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GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (Second Semester) Examinations, April – 2024

PPMT2038 - Inventory Control Models

(Mathematics)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right-hand margin indicate marks.

Answer ANY FIVE Questions

(14 x 5 = 70 Marks)

- | | Marks |
|---|-------|
| 1.a. The production department of a company required 3600kg of raw material for Manufacturing a particular item per year. It has been estimated that the cost of placing an Order is Rs.36 and the cost of carrying inventory is Rs.25 percent of the investment in Inventories. The price is Rs.10 per kg. Help the purchase Manager to determine an Ordering Policy for raw Material. | 7 |
| b. What are the cost components in inventory? | 7 |
| 2.a. Discuss the EOQ Model with Different Rates of Demand in single-item inventory when shortage is not allowed. | 7 |
| b. Discuss the Single Item Inventory Control Models without Shortages Problems when the demand rate is constant. | 7 |
| 3.a. A commodity is to be supplied at a constant rate of 200 units per day. Supplies of any amount can be obtained at any required time, but each order costs Rs.50, The cost of holding the commodity in inventory is Rs.2 per unit per day while the delay in the supply of the item induces a penalty of Rs.10 per unit per day. Find the optimal policy (Q,t), where t is the reorder cycle period and Q is the inventory after reorder. What would be the best policy to adopt if the penalty cost becomes infinite? | 7 |
| b. The demand for an item in a company is 18,000 units per year, and the company can produce the item at a rate of 3,000 per month. The cost of one set-up is Rs.500 and the holding cost of one unit per month is 15 paise. The shortage cost of one unit is Rs.240 per year. Determine the optimum manufacturing quantity and the number of shortages. Also, determine the manufacturing time and the time between set-ups. | 7 |
| 4.a. A small shop produces three Machines parts I, II and III in a lots. The shop has only 650 sq.ft of storage space. The appropriate data for three items are given in the following table: | 8 |

Item	I	II	III
Demand rate(unit/year)	5,000	2,000	10,000
Procurement cost(Rs/order)	100	200	75
Cost per unit(Rs)	10	15	5
Floor space required (sq.ft/unit)	0.70	0.80	0.40

The shop uses an inventory carrying charge of 20% of average inventory valuation per year. If no

stock outs are allowed, determine the optimal lot size for each item under the given storage constant.

- b. The annual demand of a product is 10,000 units. Each unit costs Rs.100 if the orders are Placed in quantities below 200 units. For orders of 200 or above, however, the price is Rs.95. The annual Inventory holding costs is 10% of the value of the item and the ordering Cost is Rs.5 per order. Find the Economic lot size. 6
- 5.a. Consider an item for which Annual demand = 1,000 units, cost per unit = Rs.5, Inventory carrying cost = 30%, Maximum delay in LT = 3 weeks, Service Level = 95%, Standard deviation of demand per week = 10 units, Ordering cost per Order = Rs 150, Average lead time = 4 weeks, probability of delay = 0.30. Determine the buffer stock, reserve stock, safety stock and desirable maximum inventory level for this item. 8
- b. Discuss about the following 6
- (i) ABC analysis (ii) HML analysis (iii) XYZ analysis (iv) S-OS analysis
- 6.a. Write the functional Role of Inventory Management. 7
- b. Write the steps of Inventory Model Building. 7
- 7.a. A commodity is to be supplied at a constant rate of 200 units per day. Supplies of any amount can be obtained at any required time, but each order costs Rs.50, The cost of holding the commodity in inventory is Rs.2 per unit per day while the delay in the supply of the item induces a penalty of Rs.10 per unit per day. Find the optimal policy (Q,t), where t is the reorder cycle period and Q is the inventory after reorder. What would be the best policy to adopt if the penalty cost becomes infinite? 8
- b. Write the steps of Inventory Model Building. 6
- 8.a. A company has to purchase four items A, B, C and D for the next year. The projected demand and unit price (in Rs) are as follows: 7

Item	Demand(units)	Unit Price(Rs)
A	60,000	3
B	40,000	2
C	1,200	24
D	5,000	4

If the company wants to reject the total number of orders to 40 for all the four items, how Many orders should be placed for each item?

- b. A firm experienced the probability distribution for inventory demand during the reorder period as recorded in the following table: 7

Number of units	30	40	50	60	70
Probability	0.2	0.2	0.3	0.2	0.1

The firm is paying carrying cost per unit per year at the rate of Rs. 60, while stock out cost in the form of lost profits A, etc, is estimated to be Rs.400 per unit. Find out the reserve stock level that would minimize the total annual expected cost.

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