

JAIPURIA INSTITUTE OF MANAGEMENT, NOIDA
PGDM / PGDM (M) / PGDM (SM)
FIFTH TRIMESTER (Batch 2023-25)
END TERM EXAMINATIONS, JANUARY 2025
Reappear EXAM

Course Name	Materials and inventory management	Course Code	20528
Max. Time	2 hours	Max. Marks	40 MM

INSTRUCTIONS:

- All questions are compulsory.
- Use of simple/ scientific calculators is allowed.
- Exchange of calculators and/ or stationery items is not allowed.

Q.1. A local manufacturing company produces industrial machines and need capacitors in quantities. They face a recurring challenge in minimizing inventory costs. The annual demand for the capacitors is 25,000 units, and they incur an ordering cost of \$10 per order. The annual holding charge per unit is 20% of unit cost which is \$10 per unit.

- Solve for economic order quantity (EOQ) for capacitors. **(2 Marks)**
- If the company decides to place an order for 1,000 units each time instead of the EOQ, determine the additional cost incurred compared to the EOQ cost. **(6 Marks)**

Q.2. A retail store, "Tech Gadgets," specializes in selling electronic devices and accessories. The store manages a variety of products, including smartphones, headphones, chargers, cables, and other electronic gadgets. The store wants to optimize its inventory management by applying ABC analysis, which helps classify the items based on their importance and contribution to overall sales. The following 10 items are currently stocked by the store for which unit price and annual demand is as follows:

(10 Marks)

Item Number	Item Name	Unit Price (\$)	Annual Demand (Units)
1	Smartphone	500	300
2	Laptop	1000	150
3	Bluetooth Speaker	80	500
4	Headphones	100	200
5	Portable Charger	20	800
6	Smartwatch	150	400
7	USB Cables	10	1000
8	Mouse	30	700
9	Laptop Bag	50	300
10	Power Bank	40	500

Q.3. A dealer has 60 units of smartphones in his stock. If he needs to order more smartphones, it takes 1 week to receive them after placing an order. He can place an order for a fixed quantity (lot size) of 300

units. Based on the orders at hand and forecasted demand, he has generated the gross requirement of smartphones for the next 8 weeks, as follows:

Week	1	2	3	4	5	6	7	8
Gross Requirement	150	-	100	120	-	150	100	-

Propose a Material Requirement Plan (MRP) for the smartphones, considering the available stock, minimum stock requirement, and the forecasted demand for the next 8 weeks. The dealer is required to maintain a minimum stock of 80 units to meet any uncertain demand. **(8 Marks)**

Q.4. A company produces small wooden stools. Each stool consists of one stool frame, one stool seat and one finishing kit each of which further include some parts or sub-assemblies mentioned below:

- **1 Stool Frame**
 - Requires 4 Legs and 2 Braces
 - Each Leg requires 2 Screws
- **1 Stool Seat**
 - Requires 4 Screws and 1 Cushion
- **1 Finishing Kit**
 - Contains 1 Paint Can (shared across 10 stools)

If the company plans to produce 50 stools,

1. Create the product structure tree with all components listed clearly in a hierarchical format. **(4 Marks)**
2. Determine the net quantity need to be ordered for each of the following components to complete the order of 50 stools considering the available on hand inventory for each item mentioned below:
 - Legs -5
 - Braces-3
 - Screws-75
 - Cushions-0
 - Paint Cans-2

(6 Marks)

Q.5. "To increase the profitability of a company it is always advised to reduce the cost as compared to increase the revenue". Explain. **(4 Marks)**

Formula Sheet

1) Job Shop Rules

$$\text{no. of sequences} = (n!)^m; \quad n = \text{no. of jobs} \\ m = \text{no. of machines}$$

Technologically infeasible sequence

If machine X precedes machine Y for job 1 and machine Y precedes machine X for job 2 the sequence containing $\bar{X}Y$ are technologically infeasible.

Technologically feasible but may not be optimal

Rule	Job 1	Job 2	Delete Seq. Containing
1	X...Y	Y.....	XY
2	...XY...	...X...Y...	$X\bar{Y}$
3	...X...Y...	...XY....	$\bar{X}Y$

2) Economic Order qty

$$EOQ = \sqrt{\frac{2DS}{H}} \quad (\text{Basic})$$

$$EOQ = \sqrt{\frac{2DS}{i}} \quad (\text{in monetary terms})$$

$$EOQ = \sqrt{\frac{2DS}{H} \left(\frac{p}{p-d} \right)} \quad (\text{non instantaneous supply})$$

3) Safety stock (ss)

$$SS = Z \times SD \text{ of Demand} \times \sqrt{\text{Avg LT}} \quad (\text{Demand is uncertain})$$

$$SS = Z \times \text{Avg demand} \times SD \text{ of LT} \quad (\text{LT is uncertain})$$

$$SS = Z \times \text{sq rt} (\text{Avg LT} \times \text{Demand SD}^2 + \text{Avg demand} \times \text{LT SD}^2) \\ (\text{Demand is uncertain \& LT is independent of demand})$$

$$SS = Z \times SD \text{ of Demand} \times \sqrt{\text{Avg LT}} + Z \times \text{Avg. Demand} \times \text{LT SD} \\ (\text{Demand is uncertain \& LT is dependent on demand})$$

$$\text{Total Inventory Cost (Annual)} = \overset{\text{total}}{\text{unit cost}} + \overset{\text{total}}{\text{ordering cost}} + \text{total inventory holding cost} + \overset{\text{total}}{\text{shortage cost}}$$

$$= C \times D + S \times \text{no. of orders} + H \times \text{Avg. invt.} + S_o \times \text{Avg. Shortage}$$