement of Medical expenses ₹ 67,000, Hospitalisation expenses of employee's family member borne by the employer ₹ 19,000, Festival Bonus ₹ 20,000, Festival Advance ₹ 30,000. Compute the Employee Cost.

Solution:

Computation of Employee Cost

Particulars	Amount (₹)
Basic Pay	5,00,000
Add: Net cost to employer towards lease rent paid for accommodation provided to employee [2,00,000 – 40,000]	1,60,000
Add: Employer's contribution to PF	75,000
Add: Reimbursement of Medical Expenses	67,000
Add: Hospitalisation expenses of employee's family member paid by the employer	19,000
Add: Festival Bonus	20,000
Employee Cost	8,41,000

Note:

1. Festival advance is a recoverable amount. Hence, not included in employee cost.
2. Employee's contribution to PF is not a cost to the employer. Hence, not considered.

Illustration 45**Measurement of Employee Cost (with special items)**

Gross pay ₹10,30,000 (including cost of idle time hours paid to employee ₹ 25,000); Accommodation provided to employee free of cost [this accommodation is owned by employer, depreciation of accommodation ₹ 1,00,000, maintenance charges of the accommodation ₹ 90,000, municipal tax paid for this accommodation ₹ 3,000], Employer's Contribution to P.F. ₹ 1,00,000 (including a penalty of ₹ 2,000 for violation of P.F. rules), Employee's Contribution to P.F. ₹ 75,000. Compute the Employee Cost.

Solution:**Computation of Employee Cost**

Particulars	Amount (₹)
Gross Pay (net of cost of idle time) [10,30,000 – 25,000]	10,05,000
Add: Cost of Accommodation provided by employer = Depreciation + Maintenance Charges + Municipal Tax = 1,00,000 + 90,000 + 3,000	1,93,000
Add: Employer's contribution to PF excluding penalty paid to PF authority	98,000
Employee Cost	12,96,000

Note:

1. Assumed that the entire accommodation is exclusively used by the employee. Hence, cost of accommodation provided includes all related expenses / costs, since these are identifiable / traceable to the cost centre.
2. Cost of idle time hours is assumed as abnormal. Since, it is already included in the gross pay, hence, excluded.
3. Penalty paid to PF authorities is not a normal cost. Since, it is included in the amount of contribution, it is excluded.

Illustration 46**Measurement of Employee Cost (with special items)****Trial Balance as on 31.3.2022 (relevant extracts only)**

Particulars	Amount (₹)	Particulars	Amount (₹)
Materials Consumed	25,00,000	Special Subsidy received from Government towards Employee Salary	2,75,000
Salaries	15,00,000	Recoverable amount from Employee out of perquisites extended	35,000
Employee Training Cost	2,00,000		
Perquisites to Employee	4,50,000		
Contribution to Gratuity Fund	4,00,000		
Lease rent for accommodation provided to employees	3,00,000		
Festival Bonus	50,000		
Unamortised amount of Employee cost related to a discontinued operation	90,000		

Solution:

Computation of Employee Cost

Particulars	Amount (₹)
Salaries	15,00,000
Add: Net cost of Perquisites to Employees = 4,50,000 – 35,000	4,15,000
Add: Contribution to Gratuity Fund	4,00,000
Add: Lease rent for accommodation provided to employees	3,00,000
Add: Festival Bonus	50,000
Less: Special Subsidy received from Government towards employee salary	2,75,000
Employee Cost	23,90,000

Note:

1. Recoverable amount from employee is excluded from the cost of perquisites.
2. Employee training cost is not an employee cost. It is to be treated as an overheads, hence not included.
3. Special subsidy received is to be excluded, as it reduces the cost of the employer.
4. Unamortized amount of employee cost related to a discontinued operation is not an includible item of cost.

Direct Expenses

2.3

2.3.1 Definitions

All expenditures other than those incurred for procurement of material and labour are termed as ‘expenses’. Expenses can be classified direct expense or indirect expense. This classification is based on whether the expense is traceable to cost centre or cost unit. It is important to note that;

- Proper classification of expenses into direct and indirect categories is essential for accurate financial reporting and cost analysis.
- Understanding the nature of expenses helps in making informed decisions about cost control, pricing strategies, and resource allocation.
- The distinction between direct and indirect expenses is crucial for calculating the true cost of producing goods or services and determining the profitability of specific products or projects.

Simply, expenses or costs which can be allocated to a cost centre or cost unit are referred as direct expense.

Cost Accounting Standard (CAS) 10 issued by the Council of the Institute of Cost Accountants of India deliberates various provisions for treatment of direct expenses in cost accounting. Indirect expenses, on the other hand, are those that are not traceable to the cost centre or cost unit. These are to be apportioned to a cost centre or cost unit.

Paragraph 4.4 of CAS 10 defines direct expenses as *expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material cost and direct employee cost.*

The statement highlights that in the context of manufacturing a product or rendering a service, there are expenses beyond direct material and direct employee costs. These additional expenses are identifiable and linked to the specific cost object, contributing to a more comprehensive understanding of the total costs associated with the production or service process. This is defined as direct expense.

Paragraph 5.1 of CAS 10 states that *identification of Direct Expenses shall be based on traceability in an economically feasible manner.*

Examples of direct expenses are royalties charged on production, job charges, hire charges for use of specific equipment for a specific job, cost of special designs or drawing for a job, software services specifically required for a job, travelling expenses for a specific job.

2.3.2 Nature of Direct Expenses or Chargeable Expenses

A direct expense in relation to a product forms part of the prime cost. Indirect expenses are treated as overheads. In relation to products, direct material is a material that becomes a part of it and can be physically traced in some form in the finished products, whereas the direct expenses are cost providing services or other kinds of special charges, but no trace of them can be obtained in the finished product like raw material. Both the direct material and direct expenses form part of the prime cost.

Principles of Measurement as per CAS – 10 (Para 5)

The para states that in general, the identification of direct expenses should rely on economically viable traceability methods. Specifically,

1. Direct expenses arising from the utilization of externally procured resources will be determined based on the invoice or agreed-upon price, inclusive of duties, taxes, and directly attributable expenditures. This calculation will be net of trade discounts, rebates, and any refundable or credited taxes and duties.
2. For research and development costs, the amount specifically linked to the cost object for enhancing existing product processes will be considered part of direct expenses.
3. Direct expenses settled in lump-sum or characterized as one-time payments will be amortized based on the estimated output or anticipated benefit derived from such expenses.
4. Examples like royalty fees or technical know-how payments, ensuring future benefits, will involve estimating production or service volumes for the effective period. The amortization charge will then be determined based on the achieved volume during the cost accounting period.
5. If a direct expense item is not deemed material, it may be treated as part of overheads.
6. Finance costs associated with internally generated or procured resources will not be categorized as direct expenses.
7. Direct expenses will exclude imputed costs, and for goods produced for internal consumption, imputed costs will adhere to CAS – 4 guidelines.
8. When accounting for direct expenses at standard cost, variances resulting from normal reasons will be considered part of direct expenses. Variances arising from abnormal reasons will not be included.
9. Any subsidy, grant, incentive, or similar payment received or expected concerning direct expenses will be deducted to ascertain the cost of the related cost object.
10. Any significant and quantifiable abnormal portion of direct expenses will not be considered part of direct expenses.
11. Penalties or damages paid to statutory authorities or third parties will not be included in direct expenses.
12. Credit or recoveries related to direct expenses, if material and quantifiable, will be deducted to determine the net direct expenses.
13. Changes in cost accounting principles for measuring direct expenses should only be made if required by law, compliance with cost accounting standards, or if the change results in a more appropriate preparation or presentation of the organization's cost statements.

Disclosures

Paragraph 8 of CAS-10 specifies that disclosures regarding direct expenses should only be made if they are material, significant, and quantifiable. Such disclosures can be presented within the body of the cost statement, as a footnote, or in a separate schedule. The key aspects outlined for the disclosure of direct expenses in cost statements include:

1. The rationale for distributing direct expenses to cost objects or cost units.
2. Quantities and rates of items constituting direct expenses, where applicable.
3. Details on price and usage variances in cases where direct expenses are accounted for at standard cost.
4. Direct expenses related to the procurement of resources and expenses associated with internally generated resources.

5. Direct expenses paid or payable to related parties, in accordance with relevant legal requirements applicable to the cost statement as of the statement date.
6. Direct expenses incurred in foreign exchange.
7. Any subsidy, grant, incentive, or similar payment subtracted from direct expenses.
8. Credits or recoveries related to direct expenses.
9. Identification and disclosure of any abnormal portion of direct expenses.
10. Clarification that penalties and damages are excluded from direct expenses.

Illustration 47

Measurement of Direct Expenses

Royalty paid on sales ₹ 30,000; Royalty paid on units produced ₹ 20,000, hire charges of equipment used for production ₹ 2,000, Design charges ₹ 15,000, software development charges related to production ₹ 22,000, compute the direct expenses.

Solution:

Computation of Direct Expenses

Particulars	₹
Royalty paid on sales	30,000
Add: Royalty paid on units produced	20,000
Add: Hire charges of equipment used for production	2,000
Add: Design charges	15,000
Add: Software development charges related to production	22,000
Direct Expenses	89,000

Note:

1. Expenses are related to either manufacturing of the product or rendering of service.
2. These costs are directly identifiable and can be linked with the cost object and are not related to direct material cost or direct employee cost. Hence, these are considered as direct expenses.

Illustration 48

Measurement of Direct Expenses – allocation to cost object products (in a multi-product situation)

A manufacturing unit produces two products X and Y. the following information is furnished:

Particulars	Product X	Product Y
Units produced (quantity)	20,000	15,000
Units sold (quantity)	15,000	12,000
Machine Hours utilized	10,000	5,000
Design charges	15,000	18,000
Software development charges	24,000	36,000

Cost Accounting

Royalty paid on sales ₹ 54,000 [@ ₹ 2 per unit sold, for both the products]; Royalty paid on units produced ₹ 35,000 [@ ₹ 1 per unit produced, for both the products], Hire charges of equipment used in manufacturing process of Product X only ₹ 5,000, Compute the direct expenses.

Solution:

Computation of Direct Expenses

Particulars	Product X (₹)	Product Y (₹)
Royalty paid on sales	15,000 x 2 = 30,000	12,000 x 2 = 24,000
Add: Royalty paid on units produced	20,000 x 1 = 20,000	15,000 x 1 = 15,000
Add: Hire charges of equipment used in manufacturing process of Product X only	5,000	-
Add: Design charges	15,000	18,000
Add: Software development charges related to production	24,000	36,000
Direct Expenses	94,000	93,000

Note:

1. Royalty on production and royalty on sales are allocated on the basis of units produced and units sold respectively. These are directly identifiable and traceable to the number of units produced and units sold. Hence, this is not an apportionment.
2. No adjustments are made related to units held, i.e., closing stock.

Overheads

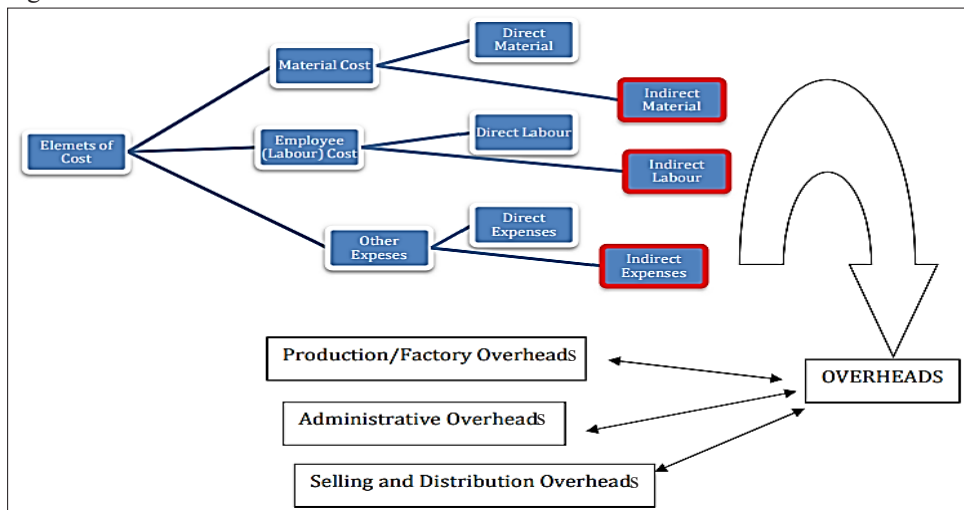
2.4

Introduction

Any cost which is not directly identifiable to any particular product, job, operation or process is mentioned as overheads. As such, it is summing up of total of indirect material cost, indirect labour cost and indirect expenses and may also be referred as indirect cost. Indirect costs are costs which are not traceable to a cost center or and cost unit and therefore have to be apportioned to the cost centre or cost unit.

CIMA defines overheads as *expenditure on labour, materials or services that cannot be economically identified with a specific saleable cost unit.*

Indirect cost which encompasses of indirect material, indirect labour and indirect expenses is generally classified as production/factory overheads, administrative overheads, selling overheads and distribution overheads. The following diagram clarifies the issue.



With the advent of time service sector organizations have become more and more prominent and this have contributed to proportionately higher overheads costs. Also, with the modern trend towards the mechanization, automation, and mass production, overheads costs have grown considerably. In service organizations the proportion of overheads costs to the total costs of products is comparatively higher.

It is important to note that the Institute of Cost Accountants of India have issued CAS 3 (Production and Operation Overheads), CAS 11 (Administrative Overheads) and CAS 15 (Selling and Distribution Overheads) which stipulates the scope, objective, principles of measurement, assignment, basis of absorption, presentation and disclosure of each specific overheads.

Production or operation overheads is the most important of the overheads as it is intricately related to the production process.

Paragraph 6.1 of Cost Accounting Standard (CAS) (Production or Operation Overheads) – 3 issued by the Institute of Cost Accountants of India states the guiding principle of assigning production or operation overheads is its traceability to a cost object in an economically feasible manner. The cost which can be traced directly to a cost object shall be directly assigned.

As per Paragraph 6.2, assignment of production overheads to the cost objects shall be based on either of the following two principles:

- i. Cause and Effect – Cause is the process or operation or activity and effect is the incurrence of cost.
- ii. Benefits received – Production Overheads are to be apportioned to the various cost objects in proportion to the benefits received by them.

In case of facilities created on a standby or ready to serve basis, the cost shall be assigned on the basis of expected benefits instead of actual.

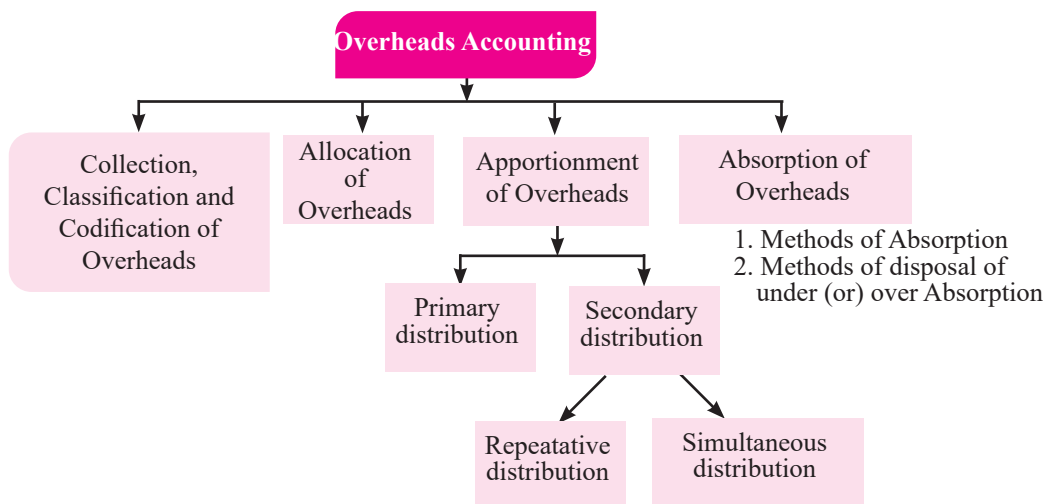
The variable production or operation overheads shall be absorbed to products or services based on actual production. The fixed production or operation overheads shall be absorbed based on the normal capacity.

Overheads Accounting

The ultimate aim of overheads accounting is to absorb them in the units produced by the firm. Absorption of overheads means charging each unit of a product with an equitable share of overhead expenses. As overheads are indirect costs, it becomes difficult to charge them to the units produced. So, it becomes necessary to charge them to the units produced on some equitable basis which is called as ‘Absorption’ of overheads. The important steps involved in overheads accounting are as follows:

1. Collection, Classification and Codification of Overheads.
2. Allocation, Apportionment and Reapportionment of Overheads,
3. Absorption of Overheads.

As mentioned above, the ultimate objective of overhead accounting is ‘absorption’ of the total overhead on the units produced by the firm. This is important as accurate absorption will help in arriving at accurate cost of production. Overheads are indirect costs and hence there are numerous difficulties in charging the overheads to the units produced. Following is a pictorial representation of the various aspects of overhead accounting.



Collection, Codification and Classification of Overheads

Collection of Overheads

Collection of overheads involves the systematic recording of every cost item in the records dedicated to determining the cost of each cost center or unit. In the realm of overheads accounting, the gathering of overheads holds significant importance. Identifying indirect expenses is crucial, and the specified source documents play a vital role in this process. The meticulous collection of overhead expenses is essential for obtaining a precise understanding of the total overhead costs. Overheads are collected on the basis of pre-planned groupings, called cost pools. Homogeneity of the cost components in respect of their behavior and character is to be considered in developing the cost pool. The *source documents* for the collection of overheads include:

1. **Stores Requisitions:** These are used to obtain indirect materials from the stores and show standing order numbers and the department using such materials
2. **Job Card/Time Cards:** These are used to record the time spent by workers on a particular job or activity
3. **Invoices:** These are used to record payments for stores and services, and the vouchers are recorded in the purchase journal
4. **Cash Book:** It is scrutinized to collect petty indirect expenses against standing order numbers
5. **Subsidiary Records:** These are used to record overheads that do not involve current cash outlay, such as depreciation, notional rent, and notional interest

These documents are essential for the proper recording and allocation of overhead expenses in a business

It is important to note that indirect materials originate in store requisitions. Each stores requisitions note specifies the standing order number and the department for which the stores are drawn. The departmentalization is done at sources. A material issue analysis sheet is prepared from store requisitions. At the end of each month, the total of these items is charged or debited to Factory Overheads Control Account and credited to Stores Ledger Control Account.

Indirect labour is obtained from the time cards and pay rolls. Wages paid to workers against each standing order number can be obtained from the time tickets or job cards. From the time tickets, the wages analysis sheet is prepared each month and at the end of the month, the total is debited to Factory Overheads Control Account and credited to the Wages account.

Codification of Overheads

Codification of overheads is the process of representing each item of overheads by a number, the digits of which indicate the group, subgroup, type, and dimension of the item. The main objectives of codification are to group items of overheads of similar nature, facilitate allocation and apportionment of overheads to different departments or cost centers, and analyze overhead expenses for control purposes. The basic requirements of a system of codification of overhead expenses include classifying expenses according to nature, object, or function, being simple and easy to comprehend, and facilitating the process of allocation, apportionment, and absorption of overheads. Codification can be done by allotting numerical codes, alphabetical codes, or a combination of both. It helps in the systematic and easy recording of expenses and reduces the task of maintaining a huge number of accounts.

The Methods of codification

The methods of codification of materials include alphabetical, mnemonic, numerical, decimal, alphanumeric, and color codification.

- **Alphabetical Codification:** This method involves the use of alphabetical letters as codes to facilitate easy and quick identification.

- **Mnemonic Codification:** It is simple to operate because it helps staff to memorize the items in a store.
- **Numerical Codification:** This is the simplest and most widely used method in manufacturing.
- **Decimal Codification:** It has the advantage of flexibility and unlimited scalability.
- **Alphanumeric Codification:** It involves the use of both letters and numbers to create codes.
- **Color Codification:** This method uses colors to represent different categories of items.

Classification of Overheads¹

Overhead costs are indirect expenses that are not directly tied to the production of goods or services but are necessary for the overall operation of the business. The classification of overheads refers to the categorization and organization of various types of overhead costs incurred by a business. Proper classification of overheads helps businesses analyze and manage their costs effectively and is a prerequisite to any form of cost analysis and control system. Classification may be made either on the basis of the element of cost or on the basis of function. It is important to note that classification used for cost collection is mostly combination of elemental and functional. The behavioural classification² cannot be used for booking of costs; it is used only for analysis and decision making. Some important aspects of the classification are stated in the following lines.

• **Elementwise classification –**

Overheads may be classified in terms of the elements of the cost; indirect material, indirect labour and indirect overheads.

- a) As per CAS – 3, indirect material cost is defined as ‘*Materials, the cost of which cannot be directly attributed to a particular cost object*’. For example, lubricant used in a machine is an indirect material and so is nuts and bolts.
- b) As per CAS – 3, ‘*indirect employee cost is the employee cost, which cannot be directly attributed to a particular cost object*’. Wages and salaries paid to indirect workers, i.e., workers who are not directly engaged on the production is an example of indirect labour (employee cost).
- c) As per CAS – 3, ‘*indirect expenses are expenses, which cannot be directly attributed to a particular cost object*’. Rent and taxes, printing and stationery, power, insurance, electricity, marketing and selling expenses are the examples of indirect expenses.

• **Functional Classification**

- **Production (Factory, Manufacturing or Operation) Overheads** – As per CAS – 3, Indirect Cost involved in the production process or in rendering service is referred as production overheads. These overheads are the aggregate of indirect materials cost, indirect wages and indirect expenses associated with manufacturing activities. Factory power, works manager’s salary, factory insurance, depreciation of factory machinery and other fixed assets are examples of factory overheads.

These costs cannot be identified specifically with or traced to cost object in an economically feasible way.

- **Office and Administration Overheads** - Indirect expenses incurred for running the administration are known as Administrative Overheads.

Paragraph 4.3 of CAS 11 defines Administrative Overheads as *cost of all activities relating to general management and administration of an entity*. This paragraph also states that administrative overheads shall exclude production overheads, marketing overheads and finance cost.

1. Classification of cost as per CAS 1 is discoursed in details in Module 1 of this study note.

2. Overhead as fixed and variable Classifying. This aspect is covered in Module 1 of this study note.

• **Selling and Distribution Overheads**

Paragraph 4.9 of CAS 15 defines selling overheads as *‘the expenses related to sale of products or services and include all indirect expenses incurred in selling the products or services’*. Examples of selling overheads include the following;

- o Sales team salaries, commissions, and bonuses.
- o Advertising and promotional expenses.
- o Sales office rent and utilities.
- o Sales travel and entertainment expenses.
- o Sales training costs.
- o Sales administration expenses.
- o Trade shows and exhibitions costs.

Paragraph 4.4 of CAS 15 defines distribution overheads as overheads which are *‘also known as distribution costs, are the costs incurred in handling a product or service from the time it is ready for despatch or delivery until it reaches the ultimate consumer including the units receiving the product or service in an inter-unit transfer’*. Examples of selling overheads include the following

- o Warehouse rent and maintenance.
- o Packaging costs.
- o Shipping and freight expenses.
- o Handling and storage costs.
- o Distribution staff salaries.
- o Vehicle maintenance and fuel for delivery vehicles.
- o Distribution network costs.
- o Costs associated with inventory management.

Distinguishing Between Selling Overheads and Distribution Overheads:

Selling overheads and distribution overheads are distributed on the basis of the following points.

1. Focus:

Selling Overheads: Primarily focus on sales and promotional activities aimed at convincing customers to make purchases.

Distribution Overheads: Primarily focus on the logistics and physical distribution of products to customers.

2. Nature of Expenses:

Selling Overheads: Include costs related to the sales team, advertising, and promotional efforts.

Distribution Overheads: Include costs associated with warehousing, packaging, and transportation.

3. Timing of Expenses:

Selling Overheads: Often incurred before the sale, during the marketing and persuasion stage.

Distribution Overheads: Incurred during the physical movement and delivery of products.

4. Impact on Sales:

Selling Overheads: Directly impact the sales process by influencing customer purchasing decisions.

Distribution Overheads: Impact the efficiency and reliability of product delivery, contributing to customer satisfaction.

• Research and Development Overheads

Research Cost is the cost of searching for new or improved products, new applications of material, or new or improved methods, process, systems or services. In the modern days, firms spend heavily on research and development. Expenses incurred on research and development is known as Research and Development Overheads. Research may be of the following types:

- o Pure or basic research to gain general know how regarding the production or market, not directed towards any particular product.
- o Applied research which applies the basic knowledge in practice i.e., improvement of existing products, new process, exploring of new products, improved measures of safety, etc.

Development cost is the cost of the process which begins with the implementation of the decision to use scientific or technical knowledge to produce a new or improved product or to employ a new or improved method, process, system, etc. and ends with the commencement of formal production of that product by that method. Development starts where the research ends. Development cost is the expenditure incurred for putting the results of research on a practical commercial basis.

Accounting of Research and Development Overheads

Accounting of Research and Development Cost arise due to the following causes:

- The expenditure is in the nature of pre-production costs and there is a considerable time lag between the incidence and expenditure and realization of benefit.
- There is no immediate production. Thus, it becomes impossible to charge this cost to products on immediate basis.

It is because of these difficulties that the accounting of research and development costs has been a subject of some controversy. Three methods are available for charging research and development costs as:

- a) Charging off to the current year profit and loss account.
- b) Capitalization so that cost may be amortized on a long-term basis.
- c) Deferment and charge off to costs of the next two or three years – a short / medium term amortization.

In the following chart, various items of overheads are cross classified according to their elements and according to their functions

Functions	Elements of Cost		
	Material	Labour	Expenses
Factory or Production or Manufacturing or Works Overheads	Nuts & bolts, consumables, lubricants, welding electrodes, cleaning materials, nails, threads, ropes etc.	Salaries and wages to foremen, supervisors, inspectors, maintenance, labour, idle time	Factory lighting and heating, factory rent, power and electricity, factory insurance, depreciation on machinery, repairs
Administrative Overheads	Printing and Stationery, Office Supplies	Salary of office staff, managers, directors, and other administrative departments as IT, Audit, Credit, Taxation	General office rent, insurance, telephones, fax, travel, legal fees, depreciation on office assets

Selling Overheads	Price lists, catalogues, mailings, advertising material such as leaflets, danglers, samples, free gifts, exhibition material	Salaries of staff and managers, commission on sales, bonus on schemes	Sales office expenses, travelling, subscription to sales magazines, bad debts, rent and insurance of showrooms, cash discount, brokerage, market research
Distribution Overheads	Secondary packing, material items used in delivery vans	Salaries of delivery staff such as drivers, dispatch clerk, logistic manager	Carriage outwards, forwarding expenses, rent and insurance of warehouses and depots, insurance, running expenses and depreciation of delivery vans

• Control-wise Classification

Overheads may also be categorized as Overhead costs controllable or uncontrollable. This is reliant on the quantum of influence of the management on the overhead cost.

- Controllable overheads are costs that can be influenced or controlled by the management and operational levels within a specific time frame. These costs are usually associated with day-to-day activities and decisions made at lower organizational levels.
- Uncontrollable overheads are costs that are beyond the immediate influence or control of lower-level management. These costs are often determined at higher levels of the organization or are influenced by external factors such as market conditions, government regulations, or economic trends.

It is important to note that the classification of overhead costs as controllable or uncontrollable can vary depending on the organization, industry, and specific circumstances. Additionally, advancements in technology and changes in business environments may influence the degree of control that management can exert over certain costs.

Allocation, Apportionment and Reapportionment of Overheads

After the collection, codification and classification of overheads, the next step is allocation and apportionment of overheads to the units produced. The following steps are required to complete this process.

• Departmentalization

Departmentalization of overhead expenses is the process of determining the overhead costs of each department involved in production. This process involves dividing the departments in a factory into two categories: production departments and service departments. The departmentalization of overheads is undertaken in two stages: allocation of overheads and apportionment of overhead expenses. The allocation of overheads is the process of charging the full amount of overhead costs to a specific cost center, while the apportionment of overhead expenses is the technique of dividing up an item of overhead cost and charging it to the cost centers on an equitable basis.

Departmentalization of overheads allows for better planning and control if the head of each department is held responsible for the costs. It also allows for the computation of plant-wide overhead rates, which is important when there are a variety of products. Some products require many operations, while others require very few operations, especially in the high-cost department.

- **Allocation and Apportionment**

- o Allocation involves identifying overheads to particular cost centre. It means charging of overhead to a particular cost centre as the overhead is relatable to that particular cost centre. It may be said that allocation is allotment of items of indirect costs to cost centre. For example, If the cost of a specialized machine is entirely associated with the production department, the total cost of that machine is allocated to the production department.
- o Apportionment involves the distribution of overhead costs among two or more cost centers or departments. This method is used when a particular cost cannot be directly attributed to a single department and needs to be shared among several units based on a reasonable and equitable basis. For example, if the rent for a building is incurred for multiple departments, the total rent cost is apportioned among these departments based on factors like the floor area, number of employees, or machine usage in each department.

Distinction between Allocation and Apportionment

The key distinction between allocation and apportionment is summarized in the following table

Feature	Allocation	Apportionment
Definition	Assignment of the entire cost to a single department.	Distribution of costs among multiple departments or cost centers.
Scope	Applied when a cost is entirely associated with a specific department.	Used when a cost is shared among multiple departments, and a fair basis is needed for distribution.
Applicability	Direct assignment without further distribution.	Involves distributing costs among various departments based on a predetermined allocation basis.
Method	Direct assignment of a cost to a specific unit.	Requires the use of a basis (e.g., floor area, machine usage) to distribute costs among departments.
Examples	Entire cost of a specialized machine assigned to a production department.	Rent cost of a building distributed among different departments based on relevant factors.
Precision	May be more precise when a cost is exclusively related to a particular department.	Requires a basis for distribution, involving some degree of estimation or approximation.

Primary distribution and secondary distribution

In overheads accounting, primary distribution and secondary distribution are two stages involved in the process of allocating and apportioning overheads to cost centers. These stages help in distributing overhead costs to the appropriate departments or production units.

- o Primary distribution involves the allocation and apportionment of overheads to all departments in a factory on a rational basis. This process is also known as the departmentalization of overheads. It ignores the distinction between production and service departments and aims to distribute overhead expenses among different departments based on equitable and practicable criteria.

In primary distribution following basis of apportionment of overheads is generally used.

Overheads item	Basis of apportionment
Rent, Rates and Taxes	Floor Area Occupied
Repairs to Building	Value of Buildings / Floor Space
General Lighting	No. of light points in each department

Power	Horse Power of Machines
Telephones	No. of extensions in a department
Supervision	No. of employees
Material Handling	No. of material requisitions or value of material used

The above list is not exhaustive and depending upon peculiarities of the organisation, it could be extended.

- o Secondary distribution is the process of redistributing the cost-of-service departments among the production departments. This step ensures that the product cost bears the equitable share of the cost-of-service departments that render services to the production departments. It is the second step in the overall process of overheads distribution

Principles of Apportionment of Overhead Cost:

The broad principles on which the allocation or apportionment of overheads is made is given in the following lines;

- (i) Allocation Based on Services Rendered: Overheads are apportioned to production departments based on the extent of services received from service departments. The production department that benefits the most from the services provided by service departments bears the largest share of the overhead costs. Consequently, the overheads of service departments are allocated to production departments.
- (ii) Ability to Pay: This approach suggests assigning a significant portion of service department overhead cost to production departments whose products contribute the most to the business firm's income. However, the practical challenge lies in determining the most financially impactful department, making this method operationally complex.
- (iii) Survey or Analysis Method: When finding a suitable base for apportionment is challenging or selecting a method is deemed costly, the survey or analysis method is employed. For instance, postage costs could be apportioned based on a survey of postage usage throughout the year.
- (iv) Efficiency Method: Overheads apportionment is determined by production targets in the efficiency method. Exceeding the target results in a reduction in unit costs, indicating above-average efficiency. Conversely, falling short of the target leads to an increase in unit costs, revealing the inefficiency of the department.

Illustration 49

A factory has 3 production departments (P1, P2, P3) and 2 service departments (S1 and S2). The following overheads and other information are extracted from the books for the month of January 2022.

Expense	Amount (₹)
Rent	6,000
Repair	3,600
Depreciation	2,700
Lighting	600
Supervision	9,000
Fire Insurance for stock	3,000
ESI contribution	900
Power	5,400

Particulars	P1	P2	P3	S1	S2
Area sq ft	400	300	270	150	80
No. of workers	54	48	36	24	18
Wages	18,000	15,000	12,000	9,000	6,000
Value of plant	72,000	54,000	48,000	6,000	-
Stock Value	45,000	27,000	18,000	-	-
Horse power of plant	600	400	300	150	50

Allocate or apportion the overheads among the various departments on suitable basis.

Solution:

The primary distribution of overheads is as follows:

Expense	Total ₹	Basis	P1 ₹	P2 ₹	P3 ₹	S1 ₹	S2 ₹
Rent	6,000	Area sq ft [40:30:27:15:8]	2,000	1,500	1,350	750	400
Repair	3,600	Value of plant [12:9:8:1]	1,440	1,080	960	120	-
Depreciation	2,700	Value of plant [12:9:8:1]	1,080	810	720	90	-
Lighting	600	Area sq ft [40:30:27:15:8]	200	150	135	75	40
Supervision	9,000	No. of workers [9:8:6:4:3]	2,700	2,400	1,800	1,200	900
Fire Insurance for stock	3,000	Stock Value [5:3:2]	1,500	900	600	-	-
ESI contribution	900	Wages [6:5:4:3:2]	270	225	180	135	90
Power	5,400	Horse power of plant [12:8:6:3:1]	2,160	1,440	1,080	540	180
Total	31,200		11,350	8,505	6,825	2,910	1,610

Secondary Distribution of Production Overheads

The next step is to reapportion the service department costs over the production departments. This also needs to be done on some suitable basis, as there may not be a direct linkage between services and production activity. The products actually do not pass through the service departments but the cost-of-service departments have to be recovered from the sales of the finished products. Hence, the overheads of the service departments have to be apportioned to production department. This process is called secondary distribution of overheads.

The basis of secondary distribution is dependent on the nature of service given by the service departments to the production departments

In the Illustration 1, the cost of S1 is ₹ 2,910 and that of S2 is ₹ 1,610 which will be loaded on to the totals of P1, P2 and P3.

Some examples of the bases that can be used to distribute cost of different service departments:

Service department	Basis
Quality	No. of inspection done
Maintenance	No. of maintenance calls or Material usage for maintenance or Time spent on maintenance

Stores	Indirect material cost or No. of issue slips or Quantity of material issued for Value of stock handled
Canteen, Welfare	No. of workers
Internal Transport	No. of truck or trolleys used for Tonne miles consumed
Payroll office	No. of labour hours
Purchase office	No. of purchase orders or Value of material purchased

This is not an exhausted list and could differ from company to company. Many times, percentage estimation is also done for such distribution if the service cannot be measured on the basis of any of the above bases.

Methods of Secondary Distribution

• Direct Distribution Method

This method is based on the assumption that one service department does not give service to other service department/s. thus between service departments there is no reciprocal service exchange. Hence, under this method, service costs are directly loaded on to the production departments. This is simple, but the assumption may not be correct. It is incorrect to assume that canteen service is not available to other service departments like labour office or stores or maintenance department and thus, the method should not be used as far as possible.

In the Illustration 50. The cost of S1 and S2 is apportioned as follows:

	Production Department		
Service Department	P1	P2	P3
S1	40%	30%	30%
S2	$\frac{5}{10}$	$\frac{3}{10}$	$\frac{2}{10}$

Distribution of cost-of-service departments is as follows:

Department	Total ₹	Basis of Apportionment	P1 ₹	P2 ₹	P3 ₹
As per primary distribution	26,680		11,350	8,505	6,825
Distribution of S1	2,910	40%:30%:30%	1,164	873	873
Distribution of S2	1,610	5:3:2	805	483	322
Total	31,200		13,319	9,861	8,020

• Step Distribution Method or Non-reciprocal Method

This method is based on the assumption that one service department gives service to the other but does not receive service from other service department. In Illustration 50, it may be assumed that S1 may render services to S2 but not vice versa, i.e., S2 may not render service to S1. In such situation, cost of that service department will be distributed first which render services to maximum number of other service departments. After this, the cost-of-service department serving the next large number of departments is distributed. This process is continued till all service departments are over. Because it is done in steps, it is called as Step Distribution Method.

Illustration 50

A manufacturing company has two production departments Fabrication and Assembly and 3 service departments as Stores, Time Office and Maintenance. The departmental overheads summary for the month of March 2022 is given below:

Fabrication	₹ 24,000
Assembly	₹ 16,000
Stores	₹ 5,000
Time office	₹ 4,000
Maintenance	₹ 3,000

Other information relating to the department was:

Particulars	Production departments		Service departments		
	Fabrication	Assembly	Stores	Time Office	Maintenance
No. of employees	40	30	20	16	10
No. of stores requisition slips	24	20	-	-	6
Machine Hours	2,400	1,600	-	-	-

Apportion the costs of service departments to the production departments.

Solution:

The overheads of the service departments have to be allocated to the production departments. The sequence and the bases on which the service departments should be selected has to be determined first. The following logical bases are decided based on the additional information given:

Service Departments	:	Basis of allocation
Time Office	:	No. of employees
Stores	:	No. of stores requisition slips
Maintenance	:	Machine Hours

Number of employees exist in all the departments. So, overheads of the time office department is allocated first. No. of stores requisition slips is used by three departments, hence overheads of the stores department is allocated next and machine hours is used by only production department. So, overheads of the maintenance department is allocated last.

Hence, the sequence of distribution of overheads will be time office, stores and maintenance.

Particulars	Total ₹	Basis	Fabrication ₹	Assembly ₹	Time Office ₹	Stores ₹	Maintenance ₹
As per primary distribution	52,000	As given	24,000	16,000	4,000	5,000	3,000
Time Office	4,000	No. of Employees (4:3:2:1)	1,600	1,200	(4,000)	800	400
Stores	5,800	No. of stores requisition slips (12:10:3)	2,784	2,320	-	(5,800)	696

Maintenance	4,096	Machine Hours (3:2)	2,458	1,638	-	-	(4,096)
Total			30,842	21,158	-	-	-

When the cost of Time Office is distributed first, the charge to stores department is ₹ 800. This makes the total cost of stores to be distributed as ₹ 5,800 (i.e., ₹ 5,000 + ₹ 800). Same is the logic for ₹ 4,096 i.e., the cost of Maintenance.

• Reciprocal Service Method

This approach acknowledges that service departments can both provide and receive services from other service departments reciprocally. The exchange of services among departments is duly considered in allocating overhead costs. Two methods are employed for distribution based on this principle: the reciprocal distribution method and the simultaneous equation method.

• Repeated Distribution Method

This involves consistent allocation of overhead costs across all departments. The predetermined ratios are applied to allocate the costs of service departments to both production and other service departments. This process continues until the figures for service departments reach 'nil' or become 'negligible'.

Illustration 51

The summary as per primary distribution is as follows:

Production departments A - ₹ 2,400; B - ₹ 2,100; C - ₹ 1,500

Service departments X - ₹ 700; Y - ₹ 900

Expenses of service departments are distributed in the ratios of:

X Department: A – 20%, B – 40%, C – 30% and Y – 10%

Y Department: A – 40%, B – 20%, C – 20% and X – 20%

Show the distribution of service costs among A, B and C under repeated distribution method.

Solution:

	Production Departments			Service Departments	
	A ₹	B ₹	C ₹	X ₹	Y ₹
As per primary distribution	24,00	2,100	1,500	700	900
Service department X (2:4:3:1)	140	280	210	(700)	70
Service department Y (2:1:1:1)	388	194	194	194	(970)
Service department X (2:4:3:1)	38.8	77.6	58.2	(194)	19.4
Service department Y (2:1:1:1)	7.76	3.88	3.88	3.88	(19.4)
Service department X (2:4:3:1)	0.776	1.552	1.164	(3.88)	0.388
Total	2,975.336	2,657.032	1,967.244	-	0.388

Ignore the fraction of the undistributed amount of the Service Department Y.

- **Simultaneous Equations Method**

Under this method, simultaneous equations are formed using the service departments' share with each other. Solving the two equations will give the total cost of service departments after loading the inter-departmental exchange of services. These costs are then distributed among production departments in the given ratio.

In Illustration 52, service department X gives 10% of its service to Y and receives 20% of Y's service.

Let 'x' be the total expense of Department X and

'y' be the total expense of Department Y

So, $x = 700 + 0.20y$ ----- equation (1)

and, $y = 900 + 0.10x$ ----- equation (2)

putting $y = 900 + 0.10x$ in equation (1)

$\Rightarrow x = 700 + 0.20 (900 + 0.10x)$

$\Rightarrow x = 700 + 180 + 0.02x$

$\Rightarrow 0.98x = 880$

$\Rightarrow x =$

Now putting $x = 898$ in equation (2)

$\Rightarrow y = 900 + 0.10 \times 898 \quad 900 + 90 = 990$

total cost of S1 = ₹ 898 and of S2 = ₹ 990

Statement showing redistribution of Overheads

	Department				
	A ₹	B ₹	C ₹	X ₹	Y ₹
Primary Distribution	2,400	2,100	1,500	700	900
Distribution of cost of X	180	359	269	(898)	90
Distribution of cost of Y	396	198	198	198	(990)

- **Trial and Error Method**

This method is to be followed when the question of distribution of costs of service cost centres which are interlocked among them arises. In the first stage, gross costs of services of service cost centres are determined. In the second stage cost of service centres are apportioned to production cost centres.

Limitations of Apportionment

Regardless of the method chosen, it relies on an appropriate basis, which inevitably introduces approximations. Using approximate data for analysis, control, and decision-making can result in errors. Therefore, caution must be exercised when associating cost data with a cost center or cost unit. Most indirect costs, particularly overheads, naturally relate to a specific time period. Attempting to link them to a cost unit is often arbitrary, given that overheads are typically period costs. Consequently, traditional methods of allocation and apportionment are frequently contested in the industry, and techniques like marginal costing have emerged in response to the limitations of Traditional Costing.

Capacity Levels and Overheads Rate

Para 5.1 of CAS 2 states that Capacity shall be determined in terms of units of production or services or equivalent machine or man hours.

The determination of the overheads rate relies significantly on the assumed activity level. The overheads rate varies across different capacity levels. To ensure the accurate calculation of a product's cost, it is essential to maintain consistency and uniformity in the principles and methods used for determining capacity³. Following capacity concepts merit consideration for overheads rate determination: -

Installed capacity (Theoretical or Maximum Plant Capacity)

Installed capacity (maximum capacity or the ideal capacity) is the capacity for which plant is designed to operate. It is also referred as theoretical capacity. It does not give allowance for waiting, delays and shut down. The capacity is significant for designing the plant mechanically. For cost considerations, this capacity is not important.

The disregard for essential interruptions in the production process makes it impractical to use ideal capacity in determining overhead rates. Installed capacity is defined in para 4.4 of CAS 2 as '*Installed capacity is the maximum capacity of producing goods or providing services, determined either based on technical specification of the facility or through a technical evaluation*'

Practical Capacity

Once the theoretical capacity is assessed, provisions are made for inevitable disruptions such as time spent on repairs, inefficiencies, equipment breakdowns, delays in the delivery of raw materials and supplies, labour shortages and absenteeism, Sundays, holidays, vacations, and inventory checks. Consequently, practical capacity represents the highest achievable capacity under the influence of minor, unavoidable interruptions. These interruptions, predominantly stemming from internal factors, exclude major external factors such as a lack of customer orders. The determination of practical capacity takes into account the nature of the industry and the specific circumstances of the factory's location. Standard unavoidable disruptions typically contribute to 15% to 25% of the maximum capacity. Thus, practical capacity ranges from 75% to 85% of the maximum capacity after accommodating normal, unavoidable interruptions. This is also referred as the actual capacity which is defined in para 4.2 of CAS 2 as '*Actual capacity utilization is measured in terms of volume of production achieved or service provided in a specified period*'. It is important to note that actual capacity utilization is usually expressed as a percentage of installed capacity

Actual capacity utilization

Actual capacity utilization is the volume of production achieved or service provided in a specified period, expressed as a percentage of installed capacity.

Volume may be measured in terms of units produced or services provided or equivalent machine or man hours, as applicable. Actual capacity utilization is usually expressed as a percentage of installed capacity.

Normal Capacity

Para 4.5 of CAS 2 defines normal capacity as '*the volume of production or services achieved or achievable on an average over a period under normal circumstances taking into account the reduction in capacity resulting from planned maintenance*'.

Normal capacity refers to the maximum level of output that a company can sustain over a set period of time. It is the level of production or service provision that a given system can maintain. Normal capacity is a key factor in measuring a company's capacity utilization rate, which is the percentage of potential output that is being achieved. Ideally, a 100% capacity utilization rate is desirable, but operating at full capacity for an extended period may not be sustainable. Therefore, normal capacity provides a realistic benchmark for sustainable output levels. It takes into account various factors such as inefficiencies and delays that make it impossible to reach a theoretical level of output over the long term.

3. This is the objective with which CAS 2 (Capacity determination) has been designed.

Capacity based on Sales Expectancy

Capacity may be derived from anticipated sales for the upcoming year, and it's crucial to discern between normal capacity and capacity based on sales expectations. While normal capacity takes into account a comprehensive analysis of long-term sales trends spanning a cycle of years, capacity based on sales expectancy focuses solely on the sales projections for the upcoming year. When establishing long-term sales trends, it involves considering a cycle of years extensive enough to mitigate cyclical fluctuations. In contrast, capacity based on sales expectancy is more influenced by general economic conditions and industry forecasts than by long-term sales trends.

The primary advantages of determining the overheads rate based on sales expectancy are:

- (i) Aligning the overheads rate with the actual sales expectations.
- (ii) Effectively spreading overhead costs across production.
- (iii) Providing a valuable overheads rate for decision-making purposes, such as fixing prices.

Idle Capacity

Idle capacity refers to the unused or underutilized capacity within a system, facility, or process. It represents the difference between the potential maximum output or production capacity and the actual level of production or activity at a given time. When a system or resource is operating below its full capacity, the unused portion is considered idle capacity.

Idle capacity can result from various factors such as low demand for products or services, maintenance downtime, equipment failures, or other inefficiencies in the production process. Efficient management seeks to minimize idle capacity to enhance productivity and optimize resource utilization. It is categorized as normal idle capacity and abnormal idle capacity.

Para 4.6 of CAS 2 defines normal idle capacity as '*the difference between installed and normal capacity*'.

Abnormal idle capacity is the difference between normal capacity and actual capacity utilization where the actual capacity is lower than the normal capacity (para 4.1 of CAS 2).

The standard defines '*Excess Capacity Utilization*' as the difference between installed capacity and the actual capacity utilization when actual capacity utilization is more than installed capacity.

The following illustrates the concepts discussed above

Illustration 52

Manufactures' Specifications – capacity per hour	= 500 units
No of shifts (each shift 8 hours)	= 3 shifts
Holidays in a year:	
Sundays	= 52 days
Other holidays	= 13 days
Annual maintenance is done within these 13 holidays	
Preventive Weekly Maintenance for the machine on Sunday	
Normal idle capacity for batch change over,	
Lunch, Personal need etc.	= 1 hr per shift
Production based on sales expectancy in past 5 years	= 30.1, 26.9, 29.7, 24.4 and 30.2 lakh units
Actual Production for the year	= 30.1
Assume year 1, year 3 & year 5 to be normal years.	

Calculation

Installed Capacity for the machine = $365 * 8 * 3 * 500$ = 43.8 lakh units

Practical; Capacity = $(365 - 52 - 13) * (8 - 1) * 3 * 500$ = 31.5 lakh units

Out of the past five years, normal capacity is average of 3 normal years.

Normal Capacity = $(30.1 + 29.7 + 30.2) / 3$ = 30.0 lakh units

Actual Capacity Utilization = $30.1 \text{ lakh units} = 68.7\%$

Idle Capacity = $(43.8 - 30.1) = 13.7 \text{ lakh unit} = 31.3\%$

Abnormal idle capacity = $31.5 - 30.1 = 1.4 \text{ lakh units}$

Absorption of Overheads and their treatment in Cost Accounts

A job or product typically traverses several production departments before reaching the stage of a finished, saleable product. It becomes essential to ascertain the cost incurred in each department through which the product passes. The primary and secondary distribution summary discussed above aids in calculating the overheads for each production department. The next phase involves allocating these overall overhead costs to the units produced. Overheads absorption facilitates the Cost Accountant in recovering the overhead costs associated with each unit of the product. Overheads absorption, also referred to as levy or recovery of overheads, is achieved by determining the overheads absorption rate.

For example, if a total of 1,200 tubes are produced and the overheads cost of the turning department is ₹72,000, then the overheads absorption rate is ₹6 per tube.

Absorption means ‘recording of overheads in Cost Accounts on an estimated basis with the help of a predetermined overheads rate, which is computed at normal or average or maximum capacity’

CIMA defines absorbed overheads as ‘overheads attached to products or services by means of an absorption rate, or rates.’

In general, the formula for overheads absorption rate is = $\text{Amount of Overheads} \div \text{Number of units of the base}$

Overheads Absorption Rates: For the purpose of absorption of overhead in costs of jobs, processes or products overhead rates related to suitable factors or bases to be determined. There are several methods in use for determining the overhead rates i.e. Actual or Predetermined Overheads Rate, Blanket or Multiple Rates.

As per para 6.3 of CAS 3 Absorption of Production or Operation Overheads shall be as follows:

- The variable Production or Operation Overheads shall be absorbed to products or services based on actual production.
- The fixed Production or Operation Overheads shall be absorbed based on the normal capacity.

Actual Overheads Rate:**Actual overheads absorption rate**

The actual overheads rate is determined retrospectively at the end of a period using the actual overhead costs incurred and the actual level of activity.

The formula for the actual overheads rate is:

$$\text{Actual Overheads Rate} = \text{Actual Total Overhead costs} \div \text{Actual level of activity}$$

Unlike the predetermined rate (discussed below), the actual overheads rate uses real costs and activity levels.

Pre-determined Overheads Rate

The predetermined overheads rate is a key concept in cost accounting. It is a rate used to allocate overhead costs to products or services based on an estimate before the actual costs are known. The predetermined overheads rate is calculated by dividing the estimated total overhead costs by the estimated level of activity (such as machine hours, direct labor hours, or production units).

The formula for the predetermined overheads rate is:

$$\text{Predetermined Overheads Rate} = \text{Estimated Total Overhead Costs} \div \text{Estimated level of activity}$$

Once the predetermined overheads rate is established, it is applied to the actual level of activity during a specific period to allocate overhead costs to products. This helps in assigning overhead costs to products in a timelier manner than waiting until the end of the period when actual overhead costs are known. The overheads absorption rates may be categorized as blanket rate or multiple rates;

Blanket (single) Overheads Rate

A single overheads rate for the entire factory may be computed for the entire factory. So, this is known as factory wide or blanket overheads rate method.

$$\text{Blanket Rate} = \text{Overheads Cost for the factory} \div \text{Total quantum of the base}$$

Blanket Rate of overheads may be applied suitable in a small concern. Blanket Rates are easy to compute. The use of Blanket rate of overheads gives erroneous and misleading results, where several products passing through number of different departments. With blanket rate of overheads, satisfactory level of managerial control is not possible.

Multiple Rates

This method is most commonly used to determine the multiple overhead rates i.e., separate rate:

- i) For each production department
- ii) For each service department
- iii) For each cost centre; and
- iv) For each product line.

The multiple rates are worked out as:

$$\text{Overheads Rate} = \text{Overheads Cost allocated and apportioned to each product, department} \div \text{Corresponding Base}$$

Bases of overheads absorption

Overheads absorption involves distributing indirect costs across various cost centers or products. The choice of absorption bases depends on the nature of the business and the most appropriate measure of activity. The common bases for the absorption of overhead costs are stated below:

A) Production Unit Method

The concept here is to average out the total overheads on total units produced. In a tube manufacturing unit, the total overheads are ₹ 72,000 and total tubes processed are 12,000. The overheads absorption rate is ₹ 6 per tube. If this rate is based on the budgeted costs and number of units, and if the factory now gets an order for 2,500 tube processing, the amount of production overheads to be charged to that order will be (2,500x6) ₹ 15,000.

B) Percentage of Direct Wages

Under this method, overheads for a job is recovered on the basis of a predetermined percentage of direct wages. This method is used when the component of direct wages is higher. If the overheads to be absorbed is ₹ 1,20,000 and the direct wages are estimated at ₹ 8,00,000, the predetermined rate will be calculated as $(\frac{₹1,20,000}{₹8,00,000} \times 100)$ 15%. If a job is received where direct wages are estimated at ₹ 9,000, then the production overheads to be absorbed will be 15% of ₹ 9,000 i.e., ₹1,350. This method is useful if the direct labour hours can be standardized and the labour rates do not fluctuate too much. However, this method ignores the contribution made by other resources like machinery. The method also ignores the fact that there may be different types or grades of workers and each may cost differently and also ignores the fact that most of the production overheads are time related.

C) Percentage of Direct Material Cost

Here the absorption rate is expressed as a percentage of direct material cost. This method is useful when the portion of material cost is very high and that of labour cost is comparatively negligible. It is useful if material grades and rates do not fluctuate too much. If production overheads to be absorbed is ₹ 2,000 and the material cost is expected to be ₹ 4,000, then the absorption rate will be as $(\frac{₹2,000}{₹4,000} \times 100)$ 50%. Thus, for a job requiring direct material of ₹ 200, the production overheads to be absorbed will be ₹ 100 (i.e., 50% x ₹ 200). However, many overheads items bear no relationship with material cost, and also the fact of time dimension of overheads is not taken into account by this method.

D) Percentage of Prime Cost

This method combines the benefits of direct wages and direct material cost methods as we know prime cost means the sum total of direct material cost, direct labour cost and direct expenses. This method could be used when prime cost constitutes a major proportion of the cost and the rates of material and labour are stable. It is needed that the product made is standard product. If the prime cost is expected to be ₹ 50,000 and the production overheads are estimated at ₹ 2,250, then the absorption rate will be $(\frac{₹2,250}{₹50,000} \times 100)$ 5% of prime cost. If a job has a prime cost of ₹ 800, then overheads absorbed on that job will be (5% of ₹ 800) ₹ 40.

E) Direct Labour Hour

Under this method, the absorption rate is calculated by dividing the overheads amount by the actual or predetermined direct labour hours. This is extremely useful when the production is labour intensive. This method is superior to the earlier ones, because it takes cognizance of the time factor. If the direct labour hours for a month is 10,000 and the overheads to be absorbed are ₹ 5,000, then the absorption rate is $(\frac{₹5,000}{10,000 \text{ hrs}})$ ₹ 0.50 per labour hour. If a job requires labour time of 250 hours, the production overheads to be loaded on the job will be (250 hrs x ₹ 0.50) ₹ 125. The data related to labour hours has to be properly collected or estimated. The labour hour rate may be calculated as a single rate or different for different group of workers.

F) Machine Hour Rate

In the days of mechanized production processes, the most relevant rate to be applied is the machine hour rate. This is the rate calculated by dividing the actual or budgeted overheads cost related to a machine or a group of machines by the appropriate number of machine hours. These hours could be actual hours or budgeted hours. When budgeted hours are used, they are taken at average capacity at which a factory normally operates. Full capacity hours cannot be taken as the factory may not operate at that level and then the absorption rate may be unnecessarily fixed at a

lower level. The overheads in a highly mechanized factory are mostly related to the number of hours a machine runs. Hence, this is supposed to be the best method for absorbing overhead costs into the cost unit. If a machine normally runs for 2,000 hours in a month and monthly overheads to be absorbed are ₹15,000, then the machine hour rate will be calculated as $(\frac{₹15,000}{2,000 \text{ hrs}})$ ₹7.50 per machine hour. If a job takes 75 hours on that machine, then $(75 \times ₹7.50)$ ₹562.50 will have to be loaded as cost of using the machine for that job.

A machine hour rate may be calculated using only those overheads which are directly related to the machine e.g., power fuel, repairs, maintenance, depreciation etc. Sum total of these expenses are calculated and then divided by the hours to compute the rate. This is called ordinary machine hour rate. Whereas, if costs not related to machine are also included (e.g., supervision, rent, lighting, heating etc.) for the rate calculation, such rate is called as composite machine hour rate. While calculating machine hour rate, the wages paid to machine operators may be added to the total costs. This is because these operators directly work on the machines and thus related to machine operation. At times a factory may have more than one similar machine simultaneously working. In such case, a group machine hour rate may be calculated.

Factors influencing the selection of Overheads Recovery rate

The particular method or methods selected for application in a company would depend upon the factors mentioned below. Selection of the most equitable method is of paramount importance since a method that is not suitable will distort costs and thus make them useless for control and decision-making purpose.

Selection of overheads recovery rates depends on the following factors:

- i) Nature of the product and process of manufacture
- ii) Nature of overhead expenses
- iii) Organizational set up of the undertaking into departments and or cost centres
- iv) Individual requirements with regard to the circumstances prevailing policy of the management
- v) Accuracy vis-à-vis cost of operating the method. Some of the methods are comparatively more accurate and provide equitable bases for overheads absorption.

The main features of a satisfactory overheads rate are as follows:

- a) Simple, easy to operate, practical and accurate
- b) Economic in application
- c) Fairly stable so that cost from period to period does not vary
- d) Related to time factor as far as practical
- e) Departmental rates are preferable to blanket rates
- f) Area of activity selected for computation of the rate should be homogeneous cost unit
- g) Base for the rate should lay stress on the main production element of the concern

Under absorption and Over absorption of Overheads

The amount of overheads absorbed in costs is the sum total of the overhead costs allotted to individual cost units by application of the overheads rate. When a predetermined rate worked out on the basis of anticipated or budgeted overheads and base is applied to the actual base, the amount absorbed may not be identical with the amount of overhead expenses incurred if either the actual base or the actual expenses or both deviate from the estimates or the budget.

If the amount absorbed is less than the amount incurred, which may be due to actual expenses exceeding the estimate and / or the output or the hours worked being less than the estimate, the difference denotes under absorption.

On the other hand, if the amount absorbed is more than the expenditure incurred, which may be due to the expense being less than estimate and / or the output or hours worked being more than the estimates, this would indicate over-absorption, which goes to inflate the costs.

Under or over absorption of overheads may arise due to one or the other of the causes given below:

- Error in estimating overhead expenses
- Error in estimating the level of production, i.e., the base
- Major unanticipated changes in the methods of production
- Unforeseen changes in the production capacity
- Seasonal fluctuations in the overhead expenses from period to period
- Overheads rate may be applied to the normal capacity which may be less than the full operating capacity of the undertaking

How does one deal with the situation of over or under absorption?

There are three ways to handle over or under absorption:

- Write off** (in case of under absorption) or **write back** (in case of over absorption) to the Profit and Loss Account. This treatment is valid if most of the overhead items are related to time.
- Carry forward to the next period through a reserve account** – this method is not recommended on the logic that it is inconsistent with Accounting Standard.
- Use of supplementary rates** - to adjust the effect to the cost of sales, finished stocks and work in progress stocks. This sound logical as it does not carry forward the unabsorbed or over absorbed overheads to the next accounting period entirely. It aims at splitting the total effect between the cost of sale (which is charged to current year's profits) and stocks (which are carried forward to the next year).

Illustration 53

Overheads incurred	₹ 1,50,000
Overheads recovered	₹ 1,00,000
Cost of sales	₹ 10,00,000
Finished goods	₹ 8,00,000
Work-in-progress	₹ 7,00,000

How the under / over absorbed overheads will be treated?

Solution:

Overheads Incurred	₹ 1,50,000
Overheads Recovered	₹ 1,00,000
Under Absorption	₹ 50,000

Cost Accounting

Supplementary Overheads rate is calculated and allocated to Cost of Sales, Finished Goods and Work in Progress.

Total of Cost of Sales, Finished Goods and Work in Progress ₹ 25,00,000

Supplementary Overheads rate $\frac{₹50,000}{25,00,000} = ₹ 0.020$

∴ Under absorbed overheads amount will be distributed as follows:

Cost of Sales = (₹ 10,00,000 × 0.020) = ₹ 20,000

Finished Goods = (₹ 8,00,000 × 0.020) = ₹ 16,000

Work in Progress = (₹ 7,00,000 × 0.020) = ₹ 14,000

2.4.3 Reporting of Overhead Costs

Presentation

- Overheads shall be presented as separate cost heads like production, administration and marketing.
- Element wise and behaviour wise details of the overheads shall be presented, if material.
- Any under – absorption or over – absorption of overheads shall be presented in the reconciliation statement.

Disclosure

- The basis of assignment of overheads to the cost objects.
- Overheads incurred in foreign exchange.
- Overheads relating to resources received from or supplied to related parties.
- Any subsidy / grant / incentive or any amount of similar nature received / receivable reduced from overheads.
- Credits / recoveries relating to the overheads.
- Any abnormal cost not forming part of the overheads.
- Any unabsorbed overheads.

Illustration 54

In an Engineering Factory, the following particulars have been extracted for the quarter ended 31st December, 2021. Compute the departmental overheads rate for each of the production departments, assuming that overheads are recovered as a percentage of direct wages.

	Production Departments			Service Departments	
	A	B	C	X	Y
Direct Wages ₹	30,000	45,000	60,000	15,000	30,000
Direct Material ₹	15,000	30,000	30,000	22,500	22,500
No. of workers	1,500	2,250	2,250	750	750
Electricity KWH	6,000	4,500	3,000	1,500	1,500
Assets Value	60,000	40,000	30,000	10,000	10,000
No. of Light points	10	16	4	6	4
Area Sq. Yards	150	250	50	50	50

The expenses for the period were:

	Amount (₹)
Power	1,100
Lighting	200
Stores Overheads	800
Welfare of Staff	3,000
Depreciation	30,000
Repairs	6,000
General Overheads	12,000
Rent and Taxes	550

Apportion the expenses of Service Department Y according to direct wages and those of Service Department X in the ratio of 5 : 3 : 2 to the production departments.

Solution

Statement Showing apportionment of overheads

Particulars	Basis of Apportionment	Total ₹	A ₹	B ₹	C ₹	X ₹	Y ₹
Material	Actual	45,000	-	-	-	22,500	22,500
Wages	Actual	45,000	-	-	-	15,000	30,000
Power	KWH (4:3:2:1:1)	1,100	400	300	200	100	100
Lighting	No. of Light Points (5:8:2:3:2)	200	50	80	20	30	20
Stores Overheads	Direct Material (2:4:4:3:3)	800	100	200	200	150	150
Welfare of Staff	No. of workers (2:3:3:1:1)	3,000	600	900	900	300	300
Depreciation	Asset Value (6:4:3:1:1)	30,000	12,000	8,000	6,000	2,000	2,000
Repairs	Asset Value (6:4:3:1:1)	6,000	2,400	1,600	1,200	400	400
General Overheads	Direct Wages (2:3:4:1:2)	12,000	2,000	3,000	4,000	1,000	2,000
Rent and Taxes	Area (3:5:1:1:1)	550	150	250	50	50	50
Total		1,43,650	17,700	14,330	12,570	41,530	57,520
Cost of X	As given 5:3:2		20,765	12,459	8,306	(41,530)	-
Cost of Y	Direct Wages (2:3:4)		12,782	19,173	25,565		(57,520)
Total Overheads of Production Department			51,247	45,962	46,441		

Computation of Overheads Recovery Rate

Production Overheads	Overheads Amount ₹	Wages ₹	Overheads Recovery Rate
A	51,247	30,000	$\frac{51,247}{30,000} \times 100 = 170.82\%$
B	45,962	45,000	$\frac{45,962}{45,000} \times 100 = 102.14\%$
C	46,441	60,000	$\frac{46,441}{60,000} \times 100 = 77.40\%$

Illustration 55

The New Enterprises Ltd has three production departments A, B and C two service departments D and E. The following figures are extracted from the records of the Co.

	Amount (₹)
Rent and Rates	5,000
General Lighting	600
Indirect Wages	1,500
Power	1,500
Depreciation on Machinery	10,000
Sundries	10,000

The following further details are available:

	A	B	C	D	E
Floor Space (Sq. Mts)	2,000	2,500	3,000	2,000	500
Light Points	10	15	20	10	5
Direct Wages	3,000	2,000	3,000	1,500	500
H.P. of machines	60	30	50	10	-
Working hours	6,226	4,028	4,066	-	-
Value of Material	60,000	80,000	1,00,000	-	-
Value of Assets	1,20,000	1,60,000	2,00,000	10,000	10,000

The expenses of D and E are allocated as follows:

	A	B	C	D	E
D	20%	30%	40%	-	10%
E	40%	20%	30%	10%	-

What is the factory cost of an article if its raw material cost is ₹50, labour cost ₹30 and it passes through Departments A, B and C. For 4, 5 and 3 hours respectively.

Solution:

Statement showing apportionment of overheads to departments

Particulars	Basis	Total ₹	Production Department			Service Department	
			A (₹)	B (₹)	C (₹)	D (₹)	E (₹)
Wages	Actuals	2,000	-	-	-	1,500	500
Rent and Rates	Floor Space (4:5:6:4:1)	5,000	1,000	1,250	1,500	1,000	250
General Lighting	Light Points (2:3:4:2:1)	600	100	150	200	100	50
Indirect Wages	Direct Wages (6:4:6:3:1)	1,500	450	300	450	225	75
Power	H.P. (6:3:5:1)	1,500	600	300	500	100	-
Depreciation on Machinery	Value of Assets (12:16:20:1:1)	10,000	2,400	3,200	4,000	200	200
Sundries	Direct Wages (6:4:6:3:1)	10,000	3,000	2,000	3,000	1,500	500
Total		30,600	7,550	7,200	9,650	4,625	1,575

Repeated Distribution Method

Particulars	Production Department			Service Department	
	A ₹	B ₹	C ₹	D ₹	E ₹
Total Overheads (As per primary distribution)	7,550	7,200	9,650	4,625	1,575
Cost of Service Department D (2:3:4:1)	925	1388	1,850	(4,625)	462
Cost of Service Department E (4:2:3:1)	815	407	611	204	(2,037)
Cost of Service Department D (2:3:4:1)	41	61	82	(204)	20
Cost of Service Department E (4:2:3:1)	8	4	6	2	(20)
Cost of Service Department D (2:3:4:1)	-	2	-	(2)	-
Total Overheads of Production Department	9,339	9,062	12,199	-	-
Working Hours	6,226	4,028	4,066	-	-
Overheads Recovery Rate per hour	1.50	2.25	3.00	-	-

Computation of Factory Cost of the Article

Particulars	Amount (₹)
Material	50.00
Labour	30.00
Prime Cost	80.00
Add: Overheads (Working hours × Rate per hour)	
Department A = 4 × 1.50	6.00
Department B = 5 × 2.25	11.25
Department C = 3 × 3	9.00
Factory Cost	106.25

Simultaneous Equation Method

Let total cost of Service Department D be 'd'

And total cost of Service Department E be 'e'

$$\text{or, } d = 4,625 + \frac{10}{100} e$$

$$\text{or, } 100 d = 4,62,500 + 10 e$$

$$\text{or, } 100 d - 10 e = 4,62,500 \text{ ----- equation (1)}$$

$$\text{And } e = 1,575 + \frac{10}{100} d$$

$$\text{or, } 100 e = 1,57,500 + 10 d$$

$$\text{or, } 10 e - d = 15,750 \text{ ----- equation (2)}$$

Adding equation (1) and (2)

$$\text{or, } 100 d - 10 e + 10 e - d = 4,62,500 + 15,750$$

$$\text{or, } 99 d = 4,78,250$$

$$\text{or, } d = \frac{4,78,250}{99} = 4,831$$

Now, putting $d = 4,831$ in equation (2)

$$\text{or, } 10 e - 4,831 = 15,750$$

$$\text{or, } e = \frac{20,581}{10} = 2,058$$

∴ Overheads Cost of Service Department D = ₹ 4,831

And Overheads Cost of Service Department E = ₹ 2,058

Particulars	Production Department			Service Department	
	A (₹)	B (₹)	C (₹)	D (₹)	E (₹)
Total Overheads (As per primary distribution)	7,550	7,200	9,650	4,625	1,575
Cost of D ₹ 4,831 is distributed (2:3:4:1)	966	1,450	1,932	(4,831)	483
Cost of E ₹ 2,058 is distributed (4:2:3:1)	823	412	617	-	(2,058)
Total Overheads of Production Department	9,339	9,062	12,199	-	-
Working Hours	6,226	4,028	4,066	-	-
Overheads Recovery Rate per hour	1.50	2.25	3.00	-	-

Illustration 56

The following information relates to the activities of a production department of factory for a certain period.

	Amount (₹)
Material used	36,000
Direct Wages	30,000
Labour Hours	12,000
Hours of Machinery operation	20,000
Overheads Chargeable to the Department	25,000

On one order carried out in the department during the period the relevant data were:

Material used (₹)	6,000
Direct Wages (₹)	4,950
Labour Hours worked	1,650 Hours
Machine Hours	1,200 Hours

Calculate the overheads chargeable to the job by four commonly used methods.

Solution:

The four commonly used methods of absorbing or recovering overheads are as follows:

1. Percentage of Overheads on Material Cost = $\frac{25,000}{36,000} \times 100 = 69.44\%$
2. Percentage of Overheads on Labour Cost = $\frac{25,000}{30,000} \times 100 = 83\frac{1}{3}\%$
3. Overheads Recovery Rate per Labour Hour = $\frac{₹ 25,000}{12,000 \text{ Hours}} = ₹ 2.083$
4. Overheads Recovery Rate per Machine Hour = $\frac{₹ 25,000}{20,000 \text{ Hours}} = ₹ 1.25$

The Overheads chargeable to job under the above methods is as follows:

- | | | |
|---|--------------------------------|--------------|
| 1. Percentage of Overheads on Material Cost | = ₹ 6,000 × 69.44% | = ₹ 4,166.40 |
| 2. Percentage of Overheads on Labour Cost | = ₹ 4,950 × 83 $\frac{1}{3}$ % | = ₹ 4,125 |
| 3. Overheads Recovery Rate per Labour Hour | = 1,650 × 2.083 | = ₹ 3,437 |
| 4. Overheads Recovery Rate per Machine Hour | = 1,200 × 1.25 | = ₹ 1,500 |

Illustration 57

In a machine department of a factory there are five identical machines. From the particulars given below; prepare the machine hour rate for one of the machines.

Space of the department	10,000 Sq. mts.
Space occupied by the machine	2,000 Sq. mts.
Cost of the machine	₹ 20,000
Scrap value of the machine	₹ 300
Estimated life of the machine	13 years
Depreciation charged at	7 $\frac{1}{2}$ % p.a.
Normal running of the machine	2,000 hours
Power consumed by the machine as shown by the meter	₹ 3,000 p.a.

Estimated repairs and maintenance throughout the working life of the machine ₹ 5,200. Sundry supplies including oil, waste etc. charged direct to the machine amount to ₹ 600 p.a.

Cost Accounting

Other expenses of the department are:

	Amount (₹)
Rent and Rates	9,000
Lighting (to be apportioned according to workers employed)	400
Supervision	1,250
Other charges	5,000

It is ascertained that the degree of supervision required by the machine is $\frac{2}{5}$ th and $\frac{3}{5}$ th being devoted to other machines.

There are 16 workers in the department of whom 4 attended to the machine and the remaining to the other machines.

Solution:

Computation of Machine Hour Rate

Particulars		Cost per annum Amount (₹)	Total Amount (₹)
Standing Charges			
Rent and Rates	₹ 9,000 ÷ 5	1,800	
Lighting	$(4/16) \times ₹ 400$	100	
Supervision	₹ 1,250 × (2/5)	500	
Other Charges	₹ 5,000 ÷ 5	1,000	
Total Standing Charges			3,400
Machine Expenses			
Depreciation	₹ 20,000 × 7.5%	1,500	
Repair Maintenance	₹ 5,200 ÷ 13 years	400	
Sundries		600	
Power		3,000	
Total Machine Expenses			4,500
Total Cost p.a.			8,900
Machine Hours			2,000
Machine Hour Rate	₹ 8,900 ÷ 2,000		₹ 4.45 per hour

Illustration 58

From the following particulars given below compute Machine Hour Rate for a machine.

- | | |
|---|--------------|
| a) Cost | ₹ 24,000 |
| b) Scrap value | ₹ 4,000 |
| c) Estimated working life | 40,000 hours |
| d) Estimated cost of repairs and maintenance during the whole life | ₹ 2,000 |
| e) Standing charges of the shop for 4 weekly period | ₹ 3,000 |
| f) Working hours in 4 weekly period | 100 hours |
| g) No. of machines in the shop each of which is liable for equal charges are 30 machines. | |
| h) Power used per hour 4 units @ 10 paise per unit. | |

Solution:

Computation of Machine Hour Rate

Particulars		Amount (₹) [Cost per hour]
Standing Charges		
Standing Charges	$\frac{₹ 3,000}{100 \text{ hours} \times 30 \text{ machines}}$	1.00
Machine Expenses		
Depreciation	$\frac{₹ 24,000 - ₹ 4,000}{40,000 \text{ Hours}}$	0.50
Repairs and Maintenance	$\frac{₹ 2,000}{40,000 \text{ Hours}}$	0.05
Power	$4 \text{ units} \times ₹ 0.10$	0.40
∴ Machine Hour Rate		1.95

Illustration 59

The following particulars relate to a processing machine treating a typical material. You are required to calculate the machine hour rate.

The cost of the machine	₹ 10,000
Estimated life	10 years
Scrap value	₹ 1,000
Working time (50 weeks of 44 hours each)	2,200 hours
Machine maintenance per annum	200 hours
Setting up time estimated @ 5% of total productive time	
Electricity is 16 units per hour @ 10 paise per unit.	
Chemical required weekly	₹ 20
Maintenance cost per year	₹ 1,200

Two attendants control the operations of the machine together with 6 other machines, their combined weekly wages are ₹ 140. Departmental overheads allocated to this machine per annum ₹ 2,000.

Solution:

Annual working hours = 50 weeks × 44 hours	=	2,200
Less: Maintenance time		200
Production hours		2,000
Less: Setting up time 5% x 2,000		100
Effective hours		1,900

Computation of Machine Hour Rate

Particulars		Amount (₹)	Amount (₹) Rate per hour
Standing Charges			
Chemical Solution	50 weeks × ₹ 20	1,000	
Attendants Wage	₹140 × 50 × $\frac{1}{7}$	1,000	
Departmental Overheads		2,000	
Total Standing Charges		4,000	
Machine Rate per hour for Standing Charges		$\frac{₹ 4,000}{2,200 \text{ Hours}}$	1.82
Machine Expenses			
Depreciation	$\frac{₹ 10,000 - ₹ 1,000}{10 \text{ years}}$	900	$\frac{₹ 900}{1,900 \text{ Hours}} = 0.47$
Maintenance		1,200	$\frac{₹ 1,200}{1,900 \text{ Hours}} = 0.63$
Power	16 units x ₹ 0.10		1.60
Machine Hour Rate			4.52

Illustration 60

Your company uses a historical cost system and applies overheads on the basis of “Predetermined” rates. The following are the figures from the Trial Balance as at 30-09-2021:

	Dr. (₹)	Cr. (₹)
Manufacturing overheads	4,26,544	-
Manufacturing overheads applied	-	3,65,904
Work-in-progress	1,41,480	-
Finished Goods Stock	2,30,732	-
Cost of Goods Sold	8,40,588	-

Give two methods for the disposal of the under absorbed overheads and show the profit implications of the method.

Solution:

	₹
Overheads Incurred	4,26,544
Less: Overheads Absorbed	3,65,904
Under Absorption	60,640

The following are the three methods for disposing off this under absorbed overheads:

1. Transferring to the Costing Profit and Loss Account. Under this method, the profit will decrease by ₹ 60,640.
2. The amount may be disposed off by carrying forward to the next year. In this case, there will be no effect on profit.

3. Applying supplementary overheads rate.

$$\therefore \text{Supplementary Overheads Rate} = \frac{\text{₹ } 60,640}{\text{₹ } 12,12,800} = \text{₹ } 0.05$$

Particulars	Existing Value ₹	Additional Overheads Absorbed ₹	New Value ₹
Working in Progress	1,41,480	$0.05 \times 1,41,480 = 7,074$	1,48,554
Finished Goods	2,30,732	$0.05 \times 2,30,732 = 11,537$	2,42,269
Cost of Goods Sold	8,40,588	$0.05 \times 8,40,588 = 42,029$	8,82,617
Total	12,12,800	60,640	12,73,440

Illustration 61

In a factory the expenses of factory are charged on a fixed percentage basis on wages and office overheads expenses are calculated on the basis of percentage of works cost.

	Order I (₹)	Order II (₹)
Material	12,500	18,000
Wages	10,000	14,000
Selling price	44,850	61,880
Percentage of profit on cost	15%	12%

Find the rate of Factory Overheads and Office Overheads.

Solution:

Let X be the percentage of works overheads on wages, and

Y be the percentage of office overheads on works cost

Particulars	Order I ₹	Order II ₹
Material	12,500	18,000
Add: Wages	10,000	14,000
Prime Cost	22,500	32,000
Add: Works Overheads	$\frac{X}{100} \times 10,000 = 100X$	$\frac{X}{100} \times 14,000 = 140X$
Works Cost	$22,500 + 100X$	$32,000 + 140X$
Add: Office Overheads	$\frac{Y}{100} \times (22,500 + 100X) = 225Y + XY$	$\frac{Y}{100} \times (32,000 + 140X) = 320Y + 1.40XY$
Total Cost	$22,500 + 100X + 225Y + XY$	$32,000 + 140X + 320Y + 1.40XY$
Total Cost (WN)	39,000	55,250

Cost Accounting

$$\begin{aligned}\text{So, } 22,500 + 100X + 225Y + XY &= 39,000 \\ \text{or, } 100X + 225Y + XY &= 16,500 \text{ ----- equation (1)}\end{aligned}$$

$$\begin{aligned}\text{And } 32,000 + 140X + 320Y + 1.40XY &= 55,250 \\ \text{or, } 140X + 320Y + 1.40XY &= 23,250 \text{ -----equation (2)}\end{aligned}$$

$$\text{equation (1) } \times 1.40 \quad \Rightarrow 140X + 315Y + 1.40XY = 23,100$$

$$\begin{array}{rcl}\text{Less: equation (2)} & \Rightarrow & 140X + 320Y + 1.40XY = 23,250 \\ & & -5Y \qquad \qquad \qquad = -150\end{array}$$

$$\text{or, } Y = 30$$

Now, putting the value of $Y = 30$ in equation (1)

$$\text{We have, } 100X + 225 \times 30 + 30X = 16,500$$

$$\text{or, } 130X = 16,500 - 6,750$$

$$\text{or, } X = 75$$

Hence, Percentage of Works Overheads on Wages = 75%

And Percentage of Office Overheads on Works Cost = 30%

Working Notes

1. Calculation of Total Cost for Order I

$$\text{Total Cost} + \text{Profit} = \text{Sales}$$

$$\text{or, Total Cost} + 15\% \text{ Total Cost} = 44,850$$

$$\text{or, Total Cost} = 44,850 \times \frac{100}{115} = ₹ 39,000$$

2. Calculation of Total Cost for Order II

$$\text{Total Cost} = 61,880 \times \frac{100}{112} = ₹ 55,250$$

Illustration 62

Self-help Ltd gensets and produced its own power Data for power costs are as follows:

	Production Departments		Service Departments	
	A	B	X	Y
Horse Power Hours	10,000	20,000	12,000	8,000
Needed at capacity production used during the month of May	8,000	13,000	7,000	6,000

During the month of May costs for generating power amounted to ₹ 9,300, of this ₹ 2,500 was considered to be fixed. Department X renders service to other Departments in the ratio of 13 : 6 : 1, while Y renders service to A and B in the ratio of 31 : 3. Given that the direct labour hours in Departments A and B are 1,650 hours and 2,175 hours respectively, find the power cost per labour in each of these two departments.

Solution:

Statement Showing apportionment of power cost and computation of cost per hour

Particulars	Basis	Total ₹	A ₹	B ₹	X ₹	Y ₹
Fixed Cost	H P Hours (5:10:6:4)	2,500	500	1,000	600	400
Variable Cost (9,300 – 2,500)	Actual Consumption (8:13:7:6)	6,800	1,600	2,600	1,400	1,200
		9,300	2,100	3,600	2,000	1,600
Cost of X distributed	(13:6:1)		1,300	600	(2,000)	100
Cost of Y distributed	(31:3)		1,550	150	-	(1,700)
Total Power Cost			4,950	4,350	-	-
Labour Hours			1,650	2,175	-	-
Cost of Power per Labour Hour			3	2		

Illustration 63

AT Ltd engineering Co. having 25 different types of automatic machines, furnishes you the following data for 2021-22 in respect of machine B:

- Cost of the machine ₹ 50,000
Life – 10 years
Scrap value is Nil
- Overheads expenses are:
 - Factory Rent ₹ 50,000 p.a.
 - Heating and Lighting ₹ 40,000 p.a.
 - Supervision ₹ 1,50,000 p.a.
 - Reserve Equipment of Machine B ₹ 5,000 p.a.
 - Area of the Factory 80,000 sq. ft.
 - Area occupied by Machine B 3,000 sq. ft.
- Wages of operator is ₹ 24 per day of 8 hours including all fringe benefits. He attends to one machine when it is under set up and two machines while under operation.
- Estimated production hours 3,600 p.a.
Estimated setup time 400 hours p.a.
Power ₹ 0.50 per hour

Prepare a schedule of comprehensive machine hour rate and find the cost of the following jobs:

	Job 1102	Job 1308
Setup time (Hours)	80	40
Operation time (Hours)	130	160

Solution:

Computation of machine hour rate when machine is in operation

Particulars		Amount (₹)	Amount (₹)
Standing Charges			
Rent	$50,000 \times \frac{3}{80}$	1,875	
Heating and Lighting	$40,000 \times \frac{3}{80}$	1,500	
Supervision	$1,50,000 \times \frac{1}{25}$	6,000	
Reserve Equipment		5,000	
Total Standing Charges		14,375	
Standing Cost per hour	$\frac{14,375}{4,000}$		3.59
Machine Expenses:			
Depreciation	$\frac{₹ 50,000}{10 \text{ years} \times 3,600 \text{ hours}}$	1.39	
Wages	$\frac{24}{8} \times \frac{1}{2}$	1.50	
Power		0.50	
Machine Cost per hour			3.39
Machine Hour Rate when in Operation			6.98

Computation of machine hour rate when machine is under setup

Particulars		Amount (₹)	Amount (₹)
Standing Charges			
Rent	$50,000 \times \frac{3}{80}$	1,875	
Heating and Lighting	$40,000 \times \frac{3}{80}$	1,500	
Supervision	$1,50,000 \times \frac{1}{25}$	6,000	
Reserve Equipment		5,000	
Total Standing Charges		14,375	
Standing Cost per hour	$\frac{14,375}{4,000}$		3.59
Machine Expenses:			
Depreciation	$\frac{₹ 50,000}{10 \text{ years} \times 3,600 \text{ hours}}$	1.39	
Wages	$\frac{24}{8}$	3.00	
Machine Cost per hour			4.39
Machine Hour Rate when under setup			7.98

Computation of cost of the jobs

Particulars	Job 1102		Job 1308	
		₹		₹
Setup Cost	80 x 7.98	638.40	40 x 7.98	319.20
Operation Cost	130 x 6.98	907.40	160 x 6.98	1,116.80
Total Cost of the Job		1,545.80		1,436.00

Illustration 64

Ganges Printing Co. has three operating departments:

1. Printing and Binding
2. Lithographing and
3. Engraving

The company has a job order cost system using a single predetermined expense rate. The management has been made aware of the deficiencies of using such a rate and is now interested in departmentalizing factory overheads. A study reveals that:

Department 1 has 3 similar machines representing a large investment and calling for high repairs and depreciation charges.

Department 2 has the workers perform similar tasks and are therefore paid the same hourly wage.

Department 3 however has several classes of workers; each group being paid the same hourly wage.

The estimated factory overheads and production data costs are as follows:

	Printing and Binding	Lithographing	Engraving
Factory Overheads (₹)	40,000	68,750	1,20,000
Direct Labour Hours	10,000	20,000	40,000
Direct Labour Cost (₹)	25,000	55,000	80,000
Machine Hours	20,000	Nil	Nil

Required:

- 1) An analysis to advise the management regarding the types of rates to be used in these departments.
- 2) A computation of the rates recommended.

Solution:**1. Printing and Binding Department**

It is appropriate to use machine hour rate method of absorbing overheads in Department 1 because there is large investment in machine and therefore, they are predominant

$$\text{Overheads Rate Per Machine Hour} = \frac{\text{Factory Overhead}}{\text{Machine hours}} = \frac{\text{₹ } 40,000}{20,000 \text{ hours}} = \text{₹ } 2 \text{ per machine hour}$$

2. Lithographing Department

In Department 2, it is better and appropriate to use labour hour rate of overheads because all the workers are

paid at uniform wage rate.

$$\text{Overheads Rate Per Labour Hour} = \frac{\text{Factory Overhead}}{\text{Labour hours}} = \frac{\text{₹ 68,750}}{20,000 \text{ hours}} = \text{₹ 3.4375 per labour hour}$$

3. Engraving Department

In Department 3 it is better and appropriate to use overheads rate based on certain percentage of wages because workers are paid at different rates.

$$\text{Overheads Percentage on Wages} = \frac{\text{Factory Overhead}}{\text{Wages}} \times 100 = \frac{\text{₹ 1,20,000}}{\text{₹ 80,000}} \times 100 = 150\%$$

Illustration 65

For a department the standard overheads rate is ₹ 2.50 per hour and the overheads allowances are as follows:

Activity Level (Hours)	Budgeted Overheads Allowance (₹)
3,000	10,000
7,000	18,000
11,000	26,000

Calculate:

- Fixed Cost
- The standard activity level on the basis of which the standard overheads rate has been worked out.

Solution:

$$\text{a) Variable Cost per hour} = \frac{\text{Difference in Total Overhead}}{\text{Difference in Activity Level}} = \frac{\text{₹ 18,000} - \text{₹ 10,000}}{7,000 \text{ hrs} - 3,000 \text{ hrs}} = \frac{\text{₹ 8,000}}{4,000 \text{ hrs}} = \text{₹ 2 per hour}$$

$$\begin{aligned} \text{Fixed Overheads} &= \text{Total Overheads} - \text{Variable Overheads} \\ &= \text{₹ 10,000} - 3,000 \text{ hrs} \times \text{₹ 2 per hour} = \text{₹ 10,000} - \text{₹ 6,000} = \text{₹ 4,000} \end{aligned}$$

Alternatively

Let Variable Overheads rate be ₹ x

and Fixed Overheads be ₹ y

$$\text{So, } 3,000x + y = 10,000 \quad \text{----- equation (i)}$$

$$\text{And, } 7,000x + y = 18,000 \quad \text{----- equation (ii)}$$

Equation (ii) – Equation (i)

$$\Rightarrow (7,000x + y) - (3,000x + y) = 18,000 - 10,000$$

$$\Rightarrow 4,000x = 8,000$$

$$\text{or, } x = \frac{8,000}{4,000} = 2$$

putting $x = 2$ in equation (i)

$$\Rightarrow y = 10,000 - 6,000 = 4,000$$

$\therefore$ Variable Overheads per hour = ₹ 2 per hour

Fixed Overheads = ₹ 4,000

b) Overheads Rate Per Hour = ₹ 2.5 (Given)

$$\text{or, } = \frac{\text{Standard Activity Level} \times \text{Variable Overhead rate per hour} + \text{Fixed Overhead}}{\text{Standard Activity Level}} = 2.5$$

or, Standard Activity Level $\times 2 + 4,000 = 2.5$ Standard Activity level

$$\text{or, Standard Activity Level} = \frac{4,000}{2.5 - 2} = 8,000$$

$\therefore$ Standard Activity Level = 8,000 hours

Illustration 66

In a certain factory three products are made from different materials by similar process. For a typical period, production costs are as under:

	Product A ₹	Product B ₹	Product C ₹
Material Used	1,600	2,000	800
Direct Labour Cost	1,200	1,000	400
Overheads (Actual)	800	650	350

Overheads is charged to cost of each product at the rate of 25% on prime cost.

Do you see anything wrong in principle in this method of charging overheads? If so, suggest a preferable method.

Solution:

Since, different materials are used for producing products, it is advisable, preferable and appropriate to use the method of absorbing overheads based on percentage of material cost instead of percentage on prime cost which is shown as follows:

Particulars	Product A ₹	Product B ₹	Product C ₹
Materials	1,600	2,000	800
Labour	1,200	1,000	400
Prime Cost	2,800	3,000	1,200
Actual Overheads Incurred	800	650	350
Overheads Recovery Rate is calculated based on historical data. So, actual overheads is used to calculate the future recovery rate	$= \frac{₹ 800}{₹ 1,600} \times 100$ = 50%	$= \frac{₹ 650}{₹ 2,000} \times 100$ = 32.50%	$= \frac{₹ 350}{₹ 800} \times 100$ = 43.75%

Illustration 67

A company produced a simple product in three sizes A, B and C. Prepare a statement showing the selling and distribution expenses apportioned over these three sizes applying the appropriate basis for such apportionment in each case from the particulars indicated:

Express the total of the costs so apportioned to each size as:

a) Cost per unit sold (nearest paise)

b) A percentage of sales turnover (nearest to two places for decimal)

The expenses are:

Cost Accounting

Expenses	Amount (₹)	Basis of apportionment
Salesman Salaries	10,000	Direct charge
Sales Commission	6,000	Sales turnover
Sales office expenses	2,096	Number of orders
Advertisement General	5,000	Sales turnover
Advertisement Specific	22,000	Direct charge
Packing	3,000	Total volume cu. ft. product sold
Delivery expenditure	4,000	Total volume cu. ft. product sold
Warehouse expenses	1,000	Total volume cu. ft. product sold
Expenses credit collection	1,296	Number of orders

Data available relating to the three sizes are as follows:

	Total	Size A	Size B	Size C
1. No. of salesmen, all paid same salary	10	4	5	1
2. Units sold	10,400	3,400	4,000	3,000
3. No. of orders	1,600	700	800	100
4. % of specific advertisement	100%	30%	40%	30%
5. Sales turnover	2,00,000	58,000	80,000	62,000
6. Volume of cu. ft. per unit of finished products	-	5	8	17

Solution:

Statement Showing apportionment of selling expenses over the sizes and computation of cost per unit and percentage on sales:

Particulars	Basis of apportionment	Total ₹	A ₹	B ₹	C ₹
Salesman Salaries	Direct charge (4:5:1)	10,000	4,000	5,000	1,000
Sales Commission	Sales turnover (29:40:31)	6,000	1,740	2,400	1,860
Sales office expenses	Number of orders (7:8:1)	2,096	917	1,048	131
Advertisement General	Sales turnover. (29:40:31)	5,000	1,450	2,000	1,550
Advertisement Specific	Direct charge (% of specific advertisement) (3:4:3)	22,000	6,600	8,800	6,600
Packing	Total volume cu. ft. product sold (WN 1) (17:32:51)	3,000	510	960	1,530

Delivery expenditure	Total volume cu. ft. product sold (17:32:51)	4,000	680	1,280	2,040
Warehouse expenses	Total volume cu. ft. product sold (17:32:51)	1,000	170	320	510
Expenses credit collection	Number of orders (7:8:1)	1,296	567	648	81
Total Selling Expenses		54,392	16,634	22,456	15,302
Cost p.u.			$= \frac{16,634}{3,400} = ₹ 4.89$	$= \frac{22,456}{4,000} = ₹ 5.61$	$= \frac{15,302}{3,000} = ₹ 5.10$
Percentage of Selling Expenses on Sales			$= \frac{16,634}{58,000} \times 100 = 28.67\%$	$= \frac{22,456}{80,000} \times 100 = 28.07\%$	$= \frac{15,302}{62,000} \times 100 = 24.69\%$

Working Note: 1.

Particulars	A	B	C
Volume of cu. ft. per unit of finished products	5	8	17
Units Sold	3,400	4,000	3,000
Total Volume of cu. ft	17,000	32,000	51,000

Illustration 68

For a production department of a manufacturing company, you are required to:

- Prepare a fixed budget of overheads
- Prepare a flexible budget of overheads, at 70% and 110% of budget volume;
- Calculate a departmental hourly rate of overheads absorption as per (a) and (b) above.

The budgeted level of activity of the department is 5,000 hours per period and the study of the various items of expenditure reveals the following:

Particulars	Particulars	Amount (₹)	₹ per hour
Indirect wages			0.40
Repairs	upto 2,000 hours	100	
	for each additional 500 hours		
	upto a total of 4,000 hours	35	
	additional from 4,001 to 5,000 hours	60	
	additional above 5,000 hours	70	
Rent and Rates		350	
Power	upto 3,600 hours		0.25
	for hours above 3,600		0.20

Consumable supplies			0.24
Supervision	upto 2,500 hours	400	
	additional for each extra 600 hours		
	above 2,500 and upto 4,900 hours	100	
	additional above 4,900 hours	150	
Depreciation	upto 5,000 hours	650	
	above 5,000 hours and upto 6,500 hours	820	
Cleaning	upto 4,000 hours	60	
	above 4,000 hours	80	
Heat and Lighting	from 2,100 hours to 3,500 hours	120	
	from 3,500 hours to 5,000 hours	150	
	above 5,000 hours	175	

Solution:

Fixed and Flexible Budget showing overheads cost per hour

Particulars	At 70% Capacity 5,000 x 70% = 3,500 hours		At 100% Capacity 5,000 hours		At 110% Capacity 5,000 x 110% = 5,500 hours	
		₹		₹		₹
Indirect Wages	0.40x3,500	1,400	0.40 x 5,000	2,000	0.40 x 5,500	2,200
Repairs	100+35x3	205	100 + 35 x 4 + 60	300	100 + 35 x 4 + 60 + 70	370
Rent and Rate		350		350		350
Power	0.25x3,500	875	0.25x3,600+0.20x1,400	1,180	0.25x3,600+0.20x1,900	1,280
Consumable Supplies	0.24x3,500	840	0.24 x 5,000	1,200	0.24 x 5,500	1,320
Supervision	400+100x2	600	400 + 100 x 4 + 150	950	400 + 100 x 4 + 150	950
Depreciation		650		650		820
Cleaning		60		80		80
Heating and Lighting		120		150		175
Total Overheads		5,100		6,860		7,545
Overheads Rate per hour	$\frac{₹ 5,100}{3,500}$	1.457	$\frac{₹ 6,860}{5,000}$	1.372	$\frac{₹ 7,545}{5,500}$	1.372

If under absorbed overheads is 10% or more of actual overheads incurred then supplementary overheads rate is applied otherwise the balance amount can be charged to Profit and Loss Account or can be carried forward to next year.

Illustration 69

In a manufacturing unit, overheads was recovered at a predetermined rate of ₹ 25 per man-day. The total factory overheads incurred and the man-days actually worked were ₹ 41,50,000 and 1,50,000 respectively. Out of the 40,000 units produced during a period of 30,000 units were sold. There were also 30,000 uncompleted units which may be reckoned at 66.67% complete.

On analysing the reasons, it was found that 40% of the unabsorbed overheads were due to defective planning and the rest were attributable to increase overhead costs.

How would unabsorbed overheads be treated in Cost Accounts?

Solution:

		Amount (₹)
Overheads Incurred		41,50,000
Less: Overheads Absorbed	25 x 1,50,000	37,50,000
Under Absorption		4,00,000

The under absorption of ₹ 4,00,000 being considerable whether due to defective planning or due to increase in prices, would be disposed off by applying supplementary overheads rate in the following manner

$$\text{Supplementary Overheads Rate} = \frac{\text{₹ 4,00,000}}{30,000 + 10,000 + 30,000 \times \frac{2}{3}} = \frac{\text{₹ 4,00,000}}{60,000 \text{ units}} = \frac{\text{₹ 20}}{3} \text{ per unit}$$

$$\text{Finished Goods Sold} = 30,000 \text{ units}$$

$$\text{Closing Stock of Finished Goods} = 10,000 \text{ units}$$

$$\text{Work in Progress} = 30,000 \text{ units; equivalent finished goods} = 30,000 \times \frac{2}{3} = 20,000 \text{ units}$$

So, under absorbed overheads will be absorbed by

$$\text{Cost of Goods Sold} = 30,000 \times \frac{20}{3} = \text{₹ 2,00,000}$$

$$\text{Closing Stock of Finished Goods} = 10,000 \times \frac{20}{3} = \text{₹ 66,667}$$

$$\text{Work in Progress} = 20,000 \times \frac{20}{3} = \text{₹ 1,33,333}$$

$$\text{Total} = \text{₹ 4,00,000}$$

Exercise

A. Theoretical Questions:

⊙ Multiple Choice Questions

1. Which of the following is considered as normal loss of material?
 - a. Pilferage
 - b. Loss due to accident
 - c. Loss due to careless handling of material
 - d. None of these
2. The most important element of cost is
 - a. Material
 - b. Labour
 - c. Overheads
 - d. All of these
3. Direct Material is a
 - a. Administration Cost
 - b. Selling and Distribution Cost
 - c. All of these
 - d. None of these
4. Which of the following is considered as accounting record?
 - a. Bind Card
 - b. Bill of Material
 - c. Store Ledger
 - d. None of these
5. Direct Material can be classified as
 - a. Fixed Cost
 - b. Semi-Variable Cost
 - c. Variable Cost
 - d. Prime Cost
6. In which of the following methods of pricing, costs lag behind the current economic values?
 - a. Replacement price method
 - b. Last in first out price method
 - c. First in first out price method
 - d. Weighted average price method

7. In which of the following methods, issues of materials are priced at pre-determined rate?
 - a. Replacement price method
 - b. Inflated price method
 - c. Specific price method
 - d. Standard price method
8. Which of the following methods smoothes out the effect of fluctuations when material prices fluctuate widely?
 - a. FIFO
 - b. Simple Average
 - c. LIFO
 - d. Weighted average
9. In which of the following incentive plan of payment, wages on time basis are not Guaranteed?
 - a. Halsey Plan
 - b. Rowan Plan
 - c. Taylor's differential piece rate system
 - d. Gantt's task and bonus system
10. Cost of idle time arising due to non availability of raw material is
 - a. Charged to costing profit and loss account
 - b. Charged to factory overheads
 - c. Recovered by inflating the wage rate
 - d. Ignored
11. When overtime is required for meeting urgent order, overtime premium should be
 - a. Charged to costing profit and loss account
 - b. Charged to overheads costs
 - c. Charged to respective jobs
 - d. Ignored
12. Labour turnover is measured by
 - a. Number of workers replaced / average number of workers
 - b. Number of workers left / number in the beginning plus number at the end
 - c. Number of workers joining / number in the beginning of the period
 - d. All of these

13. Idle time is
- Time spent by workers in factory
 - Time spent by workers in office
 - Time spent by workers off their work
 - Time spent by workers on their job
14. Overtime is
- Actual hours being more than normal time
 - Actual hours being more than standard time
 - Standard hours being more than actual hours
 - Actual hours being less than standard time
15. Labour productivity is measured by comparing
- Total output with total man-hours
 - Added value for the product with total wage cost
 - Actual time and standard time
 - All of the above
16. If the time saved is less than 50% of the standard time, then the wages under Rowan and Halsey premium plan on comparison gives:
- Equal wages under two plans
 - More wages to workers under Halsey Plan than Rowan Plan
 - More wages to workers under Rowan Plan than Halsey Plan
 - None of the above
17. Under Taylor's differential piece rate scheme, if a worker fails to complete the task within the standard time, then he is paid
- 83% of the piece work rate
 - 175% of the piece work rate
 - 67% of the piece work rate
 - 125% of the piece work rate
18. Direct Expenses _____ includes imputed cost.
- Shall
 - Shall not
 - Shall be
 - None of these

19. Direct expenses do not meet the test of materiality can be _____ part of overheads.
 - a. Treated
 - b. Not treated
 - c. All of these
 - d. None of these
20. Example of Direct Expenses.
 - a. Rent
 - b. Royalty charged on production
 - c. Bonus to employee
 - d. None of these
21. The allotment of whole items of cost of centres or cost unit is called
 - a. Cost Allocation
 - b. Cost Apportionment
 - c. Overheads Absorption
 - d. None of the above
22. The allotment of whole items of cost of centres or cost unit is called
 - A. Cost Allocation
 - B. Cost Apportionment
 - C. Overheads Absorption
 - D. None of the above
23. Packing cost is a
 - A. Production Cost
 - B. Selling Cost
 - C. Distribution Cost
 - D. It may be any of the above
24. Directors' remuneration and expenses form a part of
 - A. Production Overheads
 - B. Administration Overheads
 - C. Selling Overheads
 - D. Distribution Overheads

25. Charging to a cost centre those overheads that result solely for the existence of that cost centre is known as
- A. Allocation
 - B. Apportionment
 - C. Absorption
 - D. Allotment
26. Absorption means
- A. Charging of overheads to cost centres
 - B. Charging of overheads to cost units
 - C. Charging of overheads to cost centres or cost units
 - D. None of the above
27. Which method of absorption of factory overheads do you suggest in a concern which produces only one uniform type of product?
- A. Percentage of direct wages basis
 - B. Direct labour rate
 - C. Machine hour rate
 - D. A rate per units of output
28. When the amount of under or over absorption is significant, it should be disposed of by
- A. Transferring to costing profit and loss account
 - B. The use of supplementary rates
 - C. Carrying over as a deferred charge to the next accounting year
 - D. None of the above
29. When the amount of overheads absorbed is less than the amount of overheads incurred, it is called
- A. Under absorption of overheads
 - B. Over absorption of overheads
 - C. Proper absorption of overheads
 - D. None of the above
30. Warehouse expense is an example of
- A. Production overheads
 - B. Selling overheads
 - C. Distribution overheads
 - D. None of the above

31. Selling and Distribution overheads are absorbed on the basis of
 - A. Rate per unit
 - B. Percentage on works cost
 - C. Percentage on selling price of each unit
 - D. Any of these
32. Primary packing cost is a part of
 - A. Direct material cost
 - B. Distribution overheads
 - C. Selling overheads
 - D. Production cost
33. Chairman's remuneration and expenses form part of
 - A. Administration overheads
 - B. Production overheads
 - C. Distribution overheads
 - D. Selling overheads
34. Normal capacity of a plant refers to the difference between:
 - A. Maximum capacity and practical capacity
 - B. Maximum capacity and actual capacity
 - C. Practical capacity and estimated idle capacity as revealed by long term sales trend
 - D. Practical capacity and normal capacity
35. Find out from the following scientific and accurate method of factory overheads absorption:
 - A. Percentage of prime cost method
 - B. Machine hour rate method
 - C. Percentage of direct material cost method
 - D. Percentage of direct labour cost method

Answer:

1	C	2	A	3	D	4	C	5	C	6	C	7	D	8	D
9	C	10	A	11	B	12	A	13	C	14	A	15	D	16	C
17	A	18	B	19	A	20	B	21	A	22	A	23	D	24	B
25	A	26	B	27	D	28	B	29	A	30	C	31	D	32	D
33	A	34	C	35	B										

◉ State True or False:

1. Perpetual inventory system enables management to ascertain stock at any time without physical inventory being taken.
2. Continuous stock taking is not an essential feature to the perpetual inventory system.
3. Stores ledger is maintained in the stores department.
4. Purchase requisition is usually prepared by the storekeeper.
5. In centralized purchasing all purchases are made by the purchasing department.
6. Weighted average method of pricing issue of materials involves adding all the different prices and dividing by the number of such prices.
7. Material returned note is prepared to keep a record of return of surplus materials to stores.
8. Waste and Scrap of material have small realization value.
9. Bin card are not the part of accounting records.
10. Store Ledger is maintained inside the stores of store keeper.
11. Direct employee cost shall be presented as a separate cost head in the financial statement.
12. As per the Payment of Bonus Act, 1965 the maximum limit of bonus is 20% of gross earning.
13. Flux method means for measurement of labour turnover
14. Is overtime premium is directly assigned to cost object?
15. Time recording clocks can be successfully used for recording time of workers in large undertakings.
16. Idle time arises only when workers are paid on time basis.
17. Personnel department is concerned with proper recruitment, placement and training of workers.
18. Wages paid for abnormal idle time are added to wages for calculating prime cost.
19. The two principal systems of wage payment are payment on the basis of time and payment on the basis of work done.
20. The piece rate system of wage payment cannot be successfully applied where quantity of output can be measured.
21. If an expense can be identified with a specific cost unit, it is treated as direct expense.
22. Travelling expenses to site is a direct expense.
23. Identification of direct expenses shall be based on traceability in an economically feasible manner.
24. CAS – 9 is for Direct Expenses as issued by the cost accounting standard board (CASB) of the Institute of Cost Accountants of India

25. Finance cost shall form part of direct expenses.
26. Departments that assist producing department indirectly are called service departments.
27. Factory overheads cost applied to a job is usually based on a predetermined rate.
28. When actual overheads are more than absorbed overheads, it is known as over absorption.
29. A blanket overheads rate is a single overheads rate computed for the entire factory.
30. Under absorption of overheads means that actual overheads are more than absorbed overheads
31. Variable overheads varies with time.
32. Cash discounts are generally excluded completely from the costs.
33. Cost of indirect materials is apportioned to various departments.
34. The principal base used for applying factory overheads are: units of production, material cost, direct wages, direct labour hours and machine hours.
35. Allocation for overheads implies the identification of overheads cost centres to which they relate.

Answer:

1	T	2	F	3	F	4	T	5	T	6	F	7	T	8	F
9	T	10	F	11	F	12	T	13	T	14	T	15	T	16	T
17	T	18	T	19	T	20	F	21	T	22	T	23	T	24	F
25	F	26	T	27	T	28	F	29	T	30	T	31	F	32	T
33	F	34	T	35	T										

⊙ **Fill in the Blanks:**

1. In _____ systems, two piece rates are set for each job.
2. In Halsey plan, a worker gets bonus equal to _____ of the time saved.
3. Under Gantt Task and Bonus Plan, no bonus is payable to a worker, if his efficiency is less than _____.
4. Cost of normal idle time is charged to _____.
5. Idle time arises only when workers are paid on _____ basis.
6. Direct Expenses relating to _____ or _____.
7. Penalties / damages paid to statutory authorities be form part of direct expenses.
8. A direct expense related to a _____ form part of Prime Cost.
9. Direct expenses incurred for bought out resources shall be determined at _____.

10. Direct expenses incurred lump – sum shall be _____.
11. Example of after sales service are _____ and _____.
12. The difference between actual and absorbed factory overheads is called _____.
13. The difference between practical capacity and the capacity based on sales expectancy is known as _____.
14. Under or over absorption of overheads arises only when overheads are absorbed by _____.
15. In Absorption Costing _____ cost is added to inventory.
16. Overheads are an aggregate of _____ and _____ and _____.
17. Example of after sales service are _____ and _____.
18. Administration overheads are usually absorbed as a percentage of _____.
19. The difference between actual and absorbed factory overheads is called _____.
20. The term used for charging of overheads to cost units is known as _____.
21. The _____ rate is computed by dividing the overheads by the aggregate of the productive hours of direct workers.
22. Overheads incurred ₹ 16,000 and overheads absorbed ₹ 15,300. There is under absorption of ₹ _____.

Answer:

1	Taylor's differential piece rate	2	50%
3	100%	4	factory overheads
5	time	6	Manufacture of a product or rendering of service
7	Shall not	8	Product
9	Invoice Price	10	Amortized
11	Repair and Maintenance, Replacement of Components.	12	Under or over absorbed overheads.
13	Idle Capacity	14	Predetermined overheads rates
15	Fixed	16	Indirect Material, Indirect Labour, Indirect Expense
17	Repair and Maintenance, Replacement of Components	18	Works Cost
19	Under or over absorbed overheads	20	Absorptions
21	Direct Labour Hour	22	700

◉ **Essay Type Questions**

1. What is the prime objective of material control? It is said that in any system of material control there are always two counteracting or opposing factors. What are these and why do these factors arise?
2. “The Perpetual Inventory System is an integral part of material control”. Discuss this statement by bringing out briefly the salient features and the advantages of this system.
4. What is Economic Order Quantity? How it is calculated?
5. What is meant by Bill of Materials? When will you recommend drawal of stores under Bill of Material as opposed to individual requisition?
6. What are the stores that normally come under “Packing Materials”? what are the major classifications of packing expenses and how they are treated in cost?
7. How would you deal with the following in Cost Accounts?
 - a. Packing Cost
 - b. Cost of Tools
8. Write short notes on the following:
 - a. ABC analysis
 - b. VED analysis
 - c. Treatment of Scrap in costing
 - d. Valuation of Work in Progress
 - e. Moving Average Price Method of material issue valuation
 - f. Just in time
 - g. Bin Card vs Stores Ledger
 - h. Principles of valuation of receipt of material as per CAS – 6
 - i. Re-order Level
 - j. Maximum Stock Level
 - k. Minimum Stock Level
9. How normal and abnormal loss of material are treated in Cost Accounts?
10. What are the causes of Labour Turnover? Suggest remedial measures to reduce the Labour Turnover?
11. How do you treat idle time in Cost Accounts as per CAS – 7?
12. How do you treat overtime in Cost Accounts?
13. What are the various wage payment methods?

14. How do you treat the following in Cost Accounts?
 - a. Supervisor's salary
 - b. Night shift allowance
 - c. Lost time due to major hauling
15. Write short notes on:
 - a. Time and Motion Study
 - b. Works Study and Works Measurement
 - c. Job Evaluation
 - d. Merit Rating
 - e. Straight Piece Rate vs Differential Piece Rate
 - f. Halsey Plan
 - g. Rowan Plan
 - h. Guidelines for ascertaining the Labour Cost as per CAS – 7
16. Discuss the means to measure employee efficiency.
17. "High wages do not necessarily mean high Labour Cost". Comment.
18. Write a short note on Direct Expenses.
19. What are the disclosure requirements as per CAS – 10?
20. List down the principle of measurement of Direct Expenses?
21. What is meant by classification of overheads and why it should be attempted?
22. What do you understand by Semi-Variable Overheads? Explain the various methods of segregating Fixed and Variable Overhead Costs.
23. Define Cost Allocation and Cost Apportionment. Explain fully the distinction between Cost Allocation and Cost Apportionment.
24. How are the following items treated in Cost Accounts?
 - a. Defectives due to bad workmanship and bad materials.
 - b. Major repairs of a plant to prolong its useful life.
 - c. Labour amenities.
 - d. ESI contribution.
 - e. Fringe benefits to workers.

- f. After sales service cost.
 - g. Losses due to obsolescence.
 - h. Lay off wages paid to workers.
25. As a Cost Accountant explain with reasons how would you treat the following items in Cost Accounts:
- a. Bonus payable under the Payment of Bonus Act, 1965.
 - b. Bad Debts.
 - c. Leave Travel Assistance.
 - d. Night Shift Allowance.
26. Explain the terms “Practical Capacity”, “Normal Capacity”, “Idle Capacity”, and “Imbalanced Capacity”. With reference to any industry with which you are familiar, how will you measure the effect of idle capacity?
27. What is Under or Over Absorption? What are the causes for Under or Over Absorption?
28. Explain the nature of administration overheads? How they are apportioned?
29. Distinguish between cost allocation and cost absorption.
30. Discuss the methods of re-appointment of service department expenses over the production departments.
31. What is meant by classification of overheads and why it should be attempted?
32. What do you understand by Semi-Variable Overheads? Explain the various methods of segregating Fixed and Variable Overheads Costs.
33. What are the main sources of overheads expenses? State with examples the procedure for such collection from these sources.
34. Define Cost Allocation and Cost Apportionment. Explain fully the distinction between Cost Allocation and Cost Apportionment.
35. Explain the various basis of apportionment of overheads to departments with illustrations as to the items of expenses.
36. Briefly describe two ways of dealing with the problem of apportioning service department costs among service departments which, in addition to do work for the main operational departments, also serve one another.
37. How are the following items treated in Cost Accounts?
- a) Defectives due to bad workmanship and bad materials.
 - b) Major repairs of a plant to prolong its useful life.
 - c) Labour amenities.
 - d) ESI contribution.
 - e) Fringe benefits to workers.

- f) After sales service cost.
 - g) Losses due to obsolescence.
 - h) Lay off wages paid to workers.
38. As a Cost Accountant explain with reasons how would you treat the following items in Cost Accounts:
- a) Bonus payable under the Payment of Bonus Act, 1965.
 - b) Bad Debts.
 - c) Leave Travel Assistance.
 - d) Night Shift Allowance.
39. Explain the terms “Practical Capacity”, “Normal Capacity”, “Idle Capacity”, and “Imbalanced Capacity”. With reference to any industry with which you are familiar, how will you measure the effect of idle capacity?
40. What is Absorption? What are the various methods of absorbing overheads in Cost Accounts?
41. What is Under or Over Absorption? What are the causes for Under or Over Absorption?
42. What are the various methods of disposing off under or over absorbed overheads?
43. Write a note on Supplementary Overheads Rate.
44. How to report overheads cost in the cost statement?
45. Explain the nature of administration overheads? How they are apportioned?
46. On what basis would you analyse selling overheads for the purpose of judging the effectiveness of these expenses?
47. “While manufacturing overheads are part of costs, selling overheads are result of policy”. Comment.
48. “Management’s interest in overheads is not in the method of their absorption but in their behaviour under various conditions of production”. As a CMA please throw light on the above statement.
49. Distinguish between cost allocation and cost absorption.
50. Discuss the methods of re-appointment of service department expenses over the production departments.

B. Numerical Questions

⊙ Comprehensive Numerical Problems

1. Your factory buys and use a component for production at ₹ 10 per unit. Annual requirement is 2,000 units. Carrying cost of inventory is 10% p.a. and ordering cost is ₹ 40 per order. The purchase manager argues that as the ordering cost is very high, it is advantageous to place a single order for the entire annual requirement. He also says that if we order 2,000 pieces at a time, we can get a 3% discount from the supplier. Evaluate this proposal and make your recommendations?

2. P Ltd uses three types of materials A, B and C for production of 'X', the final product. The relevant monthly data for the components are as given below:

	A	B	C
Normal usage (in units)	200	150	180
Minimum usage (in units)	100	100	90
Maximum usage (in units)	300	250	270
Re-order quantity (in units)	750	900	720
Re-order period (in months)	2 to 3	3 to 4	2 to 3

Calculate for each component:

- Re-order Level
 - Minimum Level
 - Maximum Level
 - Average Stock Level
3. The purchases and issues of material X in the month of January 2022, is as follows:

January 3	Purchase	800 units @ ₹ 20 per unit
January 8	Purchase	700 units @ ₹ 18 per unit
January 9	Issue	600 units
January 11	Issue	800 units
January 17	Purchase	800 units @ ₹ 20 per unit
January 25	Purchase	500 units @ ₹ 25 per unit
January 31	Issue	1,000 units

The standard price per unit of material is ₹ 20 fixed for the year 2022. Show the Stores Ledger entries under LIFO method and determine the price variance for the month of January.

4. XYZ company buys in lot of 500 boxes which is a 3 months supply. The cost per box is ₹ 125 and the ordering cost is ₹ 150. The inventory carrying cost is estimated at 20% of unit value.

What is the total annual cost of the existing inventory policy?

How much money could be saved by employing the economic order quantity?

5. Following information in an inventory problem is available:

Annual demand	4,800 units
Unit price	₹ 2.40
Ordering cost	₹ 4.00
Storage cost	2% p.a.
Interest rate	10% p.a.
Lead time	Half month

Calculate EOQ and Total Annual Inventory Cost in respect of the particular raw material.

6. A company requires 1,00,000 units of an item annually. The cost per unit is ₹ 10. Ordering cost is ₹ 500 per order and inventory carrying cost is 50% per unit per annum.
- Find the EOQ
 - The supplier offers a discount of 3% for order quantity 4,500 – 5,999 and 3.5% for order quantity 6,000 and above. Work out a statement comparing the total inventory management costs for the EOQ, 4,500 and 6,000 units of order and comment on your findings. Advise the company on how much to order.
7. G Ltd produces a product which has a monthly demand of 4,000 units. The product required a component X which is purchased at ₹ 20. For every finished product, one unit of component is required. The ordering cost is ₹ 120 per order and the holding cost is 10% p.a.

You are required to calculate EOQ

If the minimum lot size to be supplied is 4,000 units. What is the extra cost, the company has to incur?

What is the minimum carrying cost, the company has to incur?

8. What will be the earnings of a worker at 60 paise per hour when he takes 100 hours to do a volume of work for which the standard time is 160 hours the plan of payment for bonus is on a sliding scale as under:

Within the first 10% saving in the Standard Time, the Bonus is	: 40% of the Time Saved
Within the second 10% saving in the Standard Time, the Bonus is	: 50% of the Time Saved
Within the third 10% saving in the Standard Time, the Bonus is	: 60% of the Time Saved
Within the fourth 10% saving in the Standard Time, the Bonus is	: 70% of the Time Saved
For the rest of the time saved	: 75% of the Time Saved

9. Using Taylor's differential piece rate system find out the earnings of X and Y from the following particulars:

Standard time per piece	- 20 minutes
Normal rate per hour	- 90 paise
In a 9 hour day: X produced	- 25 units
Y produced	- 30 units

10. The following are particulars applicable to a work process

Time rate	₹ 5 per hour
High task	- 40 units per week
Piece rate above high task	- ₹ 6.50 per unit

In a 40 hour week, the production of the workers:

A – 35 units; B – 40 units; C – 41 units; D – 52 units

Calculate the wages of the workers under Gantt Task Bonus.

11. In a unit, 10 men work as a group. When the production of the group exceeds the standard output of 200 pieces per hour, each man is paid an incentive for the excess production in addition to his wages at hourly rates. The incentive is at half the percentage, the excess production over the standard hours bears to the standard production. Each man is paid an incentive at the rate of this percentage of a wage rate of ₹ 2 per hour. There is no relation between the individual workman's hourly rate and the bonus rate.

In a week, the hours worked are 500 hours and total production is 1,20,000 units.

- Compute the total amount of bonus for the week.
- Calculate the total earnings of two workers A and B of the group:

A worked 44 hours and his basic rate per hour was ₹ 2.20

B worked 48 hours and his basic rate per hour was ₹ 1.90

12. In a factory bonus system, bonus hours are credited to the employee in the proportion of time taken which time saved based to time allowed. Jobs are carried forward from one week to another. No overtime is worked and payment is made in full for all units worked, and including those subsequently rejected.

From the following information you are required to calculate for each employee

- The bonus hours and amount of bonus earned;
- The total wages cost; and
- The wages cost of each good unit produced.

Particulars	A (₹)	B (₹)	C (₹)
Basic wage rate / hour	0.25	0.40	0.30
Units produced	2,500	2,200	3,600
Time allowed / 100 units	2 hour 36 minute	3 hours	1 hours 30 minute
Time taken	52 hours	75 hours	48 hours
Rejects	100 units	40 units	400 units

13. In a factory bonus to workman is paid according to the Rowan Plan. Time allotted for a job is 40 hours and the normal rate of wages is ₹ 1.25 per hour. The factory overheads charges are 50 paise per hour for the hours taken.

The factory cost of a work order executed by a worker is ₹ 155.468. The cost of material is ₹ 100.

Calculate the hours of time taken by the workman to complete the work order.

14. Compute the value of Direct Expenses based on the following data: Royalty paid on units produced ₹ 50,000, software development charges relating to production ₹ 36,000, design charges ₹ 17,500, hire charges of equipment used for production ₹ 5,500.

15. The 'Prabhat Ltd' is divided into two production cost centres A and B and two service cost centres X and Y. The following is the summary of overheads costs for a particular period. Works Manager's salary ₹ 4,000; Power ₹ 21,000; Contribution to PF ₹ 9,000; Rent ₹ 6,000; Plant Maintenance ₹ 4,000; Canteen expenditure ₹ 12,000; Depreciation of Plant and Machinery ₹ 20,000.

The following information is made available from the various departments.

	Department A	Department B	Department X	Department Y
No. of Employees	16	8	4	4
Area Sq. ft.	2,000	3,000	500	500
Value of Plant	₹ 75,000	₹ 1,00,000	₹ 25,000	-
Wages	₹ 40,000	₹ 20,000	₹ 10,000	₹ 5,000
Horse Power	3	3	1	-

Apportion the costs of the various departments on the most equitable basis.

16. In a factory there are 5 machines, you are required to calculate Machine Hour rate from the following data.

Space of the Departments	8,000 sq. ft.
Cost of machine	₹ 20,000
Space occupied by each machine	1,600 sq. ft.
Power consumed as indicated by meter is	₹ 3,000 p.a. for this machine.
Depreciation	$7\frac{1}{2}\%$ p.a.
Estimated life 10 years (working hours 2,000 p.a.)	
Estimated Repairs p.a. for this machine	₹ 520
Rent and Rates	₹ 9,000 p.a.
Lighting	₹ 750 for all machines p.a.
Supervision	₹ 1,500 p.a.
Other charges	₹ 4,000 p.a.

of the supervision is for this machine. There are three mechanics drawing ₹50, ₹ 60, ₹ 70 p.m. respectively.

17. You are required to calculate the machine hour rate from the following particulars.
- Cost of the machine ₹ 10,000, its estimated working life is 10 years and the estimated scrap value at the end of its life is ₹ 1,000. The estimated working time per year (50 weeks of 40 hours each) is 2,000 hours.
 - Electricity used by the machine is 16 units per hour at the cost of ₹ 0.10 per unit.
 - The machine requires a chemical solution which is replaced at the end of each week at cost of ₹ 20 each time.
 - The estimated cost of maintenance per year is ₹ 1,200.

- e. Two attendants control the operation of the machine together with five other identical machines their combined weekly wages amount to ₹ 120.
 - f. Departmental and General works overheads allocated to the machine for the year were ₹ 2,000.
18. XYZ manufactures household pumps which pass through three departments viz Foundry, Machine Shop and Assembling.

The manufacturing expenses are as follows:

	Foundry	Machine	Assembling	Total
	₹	₹	₹	₹
Direct Wages	10,000	50,000	10,000	70,000
Works Overheads	5,000	90,000	10,000	1,05,000

The factory cost of manufacturing a type of 'C' pump was prepared by the company as follows:

	₹
Material	16
Wages:	
Foundry	2
Machine Shop	4
Assembling	2
	8
Works Overheads	12
150% of Direct Wages	
Total	36

It seems that there is some fallacy. Try to correct it.

19. The following are the maintenance costs incurred in a machine shop for six months with corresponding machine hours.

Month	Machine Hours	Maintenance Cost (₹)
January	2,000	300
February	2,200	320
March	1,700	270
April	2,400	340
May	1,800	280
June	1,900	290
	12,000	1,800

Analyse the machine cost which is semi-variable into fixed and variable element.

20. From the following data segregate fixed cost and variable costs.

	Level of Activity	
Capacity (%)	80	100
Labour Hours	400	500
Maintenance expenses of a plant (₹)	2,600	2,750

21. In a factory, there are two service departments P and Q and three production departments A, B and C. In April, 2022, the departmental expenses were:

Departments	A	B	C	P	Q
₹	6,50,000	6,00,000	5,00,000	1,20,000	1,00,000

The service department expenses are allotted on a percentage basis as follows:

Service Departments	Production Departments			Service Departments	
	A	B	C	P	Q
P	30	40	15	-	15
Q	40	30	25	5	-

Prepare a statement showing the distribution of the two service departments' expenses to the three departments by a) Simultaneous Equation Method b) Repeated Distribution Method.

22. The monthly budget of a department is as under:

	Amount (₹)
Direct Material	45,000
Direct Wages	60,000
Overheads	90,000
Direct Labour Hours	15,000
Machine Hours	30,000

Find out the overheads recovery rate based on at least five different possible methods of absorption of overheads.

23. The following particulars were extracted from the records of Epsilon Ltd on 31st December:

	Department A	Department B	Department C
	₹	₹	₹
Overheads Incurred	2,000	1,500	2,500
Overheads Absorbed	2,200	1,400	2,250

The departmental loads during the three months to 31st December averaged:

Department A:	100% of Normal Capacity
Department B:	75% of Normal Capacity
Department C:	50% of Normal Capacity

How would you deal with the balances under or over absorbed? What preliminaries enquiries would you make?

24. The overheads expenses of a factory are allowed on the machine hour method. You are required to calculate the hourly rate for a certain machine from the following information:

Cost	₹ 58,000
Estimated scrap value	₹ 3,000
Estimated working life	20,000 hours
Estimated cost of maintenance during working life of machine	₹ 12,000
Power used for machine	₹ 1 per hour
Rent, rates etc per month (10% to be charged for this machine)	₹ 1,500
Normal machine running hours during a month	180 hours
Standing charges other than rent, rates etc per month	₹ 200

Answer

1.	Proposal of the purchase manager is not acceptable because it increases cost by ₹ 10; buying 400 units (i.e., EOQ) at a time is economical							
2.	(a)	900 units	1,000 units	810 units	(c)	1,450 units	1,600 units	1,350 units
	(b)	400 units	475 units	360 units	(d)	925 units	1,037 units	855 units
3.	Valuation of stock ₹ 8,000, Price variance – Nil							
4.	Saving by adopting EOQ = ₹ 2,977							
5.	EOQ 365 units, ₹ 11,629							
6.	(i) EOQ – 4,472 units, (ii) Total Cost at EOQ ₹ 10,22,360, at 4,500 units ₹ 9,92,023, at 6,000 units ₹ 9,87,808							
7.	Minimum carrying cost ₹ 2,400							
8.	Total earnings ₹ 79.44							
9.	X: ₹ 6.23; Y: ₹ 15.75							
10.	A - ₹ 200; B - ₹ 240; C - ₹ 266; D - ₹ 338							
11.	(a) Total Bonus for the week is ₹ 100; (b) Earnings of A: ₹ 105.60; B: ₹ 100.80							
12.	(a) A: 13 hours; B: Nil; C: 6 hours; Amount of Bonus A: ₹ 2.60; B: Nil; C: ₹ 1.60 (b) Total wages cost A: ₹ 15.60; B: ₹ 30; C: ₹ 16; (c) Cost per good units produced A: ₹ 0.0065; B: ₹ 0.0139; C: ₹ 0.005							
13.	Actual hours 25							
14.	₹ 1,09,000							

15.	A: ₹ 32,800; B: ₹ 30,400; X: ₹ 9,700; Y: ₹ 3,100
16.	Machine Hour Rate ₹ 4.401
17.	Machine Hour Rate ₹ 4.65
18.	Correct Factory Cost ₹ 34.20
19.	Variable Cost per machine hour ₹ 0.10; Fixed Cost ₹ 100
20.	Variable Cost per hour ₹ 1.50; Fixed Cost ₹ 2,000
21.	Total Cost: A - ₹ 7,35,340; B - ₹ 6,86,045 and C - ₹ 5,48,615
22.	Direct Material Cost Method 200%; Direct Labour Cost Method 150%; Prime Cost Method 85.71%; Direct Labour Hour Rate Method ₹ 6; Machine Hour Rate Method ₹ 3
23.	Department A: Over absorbed ₹ 200; Department B: Under absorbed ₹ 100; Department C: Under absorbed ₹ 250
24.	₹ 6.30