[This question paper contains 4 printed pages.]

8037 *Your Roll No.* .....

B.Sc. (G)/II **JS**

MATHEMATICAL SCIENCES (Operational Research)

Paper III – Inventory System and Marketing Management

Time : 3 Hours *Maximum Marks : 55*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt **five** *questions in all, selecting at least* **two** *questions from each Section.*

SECTION A (Inventory Systems)

1. (a) Formulate a production scheduling model and also give the outline for finding the optimal schedule. (5)

   (b) Explain basis of selective inventory control and state different selection techniques adopted in inventory control system. Also explain ABC analysis in detail. (6)

2. (a) Formulate and solve an inventory model when demand is deterministic and continuous, production rate is infinite. Shortages are allowed and backordered, and lead time is zero. Usual notations may be used.

   Also find reorder level when lead time is $\tau(>0)$. (8)

P.T.O.

(b) 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 ordering costs Rs. 50/-, cost of holding the commodity in inventory is Rs. 2 per unit per day while a delay in the supply of item induces a penalty of Rs. 10 per unit per day. Find optimal policy. What would be the best policy if penalty cost becomes infinite ? (3)

3. (a) A shop produces three items in lots. The demand rate for each item is constant and can be assumed to be deterministic. No backorders are to be allowed. The relevant data for items is given in the following table.

Items–	I	II	III
Carrying Cost (Rs. per unit per year)	20	20	20
Setup Cost (Rs. per setup)	50	40	60
Cost per unit (Rs.)	6	7	5
Yearly demand (Units)	10,000	12,000	7,500

Determine approximately the economic order quantity for three items subject to the condition that the total value of average inventory levels of these items does not exceed Rs. 1000. (6)

(b) What do you understand by simulation ? Explain its role in inventory Management. (5)

4. (a) Find the optimal order quantity in a continuous, single period stochastic inventory model for a time dependent case. (5)

(b) A shopkeeper estimates annual requirement of an items as 2000 units. He buys from supplier at a cost of Rs. 10 per item and the cost of ordering is Rs. 50 each time. If the stock holding costs are 25% per year of stock value, how frequently should he replenish his stock ? Further suppose the supplier offers a 10% discount on orders between 400 and 699 items and 20% discount on orders exceeding or equal to 700, can the shopkeeper reduce his cost by taking advantage of either of these discounts ? (6)

SECTION B (Marketing Management)

5. (a) Define direct demand derived demand, elasticity of demand with respect to quality. State and prove elasticity theorem. (7)

(b) Find the steady state market share of brands A and B, if the brand switching behaviour of customers from one period to another is displayed by the following transition matrix.

		Brand	
		A	B
Brand	A	0.7	0.3
	B	0.5	0.5

Assume that initial market share of two brands are 50% each. (4)

P.T.O.

6. (a) Discuss spatial allocation model of promotional effort for single product in n markets. (7)

(b) For a firm fixed costs are Rs. 10,000/- and a strategy of direct calls by manufacturers representative have been judged to cost Rs. 1,00,000/- per year as compared to with the cost of Rs. 70,000/- per year for a strategy of using wholesaler's personnel to call on retailers. If the current sales quantity (Using wholesaler's personnel) is 1,00,000 units per year, what increase in sales would be required or necessary to justify the use of manufacturer's representative. Assume that extra sales cost Rs. 0.50/- per unit is associated with the added sales. (4)

7. (a) What are the different approaches used by a firm in fixing the market price of a product. (5½)

(b) Derive the equilibrium condition for joint optimization of price and advertising budget keeping quality fixed. (5½)

8. (a) Define marketing management. Explain old and new concepts of marketing. (4)

(b) Formulate a mathematical model for media allocation problem in marketing. (7)