

[This question paper contains 4 printed pages.]

4687

Your Roll No.

B.Sc. (G) / II / NS

AS

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 and solve a deterministic economic lot size model when shortages are not allowed and production rate is finite.

Also determine the reorder level by taking lead time $\tau > 0$.

- (b) Neon lights in an industrial park are replaced at the rate of 150 units per day. The physical plant orders the neon lights periodically. It costs Rs. 100/- to initiate a purchase order. A neon light kept in storage is estimated to cost about Re 0.05/- per day. The lead time between placing and receiving an order is 12 days. Determine the optimal ordering policy for neon lights. (7,4)

P.T.O.

2. (a) Find the optimal order quantity for a continuous demand, single period, stochastic inventory model by taking the time dependent case under consideration.
- (b) What do you understand by simulation ? Explain its role in inventory management. (7,4)
3. (a) Formulate and solve a mathematical model for "incremental quantity discount" when shortages are not allowed.
- (b) Ten items kept in inventory by the School of Management Studies at a State University are listed below.

Classify the items into A, B and C categories by specifying the percentage of items and percentage of total annual value in each class.

Item	Annual Usage	Value per unit (Rs.)
1	200	40.00
2	100	360.00
3	2000	0.20
4	400	20
5	6000	0.04
6	1200	0.80
7	120	100.00
8	2000	0.70
9	1000	1.00
10	80	400.00

(5,6)

4. (a) Formulate any general production scheduling model and also give outline for finding the optimal production schedule.
- (b) Discuss a multi-item inventory model with constraint on total investment in inventory. (6,5)

SECTION B
(Marketing Management)

5. (a) Classify the market structure depending upon the nature of competitive conditions by giving an example of each.
- (b) Define arc elasticity of demand and cross elasticity of demand. (7,4)
6. (a) Derive the equilibrium condition for a firm which makes decision with respect to price and quality by taking advertising expenditure fixed.
- (b) Discuss the role of brand-switching analysis in marketing management. (6,5)
7. (a) Formulate the media allocation problem as an integer programming problem.
- (b) For a firm, fixed cost is Rs. 10,000/- and a strategy of direct calls by manufacturer's representative

has been judged to cost Rs. 2,00,000/- per year as compared to the cost of Rs. 1,50,000 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 necessary to justify the use of manufacturer's representative. Assume that an extra cost of Re 0.50/- per unit is associated with the added sales. (7,4)

8. (a) What are the different objectives of a firm in fixing the market price of a product ?

(b) Let the marginal selling expense curves in two markets be

$$y_1 = a x_1^\alpha \quad \text{and} \quad y_2 = b x_2^\alpha.$$

Find the optimal allocation of Rs. 15,000/- on promotional effort in the two markets for the coming period if the past data is given as under

Market - I

Sales $x_1^1 = 60,000$

Promotional effort $P_1^1 = 10,000$

Assume $\alpha_1 = \alpha_2 = \alpha = 1/2$.

Market - II

$x_2^1 = 50,000$

$P_2^1 = 10,000$

(7,4)