

JAIPURIA INSTITUTE OF MANAGEMENT, NOIDA
PGDM / PGDM (M) / PGDM (SM)
FIFTH TRIMESTER (Batch 2023-25)
END TERM EXAMINATIONS, JANUARY 2025
MAIN 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 company manufactures smartphones. The company needs to manage its inventory for smartphone screens, which are a critical component used in smartphone assembly. The company faces non-instantaneous supply because it takes time for the supplier to deliver the screens. The company needs to manage the ordering process carefully to reduce inventory costs while ensuring a continuous supply of screens. The annual demand (D) is 10,000 screens per year with ordering cost (S) as \$100 per order and holding cost (H) \$5 per screen per year. The unit cost (C) is \$20 per screen. The supplier takes 4 weeks to deliver the order. If the production rate (P) is 500 screens per week (rate at which screens are produced by the company internally) and consumption rate (d) is 250 screens per week (rate at which screens are used in assembly), determine EOQ. **(8 Marks)**

Q.2. A factory, "TechGear," produces compact power banks and supplies to the retailers. Managing inventory and production schedules is crucial to avoid overstocking and ensure timely delivery. Currently, the factory has an inventory of 200 power banks. The forecasted demand for next 4 weeks is for 250, 300, 280, 320 units. The scheduled receipt of 150 units is planned in week 3 from the contract manufacturer. The in-house production is done in lot of 200 units. The factory's warehouse has limited space and cannot store more than 100 units at the end of any week.

- Determine the Projected Available Balance (PAB) and available to promise (ATP) inventories for the given period. **(6 Marks)**
- If customer request a new order in week 1 for 350 units, analyse when it can be promised at the earliest by the salesman. **(2 Marks)**

Q.3. A custom furniture company has three machines to process customer orders. The company uses **Machine 1** for **cutting**, **Machine 2** for **shaping**, and **Machine 3** for **finishing**. Six customer orders (A, B, C, D, E, and F) need to be processed sequentially on all three machines, and the goal is to minimize the total elapsed time. Determine the total elapsed time and the idle time of the machines if the processing times for the jobs on each machine are as follows: **(8 Marks)**

	Processing Time		
Job	Machine 1 (Cutting)	Machine 2 (Shaping)	Machine 3 (Finishing)
A	3	6	7
B	5	4	3
C	8	5	6
D	3	7	5
E	5	6	4
F	7	4	8

Q.4. A pharmaceutical company is responsible for distributing vaccines to clinics and hospitals. The weekly demand for vaccines is uncertain, but the company must maintain high service reliability, tolerating only one stockout per year to ensure timely delivery. The annual demand for vaccines is 500000 units with a standard deviation of 500 units. The vaccines are ordered in a lot of 50000 and the supplier takes 2 weeks to deliver new stock. Determine number of orders per year, service level, safety stock, reorder level. **(2*4=8 Marks)**

Q.5. Explain the following terms

- | | |
|------------------------------------|------------------|
| 1. Inventory Cost | (2 Marks) |
| 2. Methods of inventory evaluation | (2 Marks) |
| 3. Material Requirement plan | (2 Marks) |
| 4. Available to Promise Inventory | (2 Marks) |

Formula Sheet

1) Job Shop Rules

no of sequences = $(n!)^m$; n = no. of jobs
 m = 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...	$\bar{X}Y$
2	...XY	...X.Y...	$X\bar{Y}$
3	X.Y...	...XY...	$\bar{X}Y$

2) Economic Order Qty

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

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

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

3) Safety Stock (ss)

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

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

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

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

$$\begin{aligned} \text{Total Inventory Cost (Annual)} &= \overset{\text{total}}{\text{unit cost}} + \overset{\text{total}}{\text{ordering cost}} + \overset{\text{total}}{\text{inventory holding cost}} + \overset{\text{total}}{\text{shortage cost}} \\ &= C \times D + S \times \text{no. of orders} + H \times \text{Avg invt} + S_o \times \text{Avg shortages} \end{aligned}$$

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...	$\bar{X}Y$
2	...XY...	...X.Y...	$X\bar{Y}$
3	X.Y...	...XY...	$\bar{X}Y$

2) Economic Order qty

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

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

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

3) Safety Stock (ss)

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

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

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

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

$$\begin{aligned} \text{Total Inventory Cost (Annual)} &= \overset{\text{total}}{\text{unit cost}} + \overset{\text{total}}{\text{ordering cost}} + \overset{\text{total}}{\text{inventory holding cost}} + \overset{\text{total}}{\text{shortage cost}} \\ &= C \times D + S \times \text{no. of orders} + H \times \text{Avg. invt} + S_o \times \text{Avg shortages} \end{aligned}$$