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Material

Basic Concepts

Materials	The general meaning of material is all commodities/ physical objects supplied to an organisation to be used in producing or manufacturing of finished or intermediate goods.
Bill of Material	It is a materials specification list or simply materials list. It is a schedule of standard quantities of materials required for any job or other unit of production. The materials specification list is prepared by the Engineering or Planning Department in a standard form.
Material Requisition Note	It is also known as material requisition slip; It is the voucher of the authority regarding issue of materials for use in the factory or in any of its departments. Generally it is prepared by the production department and materials are withdrawn on the basis of material requisition list or bill of materials.
Purchase Requisition	A purchase requisition is a form used for making a formal request to the purchasing department to purchase materials. This form is usually filled up by the store keeper for regular materials and by the departmental head for special materials (not stocked as regular items).
Purchase Order	It is a written request to the supplier to supply certain specified materials at specified rates and within a specified period.
Tender	This is a formal notification inviting interested vendors to submit their bid/ quotation for the specified material or service. This is a process to govern the opening, evaluation and selection of the vendors for the required material under specified terms and conditions, so that fairness of the selection can be ensured.
Request for Proposal (RFP)	Like tender this is also a selection process among the eligible vendors. This is a process of gathering information about the rate, quantity, technology, services and support etc., from the selected

	vendors who may be interested in supplying required material/ service under specified terms and conditions.
Quotation	This is a formal statement of promise made by an interested vendor in response to a tender notification to supply the goods or services required by a buyer at specified description and terms & conditions.
Good Received Note	This is a confirmation note prepared by the department who receives the goods or entitled to receive the goods (usually stores department), stating the quantity and description of goods received by it.
Material Returned Note	This is a note prepared by the department who receives the goods or entitled to receive the goods (usually stores department), stating the quantity and description of goods which are returned by it.
Bin Cards	Bin refers to a box/ container/ space where materials are kept. Card is placed with each of the bin (space) to record the details of material like receipt, issue and return.
Stock Control Card	It is a record keeping document maintained by stores department for every item of material. Recording includes receipt, issue, return, in hand and order given.
Stores Ledger	Stores Ledger is a collection of cards or loose leaves specially ruled for maintaining a record of both quantity and cost of stores received, issued and those in stock. It being a subsidiary ledger to the main cost ledger, it is maintained by the Cost Accounting Department.
Economic Oder Quantity (E.O.Q)	The size of the order for which both ordering and carrying cost are at minimum is known as economic order quantity or E.O.Q. E.O.Q is used in an optimizing stock control system
Ordering Costs	The costs which are associated with the purchasing or ordering of material. It includes costs of tender invitation, preparation of purchase orders and other expenses which are incurred for this purpose.
Carrying Costs	The costs for holding the inventories. It includes the cost of capital invested in inventories, cost of storage, insurance cost etc.
Re-order Stock Level	This level lies between minimum and the maximum levels in such a way that before the material ordered is received into the stores, there is sufficient quantity on hand to cover both normal and

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	abnormal consumption situations. In other words, it is the level at which fresh order should be placed for replenishment of stock.
Minimum Stock Level	It indicates the lowest figure of inventory balance, which must be maintained in hand at all times, so that there is no stoppage of production due to non-availability of inventory.
Maximum Stock Level	It indicates the highest level of inventory which should not be exceeded at any time.
Average Inventory Level	This is the average of both minimum stock level and maximum stock level held by an organization.
Lead Time	This is the time interval between ordering and receipt of goods or the time interval between starting of production and its completion.
Lead Time Consumption	Materials consumed during the lead time are called lead time consumption.
Danger Stock Level	The stock level which is generally fixed below the minimum stock level. When the stock reaches this point immediate action is required to obtain fresh materials. At this level normal issues of the raw material inventory are stopped and emergency issues are only made.
Buffer Stock*	Stock of materials maintained to avoid any contingent interruption in supply of materials to the user department.
Safety Stock*	Stock of materials that are carried in excess of the expected lead time consumption of materials. It is kept as cushion against the unexpected demand for the material. <i>* Safety stock and Buffer stock are some time used interchangeably</i>
Stock-out	This is a situation where requirement for the material exceeds its availability of stock.
ABC Analysis	It is a system of inventory control. It exercises discriminating control over different items of stores classified on the basis of the investment involved. Items are classified into the following categories: A Category : Quantity less than 10 % but value more than 70% B Category : Quantity less than 20 % but value about 20 % C Category : Quantity about 70 % but value less than 10%

Two Bin System	Under this system each bin is divided into two parts - one, smaller part, should stock the quantity equal to the minimum stock or even the re-ordering level, and the other to keep the remaining quantity. Issues are made out of the larger part; but as soon as it becomes necessary to use quantity out of the smaller part of the bin, fresh order is placed.
System of Budget	The exact quantity of various types of inventories and the time when they would be required can be known by studying carefully production plans and production schedules. Based on this, inventories requirement budget can be prepared. Such a budget will discourage the unnecessary investment in inventories.
Perpetual Inventory Records	Perpetual inventory represents a system of records maintained by the stores department. It in fact comprises: (i) Bin Cards, and (ii) Stores Ledger.
Continuous Stock Verification	Continuous stock taking means the physical checking of those records (which are maintained under perpetual inventory) with actual stock.
Slow and Non-moving Inventories	The item of material inventory which are no more required by the production or other user department is called non-moving inventories. The inventory which is not required frequently or has fewer requirements is called slow moving inventories.
Input Output Ratio	Inventory control can also be exercised by the use of input output ratio analysis. Input-output ratio is the ratio of the quantity of input of material to production and the standard material content of the actual output.
Inventory Turnover Ratio	Computation of inventory turnover ratios for different items of material and comparison of the turnover rates provides a useful guidance for measuring inventory performance. High inventory turnover ratio indicates that the material in the question is a fast moving one. A low turnover ratio indicates over-investment and locking up of the working capital in inventories
First-in-First-out (FIFO) Method	The materials received first are to be issued first when material requisition is received. Materials left as closing stock will be at the price of latest purchases.
Last-in-Last-out (LIFO) Method	The materials purchased last are to be issued first when material requisition is received. Closing stock is valued at the oldest stock price.

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Simple Average Price Method	<p>Under this method, materials issued are valued at average price, which is calculated by dividing the total of all units rate by the number of unit rate.</p> $\text{Material Issue Price} = \frac{\text{Total of unit price of each purchase}}{\text{Total numbers of purchases}}$
Weighted Average Price Method	<p>This method gives due weights to quantities purchased and the purchase price, while, determining the issue price. The average issue price here is calculated by dividing the total cost of materials in the stock by total quantity of materials prior to each issue.</p> $\text{Material Issue Price} = \frac{\text{Total Cost of materials in stock}}{\text{Total quantity of materials}}$
Standard Price Method	<p>Under this method, materials are priced at some predetermined rate or standard price irrespective of the actual purchase cost of the materials.</p>
Replacement Price Method	<p>Under this method, materials issued are valued at the replacement cost of the items. This method pre-supposes the determination of the replacement cost of materials at the time of each issue; viz., the cost at which identical materials could be currently purchased.</p>
Waste	<p>The portion of basic raw materials lost in processing having no recoverable value. Waste may be visible remnants of basic raw materials or invisible.</p>
Scrap	<p>It has been defined as the incidental residue from certain types of manufacture, usually of small amount and of low value, recoverable without further processing.</p>
Spoilage	<p>It is the term used for materials which are badly damaged in manufacturing operations, and they cannot be rectified economically and hence taken out of process to be disposed off in some manner without further processing</p>
Defectives	<p>It signifies those units or portions of production which can be rectified and turned out as good units by the application of additional material, labour or other service.</p>

Basic Formulae

Maximum Stock Level	$\text{Re-order level} + \text{Re-order quantity} - (\text{Minimum consumption} \times \text{Minimum re-order period})$
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Minimum Stock Level	Re-order level – (Average lead time × Average consumption)
Average Stock Level	$\frac{\text{Maximum Stock Level} + \text{Minimum Stock Level}}{2}$ Or Minimum Stock Level + ½ Re-order Quantity
Re-order Level	Maximum Re-order period × Maximum consumption Or (Normal Usage × Average Delivery Time) + Minimum Stock Level Or Safety Stock + Lead Time Consumption
Danger Level	Minimum Consumption × Emergency Delivery Time
Economic Order Quantity (E.O.Q)	$= \sqrt{\frac{2 \times \text{Annual Consumption} \times \text{Cost of placing an order}}{\text{Cost of carrying per unit per annum}}}$
Inventory Turnover Ratio	$= \frac{\text{Material Consumed}}{\text{Average Inventory}}$
Inventory Turnover Period	365 ÷ Inventory Turnover Ratio
Safety Stock	$\frac{\text{Annual Demand}}{365} \times (\text{Maximum lead time} - \text{Average lead time})$
Total Inventory Cost	Ordering Cost + Carrying Cost + Purchase Cost Ordering Cost = $\frac{\text{Annual consumption} \times \text{Cost of placing an order}}{\text{Quantity Ordered}}$ Carrying Cost = $\frac{\text{Quantity ordered}}{2} \times \text{Price per unit} \times \text{Carrying Cost}$ expressed as % of average inventory <i>Note: For calculation of total inventory carrying cost, average inventory should be taken as half of EOQ. Average inventory cost is normally given as a percentage of cost per unit.</i> <i>Note: To decide whether discount on purchase of material should be availed or not, compare total inventory cost before discount and after discount. Total inventory cost will include ordering cost, carrying cost and purchase cost.</i>

SECTION-A

Question-1

How normal and abnormal loss of material arising during storage treated in Cost Accounts?

Solution:

Treatment of normal and abnormal loss of material arising during storage in Cost Accounts.

The difference between the book balance and actual physical stock, which may either be gain or loss, should be transferred to Inventory Adjustment Account pending scrutiny to ascertain the reason for the difference.

If on scrutiny, the difference arrived at is considered as normal, then such a difference should be transferred to overhead control account and if abnormal, it should be debited to costing profit and loss account.

In the case of normal losses, an alternative method may be used. Under this method the price of the material issued to production may be inflated so as to cover the normal loss.

Question-2

Distinguish clearly Bin cards and Stores Ledger.

Solution:

Both bin cards and stores ledger are perpetual inventory records. None of them is a substitute for the other. These two records may be distinguished from the following points of view:

- (i) Bin cards are maintained by the store keeper, while the stores ledger is maintained by the cost accounting department.
 - (ii) Bin card is the stores recording document whereas the stores ledger is an accounting record.
 - (iii) Bin card contains information with regard to quantities i.e. their receipt, issue and balance while the stores ledger contains both quantitative and value information in respect of their receipts, issue and balance.
 - (iv) In the bin card entries are made at the time when transaction takes place. But in the stores ledger entries are made only after the transaction has taken place.
 - (v) Inter departmental transfer of materials appear only in stores ledger.
 - (vi) Bin cards record each transaction but stores ledger records the same information in a summarized form.
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Question-3

Discuss the accounting treatment of defectives in Cost Accounts.

Solution:**Accounting treatment of defectives in cost accounts:**

Defectives refer to those units or portions of production, which do not meet the prescribed specifications. Such units can be reworked or re-conditioned by the use of additional material, labour and /or processing and brought to the point of either standard or sub-standard units.

The possible way of treating defectives in Cost Accounts are as below:

1. When defectives are normal and it is not beneficial to identify them job-wise, then the following methods may be used.
 - (a) Charged to good products: The cost of rectification of normal defectives is charged to good units. This method is used when defectives rectified are normal.
 - (b) Charged to general overheads. If the department responsible for defectives cannot be identified, the rework costs are charged to general overheads.
 - (c) Charged to departmental overheads: If the department responsible for defectives can be correctly identified, the rectification costs should be charged to that department.
 2. When normal defectives are easily identifiable with specific job the rework costs are debited to the identified job.
 3. When defectives are abnormal and are due to causes within the control of the organization, the rework cost should be charged to the Costing Profit and Loss Account.
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Question-4

Explain the concept of "ABC Analysis" as a technique of inventory control.

Solution:

ABC Analysis: It is a system of selective inventory control whereby the measure of control over an item of inventory varies with its usage value. It exercises discriminatory control over different items of stores grouped on the basis of the investment involved. Usually the items of material are grouped into three categories viz; A, B and C according to their use value during a period. In other words, the high use value items are controlled more closely than the items of low use value.

- (i) 'A' Category of items consists of only a small percentage i.e., about 10 % of the total items of material handled by the stores but require heavy investment i.e., about 70% of inventory value, because of their high prices and heavy requirement.

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- (ii) 'B' Category of items comprises of about 20% of the total items of material handled by stores. The percentage of investment required is about 20% of the total investment in inventories.
- (iii) 'C' category of items does not require much investment. It may be about 10% of total inventory value but they are nearly 70% of the total items handled by stores.

'A' category of items can be controlled effectively by using a regular system, which ensures neither over- stocking nor shortage of materials for production. Such a system plans its total material requirements by making budgets. The stocks of materials are controlled by fixing certain levels like maximum level, minimum level and re-order level. A reduction in inventory management costs is achieved by determining economic order quantities after taking into account ordering cost and carrying cost. To avoid shortages and to minimize heavy investment of funds in inventories, the techniques of value analysis, variety reduction, standardization etc. are used along with aforesaid techniques.

In the case of 'B' category of items, as the sum involved is moderate, therefore, the same degree of control as applied in 'A' category of items is not warranted. The order for the items, belonging to this category may be placed after reviewing their situation periodically. This category of items can be controlled by routine control measures.

For 'C' category of items, there is no need of exercising constant control. Orders for items in this group may be placed either after six months or once in a year, after ascertaining consumption requirements.

Question-5

Distinguish between Re-order level and Re-order quantity

Solution:

Re-order level & Re-order quantity: Re-order level is defined as that level of an inventory item where a fresh order for its replenishment is placed. Mathematically it can be determined by using the following formulae:

$$\text{Re-order level (ROL)} = [\text{Maximum consumption} \times \text{Maximum re-order period}]$$

$$\text{Alternatively:} = \text{Minimum level} + \left(\frac{\text{Average rate of consumption}}{\text{re-order period}} \times \text{Average} \right)$$

Re-order quantity (ROQ) is defined as that quantity of an inventory item for which order is placed again and again. Economic order quantity is a re-order quantity but not vice-a-versa. It can be determined by using the following mathematical expression:

$$\text{EOQ} = \text{ROQ} = \sqrt{\frac{2 \times \text{Annual requirement of inventory item in units} \times \text{Cost of placing an order}}{\text{Annual carrying cost per unit per annum}}}$$

Thus, Re-order level is the level of stock which indicates the order for the further materials and on the other hand ROQ is the quantity of material that should be ordered.

Question-6

How is slow moving and non-moving item of stores detected and what steps are necessary to reduce such stocks?

Solution:**Detection of slow moving and non-moving item of stores:**

The existence of slow moving and non-moving item of stores can be detected in the following ways.

- (i) By preparing and *perusing periodic reports* showing the status of different items or stores.
- (ii) By calculating the *inventory turnover period* of various items in terms of number of days/months of consumption.
- (iii) By computing *inventory turnover ratio* periodically, relating to the issues as a percentage of average stock held.
- (iv) By implementing the use of a well designed information system.

Necessary steps to reduce stock of slow moving and non-moving item of stores:

- (i) Proper procedure and guidelines should be laid down for the disposal of non-moving items, before they further deteriorates in value.
 - (ii) Diversify production to use up such materials.
 - (iii) Use these materials as substitute, in place of other materials.
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Question-7

Explain the advantages that would accrue in using the LIFO method of pricing for the valuation of raw material stock.

Solution:

LIFO- Last-in-first-out: A method of pricing for the valuation of raw material stock. It is based on the assumption that the items of the last batch (lot) purchased are the first to be issued. Therefore, under this method, the price of the last batch (lot) of raw material is used for pricing raw material issues until it is exhausted. If, however, the quantity of raw material issued is more than the quantity of the latest lot, the price of immediately preceding lot and so on will be taken for pricing the raw material issues.

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The advantages that would accrue from the use of LIFO method of pricing the valuation of raw materials are as follows:

- (i) The cost of materials used is nearer to the current market price. Thus the cost of goods produced depends upon the trend of the market price of materials. This enables the matching of cost of production with current sales revenues.
 - (ii) Use of LIFO during the period of rising prices does not depict unnecessarily high profit in the income statement; compared to the first-in-first-out (FIFO) or average price methods. The profit shown by the use of LIFO is relatively lower, because the cost of production takes into account the rising trend of material prices.
 - (iii) When price of materials fall, the use of LIFO method accounts for rising the profits due to lower material cost. In spite of this finished product appears to be more competitive and at market prices.
 - (iv) Over a period, the use of LIFO will iron out the fluctuations in profit.
 - (v) During inflationary period, the use of LIFO will show the correct profit and thus avoid paying unduly high taxes to some extent.
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Question-8

Discuss briefly the considerations governing the fixation of the maximum and minimum levels of inventory.

Solution:

(a) Considerations for the fixation of maximum level of inventory.

Maximum level of an inventory item is its maximum quantity held in stock at any time. The mathematical formula used for its determination is as follows:

$$\text{Maximum level} = \text{Re-order level} - (\text{Min. Consumption} \times \text{Min. Re-order period}) + \text{Re-order quantity}$$

The important considerations which should govern the fixation of maximum level for various inventory items are as follows:

- (1) The fixation of maximum level of an inventory item requires information about re-order level. The re-order level itself depends upon its maximum rate of consumption and maximum delivery period. It in fact is the product of maximum consumption of inventory item and its maximum delivery period.
- (2) Knowledge about minimum consumption and minimum delivery period for each inventory item should also be known.
- (3) The determination of maximum level also requires the figure of re-order quantity or economic order quantity. Economic order quantity means the quantity of inventory to be ordered so that total ordering and storage cost is minimum.

- (4) Availability of funds, storage capacity, nature of items and their price also are important for the fixation of maximum level.
- (5) In the case of important materials due to their irregular supply, the maximum level should be high.

Considerations for the fixation of minimum level of inventory

Minimum level indicates the lowest figures of inventory balance, which must be maintained in hand at all times, so that there is no stoppage of production due to non-availability of inventory. The formula used for its calculation is as follows:

Minimum level of inventory = Re-order level – (Average consumption × Average delivery time).

The main considerations for the fixation of minimum level of inventory are as follows:

1. Information about maximum consumption and maximum delivery period in respect of each item to determine its re-order level.
 2. Average rate of consumption for each inventory item.
 3. Average delivery period for each item. The period can be calculated by averaging the maximum and minimum period.
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Question-9

What is material handling cost? How will you deal it in cost account?

Solution:

Material handling cost: It refers to the expenses involved in receiving, storing, issuing and handling materials. To deal with this cost in cost accounts there are two prevalent approaches as under:

First approach suggests the inclusion of these costs as part of the cost of materials by establishing a separate material handling rate e.g., at the rate of percentage of the cost of material issued or by using a separate material handling rate which may be established on the basis of weight of materials issued.

Under another approach these costs may be included along with those of manufacturing overhead and be charged over the products on the basis of direct labour or machine hours.

Question-10

At the time of physical stock taking, it was found that actual stock level was different from the clerical or computer records. What can be possible reasons for such differences? How will you deal with such differences?

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Solution:

Possible reasons for differences arising at the time of physical stock taking may be as follows when it was found that actual stock level was different from that of the clerical or computer records:

- (i) Wrong entry might have been made in stores ledger account or bin card,
- (ii) The items of materials might have been placed in the wrong physical location in the store,
- (iii) Arithmetical errors might have been made while calculating the stores balances on the bin cards or store-ledger when a manual system is operated,
- (iv) Misappropriation of stock.

When a discrepancy is found at the time of stock taking, the individual stores ledger account and the bin card must be adjusted so that they are in agreement with the actual stock. For example, if the actual stock is less than the clerical or computer record the quantity and value of the appropriate store ledger account and bin card (quantity only) must be reduced and the difference in cost be charged to factory overhead account for stores losses.

Question-11

Write short notes on any three of the following:

- (i) *Re-order quantity*
- (ii) *Re-order level*
- (iii) *Maximum stock level*
- (iv) *Minimum stock level*

Solution:

- (i) *Re-order quantity*: It refers to the quantity of stock for which an order is to be placed at any one point of time. It should be such that it minimises the combined annual costs of placing an order and holding stock. Such an ordering quantity in other words is known as economic order quantity (EOQ).

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

- A = Annual raw material usage quantity
O = Ordering cost per order
C = Cost per unit
i = Carrying cost percentage per unit per annum

(ii) *Re-order level*: It is the level at which fresh order should be placed for the replenishment of stock.

$$= \text{Maximum re-order period} \times \text{Maximum usage}$$

$$= \text{Minimum level} + \left[\text{Average consumption} \times \text{Average time to obtain fresh supplies} \right]$$

(iii) *Maximum stock level*: It indicates the maximum figure of stock held at any time.

$$= \text{Re-order Level} + \text{Re-order quantity} - \left[\text{Minimum consumption} \times \text{Minimum re-order period} \right]$$

(iv) *Minimum stock level*: It indicates the lowest figure of stock balance, which must be maintained in hand at all times, so that there is no stoppage of production due to non-availability of inventory.

$$= \text{Re-order level} - \left[\text{Average rate of consumption} \times \text{Average time of stock delivery} \right]$$

Question-12

Discuss the accounting treatment of spoilage and defectives in Cost Accounting.

Solution:

Accounting treatment of spoilage and defectives in Cost Accounting: Normal spoilage cost (which is inherent in the operation) are included in cost either by charging the loss due to spoilage to the production order or charging it to production overhead so that it is spread over all products. Any value realized from the sale of spoilage is credited to production order or production overhead account, as the case may be.

The cost of abnormal spoilage (i.e. spoilage arising out of causes not inherent in manufacturing process) is charged to the Costing Profit and Loss Account. When spoiled work is due to rigid specifications, the cost of spoiled work is absorbed by good production, while the cost of disposal is charged to production overheads.

The problem of accounting for defective work is the problem of accounting of the costs of rectification or rework. The possible ways of treatment are as below:

- (i) Defectives that are considered inherent in the process and are identified as normal can be recovered by using the following methods:
- Charged to good products
 - Charged to general overheads

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- Charged to department overheads
 - Charged to identifiable job.
- (ii) If defectives are abnormal and are due to causes beyond the control of organisation, the rework, cost should be charged to Costing Profit and Loss Account.
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Question 13

Write short note on perpetual inventory control.

Solution:

Perpetual Inventory: It represents a system of records maintained by the stores in department. It in fact comprises of:

- (i) Bin Cards, and
- (ii) Stores Ledger

Bin Card maintains a quantitative record of receipts, issues and closing balances of each item of stores. Separate bin cards are maintained for each item. Each card is filled up with the physical movement of goods i.e. on its receipt and issue.

Like bin cards, the Stores Ledger is maintained to record all receipt and issue transactions in respect of materials. It is filled up with the help of goods received note and material requisitions.

A perpetual inventory is usually checked by a programme of continuous stock taking. Continuous stock taking means the physical checking of those records (which are maintained under perpetual inventory) with actual stock. Perpetual inventory is essentially necessary for material control. It incidentally helps continuous stock taking.

The success of perpetual inventory depends upon the following:

- (a) The Stores Ledger-(showing quantities and amount of each item).
- (b) Stock Control Cards (or Bin Cards).
- (c) Reconciling the quantity balances shown by (a) & (b) above.
- (d) Checking the physical balances of a number of items every day systematically and by rotation.
- (e) Explaining promptly the causes of discrepancies, if any, between physical balances and book figures.
- (f) Making corrective entries were called for after step (e) and
- (g) Removing the causes of the discrepancies referred to step (e).

The main advantages of perpetual inventory are as follows :

- (1) Physical stocks can be counted and book balances adjusted as and when desired without waiting for the entire stock-taking to be done.
 - (2) Quick compilation of Profit and Loss Accounts (for interim period) due to prompt availability of stock figures.
 - (3) Discrepancies are easily located and thus corrective action can be promptly taken to avoid their recurrence.
 - (4) A systematic review of the perpetual inventory reveals the existence of surplus, dormant, obsolete and slow-moving materials, so that remedial measures may be taken in time.
 - (5) Fixation of the various levels and check of actual balances in hand with these levels assist the Storekeeper in maintaining stocks within limits and in initiating purchase requisitions for correct quantity at the proper time.
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Question-14

Explain Bin Cards and Stock Control Cards.

Solution:

Bin Cards and Stock control cards:

Bin Cards are quantitative records of the stores receipt, issue and balance. It is kept for each and every item of stores by the store keeper. Here, the balance is taken out after each receipt or issue transaction

Stock Control Cards are also similar to Bin Cards. Stock control cards contain further information as regards stock on order. These cards are kept in cabinets or trays or loose binders.

Question 15

Explain why the Last in First out (LIFO) has an edge over First in First out (FIFO) or any other method of pricing material issues.

Solution:

LIFO has following advantages:

- (a) The cost of the material issued will be reflecting the current market price.
 - (b) The use of the method during the period of rising prices does not reflect undue high profit in the income statement.
 - (c) In the case of falling price, profit tend to rise due to lower material cost, yet the finished goods appear to be more competitive and are at market price.
 - (d) During the period of inflation, LIFO will tend to show the correct profit.
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Question 16

Differentiate between "scrap" and "defectives" and how they are treated in cost accounting.

Solution:

Scrap: Scrap is incidental residue from certain type of manufacture, usually of small amount and low value, recoverable without further processing.

The cost of scrap is borne by good units and income from scrap is treated as other income.

Defectives: Defectives are portion of production which can be rectified by incurring additional cost. Normal defectives can be avoided by quality control. Normal defectives are charged to good products.

Abnormal defectives are charged to Costing Profit and Loss Account

Question 17

Distinguish between Bill of Materials and Material Requisition Note.

Solution:

Bills of Material	Material Requisition Note
1. It is document or list of materials prepared by the engineering/ drawing department.	1. It is prepared by the foreman of the consuming department.
2. It is a complete schedule of component parts and raw materials required for a particular job or work order.	2. It is a document authorizing Store-Keeper to issue material to the consuming department.
3. It often serves the purpose of a Store Requisition as it shows the complete schedule of materials required for a particular job i.e. it can replace stores requisition.	3. It cannot replace a bill of material.
4. It can be used for the purpose of quotation.	4. It is useful in arriving historical cost only.
5. It helps in keeping a quantitative control on materials draw through Stores Requisition.	5. It shows the material actually drawn from stores.

Question 18

State whether the following statements are true. Give reasons:

- (i) Safety stock increases as demand increases.
- (ii) In ABC analysis high cost items are most likely to fall in category A, and least cost items are likely to fall in category C.

- (iii) To protect against stock outs, a large batch size is a must.
- (iv) E.O.Q. is based on a balancing between inventory carrying cost and shortage costs.
- (v) Lead time is the time interval elapsing between the placement of a replenishment order and the receipt of last installment of goods against the order.

Solution:

SI No.	True/ Not True	Reason
(i)	Not true	Safety stock is held for meeting the unpredictable fluctuation in the demand and supply. It varies with the fluctuations in demand and not with level of demand.
(ii)	Not true	The categorization of A, B and C is done on the basis of their annual usage value (Consumption value) and not on their cost X, Y and Z. Analysis is done on the basis of value of inventory stored.
(iii)	True	If the batch size is large, number of orders in a year will be lower. Hence stock moves to lowest point (re-order level) fewer times a year. Hence danger of stock out will be less. Thus to protect against stock out, a large batch size is a must.
(iv)	Not true	E.O.Q. is based on a balancing between ordering cost and carrying cost of inventory. It does not take into account the shortage cost.
(v)	Not true	Lead time is the time interval elapsing between the placement of a replenishment order and the receipt of first instalment of goods against the order.

Question 19

"Perpetual inventory system comprises Bin Card and Stores Ledger, but the efficacy of the system depends on continuous stock taking." Comment.

Solution:

Perpetual Inventory system represents a system of records maintained by the stores department. Records comprise of (i) Bin Cards and (ii) Stores Ledger. Bin Card maintains a quantitative record of receipts, issues and closing balances of each item of stores. Like bin cards, the Stores Ledger is maintained to record all receipt and issue transactions in respect of materials. It is filled up with the help of goods received note and material requisitions. But a perpetual inventory system's efficacy depends on the system of continuous stock taking.

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Continuous stock taking means the physical checking of the records i.e. Bin cards and store ledger with actual physical stock. Perpetual inventory is essentially necessary for material control. It incidentally helps continuous stock taking.

The main advantages of continuous stock taking are as follows :

- (1) Physical stocks can be counted and book balances adjusted as and when desired without waiting for the entire stock-taking to be done.
 - (2) Quick compilation of Profit and Loss Accounts (for interim period) due to prompt availability of stock figures.
 - (3) Discrepancies are easily located and thus corrective action can be promptly taken to avoid their recurrence.
 - (4) A systematic review of the perpetual inventory reveals the existence of surplus, dormant, obsolete and slow-moving materials, so that remedial measures may be taken in time.
 - (5) Fixation of the various levels and check of actual balances in hand with these levels assist the Storekeeper in maintaining stocks within limits and in initiating purchase requisitions for correct quantity at the proper time.
-

Question 20

Steel Heart Pvt. Ltd. Manufactures TMT bars from MS Ingots and MS Billets. After production of TMT bars, sorting is carried out to find any defects or units that do not match with standard specification. The products which do not match with the standard product specification are treated as scrap. You are required to state the treatment of the products which do not match with the product specifications in Cost Accounts.

Solution:

Scrap has been defined as the incidental residue from certain types of manufacture, usually of small amount and low value, recoverable without further processing.

Scrap may be treated in cost accounts in the following ways:-

- (i) **When the scrap value is negligible:** It may be excluded from costs. In other words, the cost of scrap is borne by good units and income from scrap is treated as other income.
 - (ii) **When the scrap value is not identifiable to a particular process or job:** The sales value of scrap net of selling and distribution cost, is deducted from overhead to reduce the overhead rate. A variation of this method is to deduct the net realisable value from material cost.
 - (iii) **When scrap is identifiable with a particular job or process and its value is significant:** The scrap account should be charged with full cost. The credit is given to the job or process concerned. The profit or loss in the scrap account, on realisation, will be transferred to the Costing Profit and Loss Account.
-

SECTION-B

Inventory level, EOQ and Evaluation of offers

Question-1

A company uses three raw materials A, B and C for a particular product for which the following data apply :-

Raw Material	Usage per unit of product (Kg.)	Re-order Quantity (Kg.)	Price per Kg. (₹)	Delivery period (in weeks)			Re-order level (Kg.)	Minimum level (Kg.)
				Minimum	Average	Maximum		
A	10	10,000	0.10	1	2	3	8,000	?
B	4	5,000	0.30	3	4	5	4,750	?
C	6	10,000	0.15	2	3	4	?	2,000

Weekly production varies from 175 to 225 units, averaging 200 units of the said product. What would be the following quantities:-

- (i) Minimum Stock of A?
- (ii) Maximum Stock of B?
- (iii) Re-order level of C?
- (iv) Average stock level of A?

Solution:

(i) Minimum stock of A

$$\begin{aligned} \text{Re-order level} &= (\text{Average consumption} \times \text{Average time required to obtain delivery}) \\ &= 8,000 \text{ kg.} - (200 \text{ units} \times 10 \text{ kg.} \times 2 \text{ weeks}) = 4,000 \text{ kg.} \end{aligned}$$

(ii) Maximum stock of B

$$\begin{aligned} \text{Re-order level} &= (\text{Min. Consumption} \times \text{Min. Re-order period}) + \text{Re-order quantity} \\ &= 4,750 \text{ kg.} - (175 \text{ units} \times 4 \text{ kg.} \times 3 \text{ weeks}) + 5,000 \text{ kg.} \\ &= 9,750 - 2,100 = 7,650 \text{ kg.} \end{aligned}$$

(iii) Re-order level of C

$$\begin{aligned} \text{Maximum re-order period} \times \text{Maximum Usage} \\ &= 4 \text{ weeks} \times (225 \text{ units} \times 6 \text{ kg.}) = 5,400 \text{ kg.} \end{aligned}$$

OR

$$= \text{Minimum stock of C} + (\text{Average consumption} \times \text{Average delivery time})$$

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$$= 2,000 \text{ kg.} + [(200 \text{ units} \times 6 \text{ kg.}) \times 3 \text{ weeks}] = 5,600 \text{ kg.}$$

(iv) Average stock level of A

$$= \text{Minimum stock level of A} + \frac{1}{2} \text{ Re-order quantity}$$

$$= 4,000 \text{ kg.} + \frac{1}{2} 10,000 \text{ kg.} = 4,000 + 5,000 = 9,000 \text{ kg.}$$

OR

$$= \frac{\text{Minimum stock} + \text{Maximum stock}}{2} \quad (\text{Refer to Working Note})$$

$$= \frac{4,000 + 16,250}{2} = 10,125 \text{ kg.}$$

Working note

Maximum stock of A = ROL + ROQ – (Minimum consumption × Minimum re-order period)

$$= 8,000 \text{ kg.} + 10,000 \text{ kg.} - [(175 \text{ units} \times 10 \text{ kg.}) \times 1 \text{ week}] = 16,250 \text{ kg.}$$

Question-2

A company has the option to procure a particular material from two sources:

Source I assures that defectives will not be more than 2% of supplied quantity.

Source II does not give any assurance, but on the basis of past experience of supplies received from it, it is observed that defective percentage is 2.8%.

The material is supplied in lots of 1,000 units. Source II supplies the lot at a price, which is lower by ₹ 100 as compared to Source I. The defective units of material can be rectified for use at a cost of ₹ 5 per unit.

You are required to find out which of the two sources is more economical.

Solution:

Comparative Statement of procuring material from two sources

	Material source I	Material source II
Defective (in %)	2	2.8
	(Future estimate)	(Past experience)
Units supplied (in one lot)	1,000	1,000
Total defective units in a lot	20	28
	(1,000 units × 2%)	(1,000 units × 2.8%)

Additional price paid per lot (₹) (A)	100	–
Rectification cost of defect (₹) (B)	100	140
	<u>(20 units × ₹ 5)</u>	<u>(28 units × ₹ 5)</u>
Total additional cost per lot (₹): [(A) + (B)]	<u>200</u>	<u>140</u>

On comparing the total additional cost incurred per lot of 1,000 units, we observe that it is more economical, if the required material units are procured from material source II.

Question-3

RST Limited has received an offer of quantity discount on its order of materials as under:

Price per ton	Order Size (in ton)
₹ 9,600	Less than 50
₹ 9,360	50 and less than 100
₹ 9,120	100 and less than 200
₹ 8,880	200 and less than 300
₹ 8,640	300 and above

The annual requirement for the material is 500 tons. The ordering cost per order is ₹ 12,500 and the stock holding cost is estimated at 25% of the material cost per annum.

Required

- Compute the most economical purchase level.
- Compute EOQ if there are no quantity discounts and the price per ton is ₹ 10,500.

Solution:

(i)

Order size (Q) (Units)	*No. of orders $A \div Q$ (Units)	Cost of purchase $A \times$ cost per unit	Ordering cost $\frac{A}{Q} \times ₹12500$	Carrying cost $\frac{Q}{2} \times C \times 25\%$	Total cost (3+4+5)
(1)	(2)	(3)	(4)	(5)	(6)
40	12.5	₹48,00,000 (500 × ₹9,600)	₹ 1,56,250	₹ 48,000 $\left(\frac{40}{2} \times ₹9,600 \times 0.25\right)$	₹ 50,04,250
50	10	₹46,80,000 (500 × ₹9,360)	₹1,25,000	₹58,500 $\left(\frac{50}{2} \times ₹9,360 \times 0.25\right)$	₹48,63,500

2.23 Cost Accounting

100	5	₹45,60,000 (500 × ₹9,120)	₹62,500	₹1,14,000 $\left(\frac{100}{2} \times ₹9,120 \times 0.25\right)$	₹47,36,500
200	2.5	₹44,40,000 (500 × ₹8,880)	₹31,250	₹2,22,000 $\left(\frac{200}{2} \times ₹8,880 \times 0.25\right)$	₹46,93,250
300	1.67	₹43,20,000 (500 × ₹8,640)	₹20,875	₹3,24,000 $\left(\frac{300}{2} \times ₹8,640 \times 0.25\right)$	₹46,64,875

A = Annual requirement

The above table shows that the total cost of 500 units including ordering and carrying cost is minimum (₹ 46,64,875) where the order size is 300 units. Hence the most economical purchase level is 300 units.

(*Note: Practically number of orders should be rounded off to the nearest whole number)

(ii) Calculation of Economic Order Quantity (EOQ), when no discount is available.

$$EOQ = \sqrt{\frac{2AO}{C \times i}} = \sqrt{\frac{2 \times 500 \text{ tonne} \times ₹12,500}{₹10,500 \times 25\%}} = 69 \text{ tonnes.}$$

Question-4

IPL Limited uses a small casting in one of its finished products. The castings are purchased from a foundry. IPL Limited purchases 54,000 castings per year at a cost of ₹ 800 per casting.

The castings are used evenly throughout the year in the production process on a 360-days-per-year basis. The company estimates that it costs ₹9,000 to place a single purchase order and about ₹300 to carry one casting in inventory for a year. The high carrying costs result from the need to keep the castings in carefully controlled temperature and humidity conditions, and from the high cost of insurance.

Delivery from the foundry generally takes 6 days, but it can take as much as 10 days. The days of delivery time and percentage of their occurrence are shown in the following tabulation:

Delivery time (days)	:	6	7	8	9	10
Percentage of occurrence	:	75	10	5	5	5

Required:

- Compute the economic order quantity (EOQ).
- Assume the company is willing to assume a 15% risk of being out of stock. What would be the safety stock? The re-order point?

- (iii) Assume the company is willing to assume a 5% risk of being out of stock. What would be the safety stock? The re-order point?
- (iv) Assume 5% stock-out risk. What would be the total cost of ordering and carrying inventory for one year?
- (v) Refer to the original data. Assume that using process re-engineering the company reduces its cost of placing a purchase order to only ₹ 600. In addition company estimates that when the waste and inefficiency caused by inventories are considered, the true cost of carrying a unit in stock is ₹ 720 per year.
- (a) Compute the new EOQ.
- (b) How frequently would the company be placing an order, as compared to the old purchasing policy?

Solution:**(i) Computation of economic order quantity (EOQ)**

Annual requirement (A)	=	54,000 castings
Cost per casting (C)	=	₹ 800
Ordering cost (O)	=	₹ 9,000 per order
Carrying cost per casting p.a. (C × i)	=	₹ 300

$$\text{EOQ} = \sqrt{\frac{2AO}{C \times i}} = \sqrt{\frac{2 \times 54,000 \text{ units} \times ₹ 9,000}{₹ 300}} = 1,800 \text{ castings}$$

(ii) Safety stock (Assuming a 15% risk of being out of stock)

From the probability table given in the question, we can see that 85% certainty in delivery time is achieved when delivery period is 7 days i.e. at 15% risk level of being out of stock, the maximum delivery period should not exceed 7 days.

$$\begin{aligned} \text{Safety stock} &= \frac{\text{Annual demand}}{360 \text{ days}} \times (\text{Max. lead time} - \text{Avg. lead time}) \\ &= \frac{54,000 \text{ units}}{360 \text{ days}} \times (7 \text{ days} - 6 \text{ days}) \\ &= 150 \text{ castings} \\ \text{Re-order point (level)} &= \text{Safety Stock} + \text{Average lead time consumption} \\ &= 150 \text{ units} + (6 \text{ days} \times 150 \text{ units}) = 1,050 \text{ castings.} \end{aligned}$$

2.25 Cost Accounting

(iii) Safety stocks (Assuming a 5% risk of being out of stock)

From the probability table given in the question, we can see that 95% certainty in delivery time is achieved when delivery period is 9 days i.e. at 5% risk level of being out of stock, the maximum delivery period should not exceed 9 days.

$$\begin{aligned}\text{Safety stock} &= \frac{\text{Annual demand}}{360 \text{ days}} \times (\text{Max. lead time} - \text{Avg. lead time}) \\ &= \frac{54,000 \text{ units}}{360 \text{ days}} \times (9 \text{ days} - 6 \text{ days}) = 450 \text{ castings} \\ \text{Re-order point (level)} &= \text{Safety Stock} + \text{Average lead time consumption} \\ &= 450 \text{ units} + (6 \text{ days} \times 150 \text{ units}) = 1,350 \text{ castings.}\end{aligned}$$

(iv) At 5% stock-out risk the total cost of ordering and carrying cost is as follows:

$$\begin{aligned}\text{Total cost of ordering} &= \frac{\text{Annual demand}}{\text{EOQ}} \times \text{Cost per order} \\ &= \frac{54,000 \text{ units}}{1,800 \text{ units}} \times ₹ 9,000 = ₹ 2,70,000 \\ \text{Total cost of carrying} &= (\text{Safety Stock} + \frac{1}{2} \text{EOQ}) \times \text{Carrying cost per unit p.a.} \\ &= (450 \text{ units} + \frac{1}{2} \times 1,800 \text{ units}) ₹ 300 = ₹ 4,05,000\end{aligned}$$

(v) (a) Computation of new EOQ:

$$\text{EOQ} = \sqrt{\frac{2 \times 54,000 \text{ units} \times ₹ 600}{₹ 720}} = 300 \text{ castings}$$

$$(b) \text{ Total number of orders to be placed in a year are } \frac{54,000 \text{ units}}{300 \text{ units}} = 180 \text{ times}$$

Under new purchasing policy IPL Ltd. has to place order in every 2nd day, however under the old purchasing policy it was every 12th day.

Question-5

A company manufactures 5,000 units of a product per month. The cost of placing an order is ₹ 100. The purchase price of the raw material is ₹ 10 per kg. The re-order period is 4 to 8 weeks. The consumption of raw materials varies from 100 kg to 450 kg per week, the average consumption being 275 kg. The carrying cost of inventory is 20% per annum.

You are required to calculate

- (i) Re-order quantity
- (ii) Re-order level
- (iii) Maximum level
- (iv) Minimum level
- (v) Average stock level

Solution:

- (i) Reorder Quantity (ROQ) = 1,196 kg. (Refer to working note)
- (ii) Reorder level (ROL) = Maximum usage × Maximum re-order period
= 450 kg. × 8 weeks = 3,600 kg.
- (iii) Maximum level = ROL + ROQ – (Min. usage × Min. re-order period)
= 3,600 kg. + 1,196 kg. – (100 kg. × 4 weeks)
= 4,396 kg.
- (iv) Minimum level = ROL – (Normal usage × Normal re-order period)
= 3,600 kg. – (275 kg. × 6 weeks)
= 1,950 kg.
- (v) Average stock level = $\frac{1}{2}$ (Maximum level + Minimum level)
= $\frac{1}{2}$ (4,396 kg. + 1,950 kg.) = 3,173 kg.

OR

$$= \text{Minimum level} + \frac{1}{2} \text{ROQ}$$

$$= 1,950 \text{ kg.} + \frac{1}{2} \times 1,196 \text{ kg.} = 2,548 \text{ kg.}$$

Working Note

- Annual consumption of raw material (A) = (275 kg. × 52 weeks) = 14,300 kg.
- Cost of placing an order (O) = ₹ 100
- Carrying cost per kg. Per annum (c × i) = ₹ 10 × 20% = ₹ 2

$$\text{Economic order quantity (EOQ)} = \sqrt{\frac{2AO}{C \times i}}$$

$$= \sqrt{\frac{2 \times 14,300 \text{ kgs.} \times ₹ 100}{₹ 2}} = 1,196 \text{ Kg. (Approx)}$$

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Question-6

A company manufactures a product from a raw material, which is purchased at ₹60 per kg. The company incurs a handling cost of ₹ 360 plus freight of ₹ 390 per order. The incremental carrying cost of inventory of raw material is ₹ 0.50 per kg. per month. In addition, the cost of working capital finance on the investment in inventory of raw material is ₹ 9 per kg. per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg of raw material.

Required

- (i) Calculate the economic order quantity of raw materials.
- (ii) Advise, how frequently should orders for procurement be placed.
- (iii) If the company proposes to rationalize placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated?

Solution:

$$\text{Annual requirement of raw material in kg. (A)} = \frac{1,00,000 \text{ units}}{2.5 \text{ units per kg.}} = 40,000 \text{ kg.}$$

$$\text{Ordering Cost (Handling \& freight cost) (O)} = ₹ 360 + ₹ 390 = ₹ 750$$

$$\begin{aligned} \text{Carrying cost per unit per annum i.e. inventory carrying cost + working capital cost (c \times i)} \\ = (\text{₹ } 0.5 \times 12 \text{ months}) + ₹ 9 \\ = ₹ 15 \text{ per kg.} \end{aligned}$$

$$(i) \text{ E.O.Q.} = \sqrt{\frac{2 \times 40,000 \text{ kgs.} \times ₹ 750}{₹ 15}} = 2,000 \text{ kg.}$$

(ii) Frequency of orders for procurement:

$$\text{Annual consumption (A)} = 40,000 \text{ kg.}$$

$$\text{Quantity per order (EOQ)} = 2,000 \text{ kg.}$$

$$\text{No. of orders per annum } \left(\frac{A}{\text{EOQ}} \right) = \frac{40,000 \text{ kg.}}{2,000 \text{ kg.}} = 20 \text{ times}$$

$$\text{Frequency of placing orders (in months)} = \frac{12 \text{ months}}{20 \text{ orders}} = 0.6 \text{ months}$$

$$\text{Or, (in days)} = \frac{365 \text{ days}}{20 \text{ orders}} = 18 \text{ days (approx)}$$

(iii) Percentage of discount in the price of raw materials to be negotiated:

	Quarterly order	EOQ
Size of the order	10,000 kg.	2,000 kg.

No. of orders	4	20
Cost of placing orders	₹3,000 (4 order × ₹ 750)	₹15,000 (20 orders × ₹ 750)
Inventory carrying cost	₹75,000 (10,000 kg. × ½ × ₹ 15)	₹15,000 (2,000 kg. × ½ × ₹ 15)
Total Cost	₹78,000	₹30,000

When order is placed on quarterly basis the ordering cost and carrying cost increased by ₹ 48,000 (₹78,000 - ₹30,000). This increase in total cost should be compensated by reduction in purchase price per kg. to make quarterly order placement rational.

$$\begin{aligned} \text{Reduction per kg. in the purchase price of raw material} &= \frac{\text{Increase in total cost}}{\text{Annual requirement}} \\ &= \frac{₹ 48,000}{40,000 \text{ units}} = ₹ 1.2 \text{ per kg.} \\ \text{Discount in the price of raw material to be negotiated} &= \frac{₹ 1.20}{₹ 60} = 2\% \end{aligned}$$

Question-7

The quarterly production of a company's product which has a steady market is 20,000 units. Each unit of a product requires 0.5 kg. of raw material. The cost of placing one order for raw material is ₹ 100 and the inventory carrying cost is ₹ 2 per annum. The lead time for procurement of raw material is 36 days and a safety stock of 1,000 kg. of raw materials is maintained by the company. The company has been able to negotiate the following discount structure with the raw material supplier.

Order quantity (kg.)	Discount (₹)
Upto 6,000	NIL
6,001 – 8,000	400
8,001 – 16,000	2,000
16,001 – 30,000	3,200
30,001 – 45,000	4,000

You are required to

- Calculate the re-order point taking 30 days in a month.
- Prepare a statement showing the total cost of procurement and storage of raw material after considering the discount of the company elects to place one, two, four or six orders in the year.

2.29 Cost Accounting

(iii) State the number of orders which the company should place to minimize the costs after taking EOQ also into consideration.

Solution:

Working notes

1. Annual production (20,000 units per quarter × 4 quarters) = 80,000 units
2. Raw material required for 80,000 units (80,000 units × 0.5 kg.) = 40,000 kg.
3.
$$EOQ = \sqrt{\frac{2 \times 40,000 \text{ kgs.} \times ₹ 100}{₹ 2}} = 2,000 \text{ kgs.}$$
4. Total cost of procurement and storage when the order size is equal to EOQ or 2,000 kg.

No. of orders (40,000 kg. ÷ 2,000 kg.)	= 20 times
Ordering cost (20 orders × ₹100)	= ₹ 2,000
Carrying cost (₹)(½ × 2,000 kg. × ₹ 2)	= <u>₹ 2,000</u>
Total cost	<u>₹ 4,000</u>

- (i) **Re-order point** = Safety stock + Lead time consumption
- $$= 1,000 \text{ kg.} + \frac{40,000 \text{ kg.}}{360 \text{ days}} \times 36 \text{ days}$$
- $$= 1,000 \text{ kg.} + 4,000 \text{ kg.} = 5,000 \text{ kg.}$$

(ii) **Statement showing the total cost of procurement and storage of raw materials**

(after considering the discount)

Order size	No. of orders	Total cost of procurement	Average stock	Total cost of storage of raw materials	Discount	Total cost
Kg.		(₹)	Kg.	(₹)	(₹)	(₹)
(1)	(2)	(3)=(2)×₹100	(4)=½×(1)	(5)=(4)×₹2	(6)	(7)=[(3)+(5)- (6)]
40,000	1	100	20,000	40,000	4,000	36,100
20,000	2	200	10,000	20,000	3,200	17,000
10,000	4	400	5,000	10,000	2,000	8,400
6666.66	6	600	3,333	6,666	400	6,866

(iii) Number of orders which the company should place to minimize the costs after taking EOQ also into consideration is 20 orders each of size 2,000 kg. The total cost of procurement and storage in this case comes to ₹ 4,000, which is minimum.

(Refer to working notes 3 and 4)

Question-8

PQR Ltd., manufactures a special product, which requires 'ZED'. The following particulars were collected for the year 2013-14:

(i)	Monthly demand of Zed	:	3,000 units
(ii)	Cost of placing an order	:	₹ 500
(iii)	Re-order period	:	5 to 8 weeks
(iv)	Cost per unit	:	₹ 60
(v)	Carrying cost p.a.	:	10%
(vi)	Normal usage	:	500 units per week
(vii)	Minimum usage	:	250 units per week
(viii)	Maximum usage	:	750 units per week

Required:

- (i) Re-order quantity.
- (ii) Re-order level.
- (iii) Minimum stock level.
- (iv) Maximum stock level.
- (v) Average stock level.

Solution:

$$\begin{aligned}
 \text{(i) Re - order quantity} &= \sqrt{\frac{2AO}{C \times i}} \\
 &= \sqrt{\frac{2 \times 3,000 \text{ units} \times 12 \text{ months} \times ₹ 500}{₹ 60 \times 10\%}} \\
 &= 2,450 \text{ units} \quad (\text{Approx})
 \end{aligned}$$

(ii) Re-order level

$$\begin{aligned}
 &= \text{Maximum re-order period} \times \text{Maximum usage} \\
 &= 8 \text{ weeks} \times 750 \text{ units per week} = 6,000 \text{ units}
 \end{aligned}$$

(iii) Minimum stock level

$$\begin{aligned}
 &= \text{Re-order level} - \{\text{Normal usage} \times \text{Normal re-order period}\} \\
 &= 6,000 \text{ units} - (500 \text{ units} \times 6.5 \text{ weeks}) = 2,750 \text{ units}
 \end{aligned}$$

(iv) Maximum stock level

$$= \text{Re-order level} + \text{Re-order quantity} - (\text{Minimum usage} \times \text{Minimum re-order period})$$

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$$= 6,000 \text{ units} + 2,450 \text{ units} - (250 \text{ units} \times 5 \text{ weeks}) = 7,200 \text{ units}$$

(v) Average stock level

$$= \frac{1}{2} (\text{Minimum stock level} + \text{Maximum stock level})$$

$$= \frac{1}{2} (2,750 + 7,200) = 4,975 \text{ units}$$

Question 9

A Company manufactures a special product which requires a component 'Alpha'. The following particulars are collected for the year 2013:

- | | | | |
|-------|--------------------------|---|-----------------|
| (i) | Annual demand of Alpha | : | 8,000 units |
| (ii) | Cost of placing an order | : | ₹ 200 per order |
| (iii) | Cost per unit of Alpha | : | ₹ 400 |
| (iv) | 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 discount offer can be accepted.

Solution:

$$\begin{aligned} \text{(i) } \text{EOQ} &= \sqrt{\frac{2AO}{C \times i}} \\ &= \sqrt{\frac{2 \times 8,000 \text{ units} \times ₹200}{₹400 \times 20\%}} \\ &= 200 \text{ units.} \end{aligned}$$

Calculation of total inventory cost p.a. at EOQ.

Purchase cost = 8,000 units × ₹400	(₹)
	32,00,000
Ordering cost $\left(\frac{A}{Q} \times O = \frac{8,000 \text{ units}}{200 \text{ units}} \times ₹200 \right)$	8,000
Carrying cost $\left(\frac{Q}{2} \times C \times i = \frac{200 \text{ units}}{2} \times ₹400 \times 20\% \right)$	8,000
	<hr/>
	32,16,000

Calculation of total inventory cost p.a. with quantity discount

	(₹)
Purchase cost = 8,000 units × (₹400 – 4%)	30,72,000
Ordering cost $\left(\frac{A}{Q} \times O = \frac{8,000 \text{ units}}{4,000 \text{ units}} \times ₹200 \right)$	400
Carrying cost $\left(\frac{Q}{2} \times C \times i = \frac{4,000 \text{ units}}{2} \times ₹384 \times 20\% \right)$	<u>1,53,600</u>
	<u>32,26,000</u>

- (ii) Quantity discount offered should not be accepted as it results in increase in total cost of inventory management by ₹ 10,000.

Question-10

ZED Company supplies plastic crockery to fast food restaurants in metropolitan city. One of its products is a special bowl, disposable after initial use, for serving soups to its customers. Bowls are sold in pack 10 pieces at a price of ₹ 50 per pack.

The demand for plastic bowl has been forecasted at a fairly steady rate of 40,000 packs every year. The company purchases the bowl direct from manufacturer at ₹ 40 per pack within a three days lead time. The ordering and related cost is ₹ 8 per order. The storage cost is 10% per annum of average inventory investment.

Required:

- (i) Calculate Economic Order Quantity.
- (ii) Calculate number of orders needed every year.
- (iii) Calculate the total cost of ordering and storage bowls for the year.
- (iv) Determine when should the next order to be placed. (Assuming that the company does maintain a safety stock and that the present inventory level is 333 packs with a year of 360 working days.

Solution:

- (i) Economic Order Quantity

$$EOQ = \sqrt{\frac{2 \times A \times O}{C_i}} = \sqrt{\frac{2 \times 40,000 \text{ packs} \times ₹8}{₹40 \times 10\%}} = 400 \text{ packs.}$$

- (ii) Number of orders per year

$$\frac{\text{Annual requirements}}{\text{E.O.Q}}$$

2.33 Cost Accounting

$$\frac{40,000 \text{ packs}}{400 \text{ packs}} = 100 \text{ orders a year}$$

(iii) Ordering and storage costs

	(₹)
Ordering costs :- 100 orders × ₹ 8.00	800
Storage cost :- ½ (400 packs × 10% of ₹40)	<u>800</u>
Total cost of ordering & storage	<u>1,600</u>

(iv) Timing of next order

(a) Day's requirement served by each order.

$$\text{Number of days requirements} = \frac{\text{No. of working days}}{\text{No. of order in a year}} = \frac{360}{100} = 3.6 \text{ days supply}$$

This implies that each order of 400 packs supplies for requirements of 3.6 days only.

(b) Days requirement covered by inventory

$$= \frac{\text{Units in inventory}}{\text{Economic order quantity}} \times (\text{Day's requirement served by an order})$$

$$\therefore \frac{333 \text{ packs}}{400 \text{ packs}} \times 3.6 \text{ days} = 3 \text{ days requirement}$$

(c) Time interval for placing next order

Inventory left for day's requirement – Lead time of delivery

$$3 \text{ days} - 3 \text{ days} = 0 \text{ days}$$

This means that next order for the replenishment of supplies has to be placed immediately.

Question-11

The annual carrying cost of material 'X' is ₹ 3.6 per unit and its total carrying cost is ₹ 9,000 per annum. What would be the Economic order quantity for material 'X', if there is no safety stock of material X?

Solution:

Calculation of Economic Order Quantity

$$\text{Average Inventory} = \frac{\text{Total Carrying Cost}}{\text{Carrying Cost per unit}} = \frac{\text{₹ } 9,000}{\text{₹ } 3.60} = 2,500 \text{ Units}$$

$$\text{Economic Order Quantity} = \text{Average Inventory} \times 2 = 2,500 \text{ units} \times 2 = 5,000 \text{ units.}$$

Question-12

The following information relating to a type of Raw material is available:

Annual demand	2,000 units
Unit price	₹ 20.00
Ordering cost per order	₹20.00
Storage cost	2% p.a.
Interest rate	8% p.a.
Lead time	Half-month

Calculate economic order quantity and total annual inventory cost of the raw material.

Solution:

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2 \times \text{Annual demand} \times \text{Cost per order}}{\text{Storage cost per unit per annum}}} \\ &= \sqrt{\frac{2 \times 2,000 \text{ units} \times ₹ 20}{₹ 20 \times (2 + 8)\%}} = \sqrt{\frac{80,000}{2}} = 200 \text{ Units} \end{aligned}$$

Total Annual Inventory Cost

Purchasing cost of 2,000 units @ ₹20 per unit	=	₹ 40,000
Ordering Cost ($\frac{2,000 \text{ units}}{200 \text{ units}} \times ₹ 20$)	=	₹ 200
Carrying cost of Inventory $\frac{1}{2}$ (200 units \times ₹20 \times 10%)	=	<u>₹ 200</u>
		<u>₹ 40,400</u>

Question 13

Re-order quantity of material 'X' is 5,000 kg.; Maximum level 8,000 kg.; Minimum usage 50 kg. per hour; minimum re-order period 4 days; daily working hours in the factory is 8 hours. You are required to calculate the re-order level of material 'X'.

Solution:

$$\begin{aligned} \text{Maximum Level} &= \text{Re-order level} + \text{Re-order Quantity} - (\text{Min. usage} \times \text{Min. Re-order Period}) \\ \text{Re-order Level} &= \text{Maximum Level} - [\text{Re-order Quantity} - (\text{Min. usage} \times \text{Min. Re-order Period})] \\ &= 8,000 \text{ kg.} - [5,000 \text{ kg.} - (400 \text{ kg}^* \times 4 \text{ days})] = 8,000 \text{ kg.} - 3,400 \text{ kg.} = 4,600 \text{ kg.} \end{aligned}$$

Hence, Re-order level is 4,600 kg.

*Minimum usage per day = 50 kg. \times 8 hours = 400 kg.

2.35 Cost Accounting

Question-14

KL Limited produces product 'M' which has a quarterly demand of 8,000 units. The product requires 3 kg. quantity of material 'X' for every finished unit of product. The other information are follows:

Cost of material 'X'	:	₹ 20 per kg.
Cost of placing an order	:	₹ 1,000 per order
Carrying Cost	:	15% per annum of average inventory

You are required:

- Calculate the Economic Order Quantity for material 'X'.
- Should the company accept an offer of 2 percent discount by the supplier, if he wants to supply the annual requirement of material 'X' in 4 equal quarterly installments?

Solution:

Annual demand of material 'X'

= 8,000 units (per quarter) x 4 (No. of Quarter in a year) x 3 kg. (for every finished product)
= 96,000 kg.

- Calculation of Economic Order Quantity (EOQ) for material 'X'

$$EOQ = \sqrt{\frac{2 \times \text{Annual demand} \times \text{ordering cost}}{\text{Carrying cost per unit per annum}}} = \sqrt{\frac{2 \times 96,000 \text{ kg} \times ₹ 1000}{₹ 20 \times 15\%}} = 8,000 \text{ kg.}$$

- Evaluation of Cost under different options of 'order quantity'.

Particulars	When EOQ is ordered	When discount of 2% is accepted and supply is in 4 equal installments
Order size	8,000 kg.	24,000 kg. ($\frac{96,000 \text{ kg.}}{4}$)
No. of orders	12 ($\frac{96,000 \text{ kg.}}{8,000 \text{ kg.}}$)	4 ($\frac{96,000 \text{ kg.}}{24,000 \text{ kg.}}$)
Purchase Cost per kg.	₹ 20	₹ 19.60 {₹ 20 - (₹20 × 2%)}
Total Purchase Cost (A)	₹19,20,000 (96,000 kg. x ₹ 20)	₹18,81,600 (96,000 kg. x ₹19.6)
Ordering Cost (B)	₹12,000	₹ 4,000

	(12 orders x ₹ 1,000)	(4 orders x ₹ 1,000)
Carrying Cost (C)	₹ 12,000 $(\frac{8,000 \text{ kg.}}{2} \times 15\% \times ₹20)$	₹ 35,280 $(\frac{24,000 \text{ kg.}}{2} \times 15\% \times ₹19.6)$
Total Cost (A+B+C)	₹ 19,44,000	₹19,20,880

Advice – The total Cost is lower if Company accept an offer of 2 percent discount by the supplier, when supply of the annual requirement of material 'X' is made in 4 equal installments.

Question-15

Assume that the following quantity discount schedule for a particular bearing is available to a retail store:

Order size (unit)	Discount
0 - 49	0%
50 - 99	5%
100 - 199	10%
200 and above	12%

The cost of a single bearing with no discount is ₹ 30. The annual demand is 250 units. Ordering cost is ₹ 20 per order and annual inventory carrying cost is ₹ 4 per unit. Determine the optimal order quantity and the associated minimal total cost of inventory and purchasing costs, if shortages are not allowed.

Solution:

Working Notes

- EOQ without discount

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2AO}{C_i}} = \sqrt{\frac{2 \times 250 \text{ units} \times ₹20}{₹4}} \\ &= \sqrt{2,500} = 50 \text{ units} \end{aligned}$$

- Prices with discount for different order size

$$5\% \text{ Discount} = 30 - 5\% = ₹ 28.50$$

$$10\% \text{ Discount} = 30 - 10\% = ₹ 27.00$$

$$12\% \text{ Discount} = 30 - 12\% = ₹ 26.40$$

2.37 Cost Accounting

Statement of Computing Total cost at various order sizes

Orders size (units)	No. of Orders in a year	Ordering Cost (₹)	Carrying cost of average inventory (₹)	Purchase cost (₹)	Total cost (₹)
(1)	(2)	(3)	(4)	(5)	(3+4+5)= (6)
50	5 $(\frac{250 \text{ units}}{50 \text{ units}})$	100 (5 orders × ₹20)	100 $(\frac{50 \text{ units}}{2} \times ₹4)$	7,125 (250 × ₹28.50)	7,325
100	2.5* $(\frac{250 \text{ units}}{100 \text{ units}})$	50 (2.5 orders × ₹20)	200 $(\frac{100 \text{ units}}{2} \times ₹4)$	6,750 (250 × ₹27)	7,000
125	2 $(\frac{250 \text{ units}}{125 \text{ units}})$	40 (2 orders × ₹20)	250 $(\frac{125 \text{ units}}{2} \times ₹4)$	6,750 (250 × ₹27)	7,040
200	1.25* $(\frac{250 \text{ units}}{200 \text{ units}})$	25 (1.25 orders × ₹20)	400 $(\frac{200 \text{ units}}{2} \times ₹4)$	6,600 (250 × ₹26.4)	7,025
250	1 $(\frac{250 \text{ units}}{250 \text{ units}})$	20 (1 order × ₹20)	500 $(\frac{250 \text{ units}}{2} \times ₹4)$	6,600 (250 × ₹26.4)	7,120

Optimal order quantity = 100 units

Minimum total cost of inventory and purchasing cost = ₹ 7,000.

Note: Theoretically it may be 2.5 orders, $(250 \div 100)$, however practically 3 orders are required. Therefore ordering cost would be ₹ 60 (3×20) and total cost ₹ 7,010 $(60 + 200 + 6750)$.

(* Theoretically orders may be in fraction but in practicality orders shall be in a whole number.)

Question-16

Primex Limited produces product 'P'. It uses annually 60,000 units of a material 'Rex' costing ₹ 10 per unit. Other relevant information are:

Cost of placing an order : ₹ 800 per order

Carrying cost : 15% per annum of average inventory

Re-order period : 10 days

Safety stock : 600 units

The company operates 300 days in a year.

You are required to calculate:

- (i) Economic Order Quantity for material 'Rex'.
- (ii) Re-order Level
- (iii) Maximum Stock Level
- (iv) Average Stock Level

Solution:

- (i) Economic Order Quantity (E.O.Q)

$$= \sqrt{\frac{2 \times \text{Annual requirement of 'Rex'} \times \text{Ordering cost per order}}{\text{Annual carrying cost per unit per annum}}}$$

$$= \sqrt{\frac{2 \times 60,000 \text{ units} \times ₹ 800}{₹ 10 \times 15\%}} = \sqrt{\frac{9,60,00,000}{₹ 1.5}}$$

$$= 8,000 \text{ units}$$

- (ii) Re-order Level = Safety Stock + (Normal daily Usage × Re-order period)

$$= 600 + \left(\frac{60,000 \text{ units}}{300 \text{ days}} \times 10 \text{ days} \right)$$

$$= 600 + 2,000$$

$$= 2,600 \text{ units}$$

- (iii) Maximum Stock Level = E.O.Q (Re-order Quantity) + Safety Stock

$$= 8,000 \text{ units} + 600 \text{ units}$$

$$= 8,600 \text{ units}$$

- (iv) Average Stock Level = Minimum Stock level + $\frac{1}{2}$ Re-order Quantity

$$= 600 + \frac{1}{2} \times 8,000 \text{ units}$$

$$= 4,600 \text{ units}$$

OR

$$\text{Average Stock Level} = \frac{\text{Maximum Stock level} + \text{Minimum Stock level}}{2}$$

$$= \frac{8,600 \text{ units} + 600 \text{ units}}{2}$$

$$= 4,600 \text{ units}$$

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$$\begin{aligned} * \text{ Minimum Stock Level} &= \text{Re-order level} - (\text{Normal daily usage} \times \text{Re-order period}) \\ &= 2,600 - \left(\frac{60,000 \text{ units}}{300 \text{ days}} \times 10 \text{ days} \right) \\ &= 2,600 - 2,000 \\ &= 600 \text{ units} \end{aligned}$$

OR

$$\text{Minimum Stock Level} = \text{Safety Stock level} = 600 \text{ units}$$

Question-17

Aditya Ltd. produces a product 'Exe' using a raw material Dee. To produce one unit of Exe, 2 kg of Dee is required. As per the sales forecast conducted by the company, it will be able to sell 10,000 units of Exe in the coming year. The following is the information regarding the raw material Dee:

- (i) *The Re-order quantity is 200 kg. less than the Economic Order Quantity (EOQ).*
- (ii) *Maximum consumption per day is 20 kg. more than the average consumption per day.*
- (iii) *There is an opening stock of 1,000 kg.*
- (iv) *Time required to get the raw materials from the suppliers is 4 to 8 days.*
- (v) *The purchase price is ₹125 per kg.*

There is an opening stock of 900 units of the finished product Exe.

The rate of interest charged by bank on Cash Credit facility is 13.76%.

To place an order company has to incur ₹ 720 on paper and documentation work.

From the above information find out the followings in relation to raw material Dee:

- (a) *Re-order Quantity*
- (b) *Maximum Stock level*
- (c) *Minimum Stock level*
- (d) *Calculate the impact on the profitability of the company by not ordering the EOQ.*

[Take 364 days for a year]

Solution:

Working Notes:

- (i) **Computation of Annual consumption & Annual Demand for raw material 'Dee':**

Sales forecast of the product 'Exe'	10,000 units
Less: Opening stock of 'Exe'	900 units

Fresh units of 'Exe' to be produced	9,100 units
Raw material required to produce 9,100 units of 'Exe' (9,100 units × 2 kg.)	18,200 kg.
Less: Opening Stock of 'Dee'	1,000 kg.
Annual demand for raw material 'Dee'	17,200 kg.

(ii) Computation of Economic Order Quantity (EOQ):

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2 \times \text{Annual demand of 'Dee'} \times \text{Ordering cost}}{\text{Carrying cost per unit per annum}}} \\ &= \sqrt{\frac{2 \times 17,200 \text{ kg.} \times ₹ 720}{₹ 125 \times 13.76\%}} = \sqrt{\frac{2 \times 17,200 \text{ kg.} \times ₹ 720}{₹ 17.2}} = 1,200 \text{ kg.} \end{aligned}$$

(iii) Re- Order level:

$$\begin{aligned} &= (\text{Maximum consumption per day} \times \text{Maximum lead time}) \\ &= \left\{ \left(\frac{\text{Annual Consumption of 'Dee'}}{364 \text{ days}} + 20 \text{ kg.} \right) \times 8 \text{ days} \right\} \\ &= \left\{ \left(\frac{18,200 \text{ kg.}}{364 \text{ days}} + 20 \text{ kg.} \right) \times 8 \text{ days} \right\} = 560 \text{ kg.} \end{aligned}$$

(iv) Minimum consumption per day of raw material 'Dee':

Average Consumption per day = 50 Kg.

Hence, Maximum Consumption per day = 50 kg. + 20 kg. = 70 kg.

So Minimum consumption per day will be

$$\text{Average Consumption} = \frac{\text{Min. consumption} + \text{Max. consumption}}{2}$$

$$\text{Or, } 50 \text{ kg.} = \frac{\text{Min. consumption} + 70 \text{ kg.}}{2}$$

$$\text{Or, Min. consumption} = 100 \text{ kg} - 70 \text{ kg.} = 30 \text{ kg.}$$

(a) Re-order Quantity :

$$\text{EOQ} - 200 \text{ kg.} = 1,200 \text{ kg.} - 200 \text{ kg.} = 1,000 \text{ kg.}$$

(b) Maximum Stock level:

$$= \text{Re-order level} + \text{Re-order Quantity} - (\text{Min. consumption per day} \times \text{Min. lead time})$$

$$= 560 \text{ kg.} + 1,000 \text{ kg.} - (30 \text{ kg.} \times 4 \text{ days}) = 1,560 \text{ kg.} - 120 \text{ kg.} = 1,440 \text{ kg.}$$

2.41 Cost Accounting

(c) **Minimum Stock level:**

$$= \text{Re-order level} - (\text{Average consumption per day} \times \text{Average lead time})$$

$$= 560 \text{ kg.} - (50 \text{ kg.} \times 6 \text{ days}) = 260 \text{ kg.}$$

(d) **Impact on the profitability of the company by not ordering the EOQ.**

		When purchasing the ROQ	When purchasing the EOQ
I	Order quantity	1,000 kg.	1,200 kg.
II	No. of orders a year	$\frac{17,200\text{kg.}}{1,000\text{kg.}} = 17.2$ or 18 orders	$\frac{17,200\text{kg.}}{1,200\text{kg.}} = 14.33$ or 15 orders
III	Ordering Cost	18 orders \times ₹ 720 = ₹12,960	15 orders \times ₹ 720 = ₹10,800
IV	Average Inventory	$\frac{1,000\text{kg.}}{2} = 500\text{kg.}$	$\frac{1,200\text{kg.}}{2} = 600\text{kg.}$
V	Carrying Cost	500 kg. \times ₹ 17.2 = ₹ 8,600	600 kg. \times ₹ 17.2 = ₹ 10,320
VI	Total Cost	₹ 21,560	₹ 21,120

Extra Cost incurred due to not ordering EOQ = ₹ 21,560 - ₹ 21,120 = ₹440

Question-18

A company manufactures a product from a raw material, which is purchased at ₹ 80 per kg. The company incurs a handling cost of ₹ 370 plus freight of ₹ 380 per order. The incremental carrying cost of inventory of raw material is ₹ 0.25 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw material is ₹ 12 per kg per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg. of raw material.

Required:

- Calculate the economic order quantity of raw materials.
- Advise, how frequently company should order for procurement be placed.
- If the company proposes to rationalize placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated?

Assume 360 days in a year.

Solution:

(i) Calculation of Economic Order Quantity (E.O.Q)

$$\text{Annual requirement (usage) of raw material in kg. (A)} = \frac{1,00,000 \text{ units}}{2.5 \text{ units per kg.}} = 40,000 \text{ kg.}$$

$$\text{Ordering Cost (Handling \& freight cost) (O)} = ₹ 370 + ₹ 380 = ₹ 750$$

$$\begin{aligned} \text{Carrying cost per unit per annum (C) i.e. inventory carrying cost + working capital cost} \\ = (\₹0.25 \times 12 \text{ months}) + ₹ 12 \\ = ₹15 \text{ per kg.} \end{aligned}$$

$$\text{E.O.Q.} = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 40,000 \text{ kg.} \times ₹ 750}{₹15}} = 2,000 \text{ kg.}$$

(ii) Frequency of placing orders for procurement:

$$\text{Annual consumption (A)} = 40,000 \text{ kg.}$$

$$\text{Quantity per order (E.O.Q)} = 2,000 \text{ kg.}$$

$$\text{No. of orders per annum } \left(\frac{A}{\text{E.O.Q}} \right) = \frac{40,000 \text{ kg.}}{2,000 \text{ kg.}} = 20 \text{ orders}$$

$$\text{Frequency of placing orders (in days)} = \frac{360 \text{ days}}{20 \text{ orders}} = 18 \text{ days}$$

(iii) Percentage of discount in the price of raw materials to be negotiated:

Particulars	On Quarterly Basis	On E.O.Q Basis
1. Annual Usage (in Kg.)	40,000 kg.	40,000 kg.
2. Size of the order	10,000 kg.	2,000 kg.
3. No. of orders (1 ÷ 2)	4	20
4. Cost of placing orders or Ordering cost (No. of orders × Cost per order)	₹ 3,000 (4 order × ₹ 750)	₹ 15,000 (20 orders × ₹ 750)
5. Inventory carrying cost (Average inventory × Carrying cost per unit)	₹ 75,000 (10,000 kg. × ½ × ₹15)	₹ 15,000 (2,000 kg. × ½ × ₹ 15)
6. Total Cost (4 + 5)	₹ 78,000	₹ 30,000

When order is placed on quarterly basis the ordering cost and carrying cost increased by ₹ 48,000 (₹78,000 - ₹30,000).

So, discount required = ₹ 48,000

Total annual purchase = 40,000 kg. × ₹ 80 = ₹ 32,00,000

2.43 Cost Accounting

$$\text{So, Percentage of discount to be negotiated} = \frac{\text{₹ } 48,000}{\text{₹ } 32,00,000} \times 100 = 1.5\%$$

Question-19

Following details are related to a manufacturing concern:

Re-order Level	16,000 units
Economic Order Quantity	90,000
Minimum Stock Level	100000 units
Maximum Stock Level	190000 units
Average Lead Time	6 days
Difference between minimum lead time and Maximum lead time	4 days

Calculate:

- (i) Maximum consumption per day
- (ii) Minimum consumption per day

Solution:

Difference between Minimum lead time Maximum lead time = 4 days

Max. lead time – Min. lead time = 4 days

Or, Max. lead time = Min. lead time + 4 days.....(i)

Average lead time is given as 6 days i.e.

$$\frac{\text{Max.lead time} + \text{Min.lead time}}{2} = 6 \text{ days}..... (ii)$$

Putting the value of (i) in (ii),

$$\frac{\text{Min. lead time} + 4 \text{ days} + \text{Min.lead time}}{2} = 6 \text{ days}$$

Or, Min. lead time + 4 days + Min. lead time = 12 days

Or, 2 Min. lead time = 8 days

$$\text{Or, Minimum lead time} = \frac{8 \text{ days}}{2} = 4 \text{ days}$$

Putting this Minimum lead time value in (i), we get

Maximum lead time = 4 days + 4 days = 8 days

(i) **Maximum consumption per day:**

Re-order level = Max. Re-order period × Maximum Consumption per day

1,60,000 units = 8 days × Maximum Consumption per day

$$\text{Or, Maximum Consumption per day} = \frac{1,60,000 \text{ units}}{8 \text{ days}} = 20,000 \text{ units}$$

(ii) Minimum Consumption per day:

Maximum Stock Level =

Re-order level + Re-order Quantity – (Min. lead time × Min. Consumption per day)

$$\text{Or, } 1,90,000 \text{ units} = 1,60,000 \text{ units} + 90,000 \text{ units} - (4 \text{ days} \times \text{Min. Consumption per day})$$

$$\text{Or, } 4 \text{ days} \times \text{Min. Consumption per day} = 2,50,000 \text{ units} - 1,90,000 \text{ units}$$

$$\text{Or, Minimum Consumption per day} = \frac{60,000 \text{ units}}{4 \text{ days}} = 15,000 \text{ units}$$

Store ledgers and Method of pricing of material issue

Question-20

The following are the details of receipts and issues of a material of stores in a manufacturing company for the period of three months ending 30th June, 2014:

Receipts:

Date	Quantity (kg.)	Rate per kg. (₹)
April 10	1,600	5.00
April 20	2,400	4.90
May 5	1,000	5.10
May 17	1,100	5.20
May 25	800	5.25
June 11	900	5.40
June 24	1,400	5.50

There was 1,500 kg. in stock at April 1, 2014 which was valued at ₹ 4.80 per kg.

Issues:

Date	Quantity (kg.)
April 4	1,100
April 24	1,600
May 10	1,500
May 26	1,700
June 15	1,500
June 21	1,200

Issues are to be priced on the basis of weighted average method.

2.45 Cost Accounting

The stock verifier of the company reported a shortage of 80 kgs. on 31st May, 2014 and 60 kgs. on 30th June, 2014. The shortage is treated as inflating the price of remaining material on account of shortage.

You are required to prepare a Stores Ledger Account.

Solution:

(a) **Stores Ledger Account**
for the three months ending 30th June, 2014
(Weighted Average Method)

Date	Receipts				Issues				Balance		Rate for further Issue (₹)
	GRN No. PR No.	Qty. (Kg.)	Rates (₹)	Amounts	MR No.	Qty. (Kg.)	Rates (₹)	Amount (₹)	Qty. (Kg.)	Amount (₹)	
2014											
April 1									1,500	7,200	4.80
April 4						1,100	4.80	5,280	400	1,920	4.80
April 10		1,600	5.00	8,000					2,000	9,920	$\frac{9,920}{2,000} = 4.96$
April 20		2,400	4.90	11,760					4,400	21,680	$\frac{21,680}{4,400} = 4.93$
April 24						1,600	4.93	7,888	2,800	13,792	$\frac{13,792}{2,800} = 4.93$
May 5		1,000	5.10	5,100					3,800	18,892	$\frac{18,892}{3,800} = 4.97$
May 10						1,500	4.97	7,455	2,300	11,437	$\frac{11,437}{2,300} = 4.97$
May 17		1,100	5.20	5,720					3,400	17,157	$\frac{17,157}{3,400} = 5.05$
May 25		800	5.25	4,200					4,200	21,357	$\frac{21,357}{4,200} = 5.09$
May 26						1,700	5.09	8,653	2,500	12,704	$\frac{12,704}{2,500} = 5.09$
May 31					Shortage	80			2,420	12,704	$\frac{12,704}{2,420} = 5.25$
June 11		900	5.40	4,860					3,320	17,564	$\frac{17,564}{3,320} = 5.29$
June 15						1,500	5.29	7,935	1,820	9,629	$\frac{9,629}{1,820} = 5.29$
June 21						1,200	5.29	6,348	620	3,281	$\frac{3,281}{620} = 5.29$
June 24		1,400	5.50	7,700					2,020	10,981	$\frac{10,981}{2,020} = 5.44$
June 30					Shortage	60			1,960	10,981	$\frac{10,981}{1,960} = 5.60$

Question-21

Prepare a Store Ledger Account from the following transactions of XY Company Ltd.

April, 2014

- 1 Opening balance 200 units @ ₹ 10 per unit.
- 5 Receipt 250 units costing ₹ 2,000
- 8 Receipt 150 units costing ₹ 1,275
- 10 Issue 100 units
- 15 Receipt 50 units costing ₹ 500
- 20 Shortage 10 units
- 21 Receipt 60 units costing ₹ 540
- 22 Issue 400 units

The issues upto 10-4-14 will be priced at LIFO and from 11-4-14 issues will be priced at FIFO.

Shortage will be charged as overhead.

Solution:

(a)

Store Ledger Account

Date	Receipts			Issues			Balance		
	Qty.	Rate	Amount	Qty.	Rate	Amount	Qty.	Rate	Amount
	Units	(₹)	(₹)	Units	(₹)	(₹)	Units	(₹)	(₹)
April 1							200	10	2,000
" 5	250	8	2,000				200	10	4,000
							250	8	
" 8	150	8.50	1,275				200	10	5,275
							250	8	
							150	8.50	
" 10				100	8.50	850	200	10	4,425
							250	8	
							50	8.50	
" 15	50	10	500				200	10	4,925
							250	8	
							50	8.50	
							50	10	
" 20				10	10	100	190	10	4,825
				(shortage)			250	8	
							50	8.50	
							50	10	

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" 21	60	9	540				190	10	5,365
							250	8	
							50	8.50	
							50	10	
							60	9	
" 22				190	10	3,580	40	8	1,785 (Closing Stock)
				210	8		50	8.50	
							50	10	
							60	9	

Question 22

The following transactions in respect of material Y occurred during the six months ended 30th June, 2014:

Month	Purchase (units)	Price per unit (₹)	Issued units
January	200	25	Nil
February	300	24	250
March	425	26	300
April	475	23	550
May	500	25	800
June	600	20	400

Required

The chief accountant argues that the value of closing stock remains the same no matter which method of pricing of material issues is used. Do you agree? Why or why not? Detailed stores ledgers are not required.

Solution:

Assumption: There was no opening stock as on 1st January 2014

Materials Cost and Control

Month	Opening balance (units)	Purchases (units)	Issues (units)	Closing balance (units)
January, 2014	Nil	200	-	200
February	200	300	250	250
March	250	425	300	375
April	375	475	550	300
May	300	500	800	Nil
June, 2014	Nil	600	400	200

At the end of May 2014, there was no closing stock, i.e. no opening stock on 1st June, 2014. But there was closing of 200 units at the end of June 2014.

Value of closing stock at the end of June 2014

FIFO 200 Units at ₹ 20	=	₹ 4,000
LIFO 200 Units at ₹ 20	=	₹ 4,000
Weighted average ₹ 20	=	₹ 4,000

Hence the argument of Chief Accountant is correct. He is correct only in the above case. If there was closing stock at the end of May 2014, the argument of the Chief Accountant would not be correct.

Question-23

After the annual stock taking you come to know of some significant discrepancies between book stock and physical stock. You gather the following information:-

Item	Stock card Units	Stores Ledger Units	Physical Check Units	Cost/unit (₹)
A	600	600	560	60
B	380	380	385	40
C	750	780	720	10

- What action should be taken to record the information shown.
- Suggest reasons for the shortage and discrepancies disclosed above and recommended a possible course of action by management to prevent future losses.

Solution:

- Item A:** The shortage of 40 units may be entered in the Stock Card and Stores Ledger. That means, stock card should reflect the physical quantity only. The value is ₹ 2,400 (i.e. 40 units at ₹ 60 per unit).

Accounting treatment

- If the shortage is normal:-

Production Overhead control A/c	Dr. 2,400	
To Stores Ledger control A/c		2,400

- If the shortage is abnormal:-

Costing P&L A/c	Dr. 2,400	
To Stores Ledger control A/c		2,400

- If the shortage is due to non-recording or short-recording of direct material issued to production:

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- | | | |
|------------------------------|-----------|-------|
| WIP Control A/c | Dr. 2,400 | |
| To Stores Ledger control A/c | | 2,400 |
4. *If the shortage is due to non-recording or short-recording of indirect material issued:-*
- | | | |
|---------------------------------|-----------|-------|
| Production Overhead control A/c | Dr. 2,400 | |
| To Stores Ledger control A/c | | 2,400 |
5. *Clerical errors, if any, should be rectified.*

Item B: Excess physical units is 5 units valuing 5 unit × ₹40 = ₹ 200.

Accounting treatment

1. *If the excess is due to normal causes:*
- | | | |
|------------------------------------|---------|-----|
| Stores Ledger control A/c | Dr. 200 | |
| To Production Overhead control A/c | | 200 |
2. *If the excess is due to abnormal causes:*
- | | | |
|---------------------------|---------|-----|
| Stores Ledger control A/c | Dr. 200 | |
| To Costing P&L A/c | | 200 |
3. *If the excess is due to wrong recording of direct material:*
- | | | |
|---------------------------|---------|-----|
| Stores Ledger control A/c | Dr. 200 | |
| To WIP Control A/c | | 200 |
4. *If the excess is due to wrong recording of indirect material:*
- | | | |
|------------------------------------|---------|-----|
| Stores Ledger control A/c | Dr. 200 | |
| To Production Overhead control A/c | | 200 |

Item C:	Units
Physical stock	720
Stock Card	<u>750</u>
Shortage	<u>30</u>
Value 30 units at ₹ 10 = ₹ 300.	

Accounting treatment is the same as given in case of Item A.

Stock Card	750
Stores Ledger	<u>780</u>
Difference	<u>30</u>

Reasons for difference of 30 units between stock card and stores Ledger:

1. One issue voucher of 30 units might not have been posted in Stores Ledger

2. There may be clerical errors in balancing, posting etc. After ascertaining, these may be rectified.
3. One receipt of 30 units might not have been posted in Stock Card. After posting of this stock card balance will be 780 units. Then the shortage will be 60 units as compared to physical quantity of 720 units.

(b) Reasons for shortage and discrepancies:

1. Wastage of material due to spoilage, breakages, evaporation etc. it may be normal or abnormal.
2. Theft or pilferage.
3. Issued but not entered in stock card.
4. Over issues.
5. Entering the issue in the wrong stock card.
6. Clerical errors in balancing or posting etc.
7. Incorrect entries in stock card.
8. Goods received and deposited in the wrong bins.
9. Small defective units – nails, screws etc.
10. Purchase in kg. but issues to production in numbers i.e. bolts, nuts etc.

Recommended course of action to prevent future losses

1. The entries should be correctly entered in stock cards.
2. Internal check system should be introduced by double checking on the entries.
3. Entry in the stores should be restricted to authorized persons only.
4. To avoid pilferage, the store room should be well guarded and protected. (Just like cash room).
5. Proper accounting should be done for all stock movements.
6. FIFO system should be followed while issuing materials (pricing of issue of materials may be a different method). This will avoid losses due to deterioration or obsolescence.
7. All issues of stock should be made on the basis of stores requisition duly signed by authorised person.
8. To minimise losses due to breakage in case of heavy and bulky materials, materials handling equipment like forklift trucks and cranes should be provided.
9. Wrong issues should be avoided by accurate measuring and weighing equipment should be inspected / checked periodically.
10. Proper storage conditions should be provided, particularly in the case of perishable items and items of lesser shelf life.

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11. No movement of materials from one place to another place without proper authorisation and documentation.

Question-24

Aditya Ltd. is engaged in heavy engineering works on the basis of job order received from industrial customers. The company has received a job order of making turbine from a power generating company. Below are some details of stores receipts and issues of copper wire, used in the manufacturing of turbine:

Feb. 1	Opening stock of 1,200 Kgs. @ ₹ 475 per kg.
Feb. 5	Issued 975 kgs. to mechanical division vide material requisition no. Mec 09/13
Feb. 6	Received 3,500 kgs. @ ₹ 460 per kg vide purchase order no. 159/2013
Feb. 7	Issued 2,400 kgs. to electrical division vide material requisition no. Ele 012/13
Feb. 9	Returned to stores 475 kgs. by electrical division against material requisition no. Ele 012/13.
Feb. 15	Received 1,800 kgs. @ ₹ 480 per kg. vide purchase order no. 161/ 2013
Feb. 17	Returned to supplier 140 kgs. out of quantity received vide purchase order no. 161/2013.
Feb. 20	Issued 1,900 kgs. to electrical division vide material requisition no. Ele 165/ 2013

On 28th February, 2014 it was found that 180 kgs. of wire was fraudulently misappropriated by the stores assistant and never recovered by the company.

From the above information you are required to prepare the Stock Ledger account using 'Weighted Average' method of valuing the issues.

Solution:

Store Ledger of Aditya Ltd. (Weighted Average Method)

Date	Receipts			Issues			Balance of Stock		
	Qty (kg.)	Rate (₹)	Amount (₹)	Qty (kg.)	Rate (₹)	Amount (₹)	Qty (kg.)	Rate (₹)	Amount (₹)
1	-	-	-	-	-	-	1,200	475.00	5,70,000
5	-	-	-	975	475.00	4,63,125	225	475.00	1,06,875
6	3,500	460.00	16,10,000	-	-	-	3,725	460.91	17,16,875
7	-	-	-	2,400	460.91	11,06,175	1,325	460.91	6,10,700
9	475	460.91	2,18,932	-	-	-	1,800	460.91	8,29,632
15	1,800	480.00	8,64,000	-	-	-	3,600	470.45	16,93,632
17	-	-	-	140	480.00	67,200	3,460	470.07	16,26,432

20	-	-	-	1,900	470.07	8,93,133	1,560	470.06	7,33,299
28	-	-	-	180*	470.06	84,611	1,380	470.06	6,48,688

* 180 kgs. is abnormal loss, hence it will be transferred to Costing Profit & Loss A/c.

Miscellaneous

Question-25

The following data are available in respect of material X for the year ended 31st March, 2014:

Opening stock ₹ 90,000

Purchases during the year ₹ 2,70,000

Closing stock ₹ 1,10,000

Calculate: (i) Inventory turnover ratio and (ii) the number of days for which the average inventory is held.

Solution:

Working Notes

		(₹)
(a) Opening stock		90,000
Add: Purchases		<u>2,70,000</u>
		3,60,000
Less: Closing stock		<u>1,10,000</u>
Material consumed during the year		<u>2,50,000</u>
(b) Average stock	=	$\frac{\text{Opening Stock} + \text{Closing Stock}}{2}$
	=	$\frac{₹90,000 + ₹1,10,000}{2} = ₹1,00,000$
(i) Inventory turnover Ratio	=	$\frac{\text{Material Consumed}}{\text{Average Stock}} = \frac{₹2,50,000}{₹1,00,000} = 2.5 \text{ times}$
(ii) No. of days for which the average inventory is held		
	$\frac{\text{No. days in a year}}{\text{Inventory Turnover Ratio}}$	$= \frac{365 \text{ days}}{2.5 \text{ times}} = 146 \text{ days}$

Question-26

Raw materials 'AXE' costing ₹ 150 per kg. and 'BXE' costing ₹ 90 per kg. are mixed in equal proportions for making product 'A'. The loss of material in processing works out to 25% of the product. The production expenses are allocated at 40% of direct material cost. The end product is priced with a margin of 20% over the total cost.

Material 'BXE' is not easily available and substitute raw material 'CXE' has been found for 'BXE' costing ₹ 75 per kg. It is required to keep the proportion of this substitute material in the mixture as low as possible and at the same time maintain the selling price of the end product at existing level and ensure the same quantum of profit as at present.

You are required to compute the ratio of the mix of the raw materials 'AXE' and 'CXE'.

Solution:**Working Notes:****(i) Computation of material mix ratio:**

Let 1 kg. of product A requires 1.25 kg. of input of materials A X E and B X E

Raw materials are mixed in equal proportions.

Then raw material A X E = $\frac{1}{2} \times 1.25$ kg. = 0.625 kg.

Then raw material B X E = $\frac{1}{2} \times 1.25$ kg. = 0.625 kg.

(ii) Computation of selling price per kg. of product A

	(₹)
Raw material A X E 0.625 kg. × ₹150 = ₹ 93.75	
Raw material B X E 0.625 kg. × ₹90 = ₹ 56.25	150.00
Production expenses (40% of material cost)	<u>60.00</u>
Total cost	210.00
Add: profit 20% of total cost	<u>42.00</u>
Selling price	<u>252.00</u>

Computation of proportions of materials A X E and C X E in 'A'

Let material C X E required in product A be 'm' kg.

Then for producing 1 kg of product 'A', material A X E requirement = (1.25 – m) kg.

To maintain same level of profit and selling price as per Working note (ii), it is required that the total cost of material in 1 kg. of product A should not exceed ₹ 150.

i.e., m kg. × ₹ 75 + (1.25 – m) kg. × ₹150 = ₹150

or 75 m + 187.5 – 150 m = 150

or 75 m = 37.5

or $m = 0.5$ kg.

Raw material A X E requirement in product A = $1.25 - 0.5 = 0.75$ kg.

So, proportion of material A X E and C X E = $0.75 : 0.50$ i.e. 3 : 2

Question-27

Aditya Agro Ltd. produces edible oils of different varieties. The monthly demand pattern for the finished products are as follows:

Mustard oil	45,000 Litre
Soybean oil	15,000 Litre
Olive oil	3,000 Litre

To produce one litre of Mustard oil, Soybean oil and Olive oil, 5 kg. of mustards, 6 kg. of soybeans and 4.5 kg. of olives are required respectively. There is no opening and closing stock of materials.

Aditya Agro Ltd. can purchase the materials either from the farmers directly or from the wholesale market. The company can purchase any quantity of materials from the wholesale market but in case of purchase from the farmers, it has to purchase the minimum specified quantity of materials at a time. Following is the material-wise summary related with the purchase of materials:

	Wholesale Market	Farmers
Mustard:		
Minimum Quantity to be purchased	Any quantity	13,50,000 kg.
Purchase price per kg. (₹)	15.00	12.50
Central Sales Tax (CST)*	2%	---
Transportation cost per purchase	6,000	15,000
Sorting and piling cost per purchase	---	1,200
Loading cost per 50 kg.	10.00	5.00
Unloading cost per 50 kg.	2.00	2.00
Soybean:		
Minimum Quantity to be purchased	Any Quantity	2,70,000 kg.
Purchase price per kg. (₹)	11.00	9.00
Value Added Tax (VAT)**	4%	---
Transportation cost per purchase	9,000	12,000
Sorting and piling cost per purchase	---	800
Loading cost per 50 kg.	10.00	3.00
Unloading cost per 50 kg.	2.00	2.00
Olive:		
Minimum Quantity to be purchased	Any Quantity	1,62,000 kg.

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Purchase price per kg. (₹)	36.00	28.00
Import duty***	---	10%
Transportation Cost per purchase (₹)	3,000	11,000
Sorting and piling cost per purchase	1,800	---
Loading cost per 50 kg.	10.00	25.00
Unloading cost per 50 kg.	2.00	2.00

The company is paying 12.5% p.a. as interest to its bank for cash credit facility and ₹100 per 100 kg. as rent to the warehouse.

[*CST will be added with the purchase price of mustards; **VAT will not be added with the purchase price of soybeans; ***Import duty will be added with the purchase price of olives.]

You are required to

- (i) Calculate the purchase cost of each material
 - (a) from Wholesale market
 - (b) from the Farmers
- (ii) Calculate Economic Order Quantity of each material under the both options.
- (iii) Recommend the best purchase option for the material 'olive'.

Solution:

- (i) Calculation of Purchase Cost per Kg. of Materials

	Wholesale Market (₹)	Farmers (₹)
Mustard:		
Purchase price	15.00	12.50
Add: Central Sales Tax @ 2%	0.30	---
Add: Loading Cost	0.20 (₹ 10 ÷ 50 Kg.)	0.10 (₹ 5 ÷ 50 Kg.)
Add: Unloading Cost	0.04 (₹ 2 ÷ 50 Kg.)	0.04 (₹ 2 ÷ 50 Kg.)
	15.54	12.64
Soybean:		
Purchase price	11.00	9.00
Add: Loading Cost	0.20 (₹ 10 ÷ 50 Kg.)	0.06 (₹ 3 ÷ 50 Kg.)
Add: Unloading Cost	0.04 (₹ 2 ÷ 50 Kg.)	0.04 (₹ 2 ÷ 50 Kg.)
	11.24	9.10

Olive:		
Purchase price	36.00	28.00
Add: Import duty @ 10%	---	2.80
Add: Loading Cost	0.20 (₹ 10 ÷ 50 Kg.)	0.50 (₹ 25 ÷ 50 Kg.)
Add: Unloading Cost	0.04 (₹ 2 ÷ 50 Kg.)	0.04 (₹ 2 ÷ 50 Kg.)
	36.24	31.34

$$(ii) \text{ Economic Order Quantity (E.O.Q)} = \sqrt{\frac{2 \times \text{Annual requirement} \times \text{Ordering cost}}{\text{Carrying cost per kg. per annum}}}$$

Annual Requirement (A) :

Commodity	Quantity (Kg.)
Mustard (45,000 Ltr. × 5 Kg. × 12 months)	27,00,000
Soybean (15,000 Ltr. × 6 Kg. × 12 months)	10,80,000
Olive (3,000 Ltr. × 4.5 Kg. × 12 months)	1,62,000

Cost per Order (O):

	Wholesale Market (₹)	Farmers (₹)
Mustard:		
- Transportation cost	6,000	15,000
- Sorting and piling cost	---	1,200
	6,000	16,200
Soybean:		
- Transportation cost	9,000	12,000
- Sorting and piling cost	---	800
	9,000	12,800
Olive:		
- Transportation cost	3,000	11,000
- Sorting and piling cost	1,800	---
	4,800	11,000

Carrying Cost per Kg. per annum (C × i):

	Wholesale Market (₹)	Farmers (₹)
Mustard:		
- Interest on cash credit	1.9425 (₹ 15.54 × 12.5%)	1.5800 (₹ 12.64 × 12.5%)

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- Warehouse rent*	1.0000	1.0000
	2.9425	2.5800
Soybean:		
- Interest on cash credit	1.4050 (₹ 11.24 × 12.5%)	1.1375 (₹ 9.10 × 12.5%)
- Warehouse rent	1.0000	1.0000
	2.4050	2.1375
Olive:		
- Interest on cash credit	4.5300 (₹ 36.24 × 12.5%)	3.9175 (₹ 31.34 × 12.5%)
- Warehouse rent	1.0000	1.0000
	5.5300	4.9175

$$* \text{ Warehouse rent per Kg.} = \frac{\text{₹}100}{100\text{Kg.}} = \text{₹} 1$$

Calculation of E.O.Q for each material under the both options

	Wholesale Market (Kg.)	Farmers (Kg.)
Mustard	$\sqrt{\frac{2 \times 27,00,000 \text{Kg.} \times \text{₹} 6,000}{\text{₹} 2.9425}}$ = 1,04,933.53	$\sqrt{\frac{2 \times 27,00,000 \text{Kg.} \times \text{₹} 16,200}{\text{₹} 2.5800}}$ = 1,84,138.47
Soybean	$\sqrt{\frac{2 \times 10,80,000 \text{Kg.} \times \text{₹} 9,000}{\text{₹} 2.4050}}$ = 89,906.40	$\sqrt{\frac{2 \times 10,80,000 \text{Kg.} \times \text{₹} 12,800}{\text{₹} 2.1375}}$ = 1,13,730.98
Olive	$\sqrt{\frac{2 \times 1,62,000 \text{Kg.} \times \text{₹} 4,800}{\text{₹} 5.5300}}$ = 16,769.90	$\sqrt{\frac{2 \times 1,62,000 \text{Kg.} \times \text{₹} 11,000}{\text{₹} 4.9175}}$ = 26,921.34

(iii) Selection of best purchase option for the purchase of Olives

	Wholesale Market	Farmers
Annual Requirement (A) (Kg.)	1,62,000	1,62,000
Order Quantity (Q)	16,769.90	1,62,000
No. of orders $\left(\frac{A}{Q}\right)$	9.66 or 10	1

Average Inventory $\left(\frac{Q}{2}\right)$ (Kg.)	8,384.95	81,000
Ordering Cost (₹) (I)	48,000 (10 Orders × ₹ 4,800)	11,000 (1 Order × ₹ 11,000)
Carrying Cost (₹) (II) (Average Inventory × Carrying cost per kg.)	46,368.77 (8,384.95 Kg. × ₹ 5.5300)	3,98,317.5 (81,000 Kg. × ₹ 4.9175)
Purchase Cost (₹) (III)	58,70,880 (1,62,000 Kg. × ₹ 36.24)	50,77,080 (1,62,000 Kg. × ₹ 31.34)
Total Cost (I) + (II) + (III)	59,65,248.77	54,86,397.50

Purchasing olives direct from the farmers is the best purchase option for the Aditya Agro Ltd.