[This question paper contains 4 printed pages.]

2503A *Your Roll No.* .....

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

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 I
(Inventory System)

1. (a) Define the following :–

   (i) Lead time and buffer stock

   (ii) Multi-echelon inventory system

   (iii) Multi-stage inventory system

   (b) Formulate and solve a continuous, deterministic demand inventory model with infinite production rate, lost shortages, and zero lead time. (5,6)

2. (a) The annual demand of a particular item purchased by a company is 10,000 units. This item may be obtained from either an outside supplier or a

P.T.O.

subsidiary company. The relevant data for the procurement of the item are given below –

Costs	*From Outside Supplier (Rs.)*	*From Subsidiary Supplier (Rs.)*
Cost per unit	12	13
Cost of placing an order	10	10
Cost of receiving an order	20	15
Storage and all carrying cost including capital cost per unit per annum	2	2

What purchase quantity and from which source, would you recommend to procure ? What would be the minimum total cost ?

(b) Discuss a production scheduling model in an inventory system. (5½,5½)

3. (a) Differentiate between "all–unit" and "incremental quantity discount."

Derive an expression of optimal order quantity for an incremental quantity discount model when demand is continuous and deterministic and shortages are not allowed.

(b) A newspaper boy buys papers for Rs. 1.40/- and sells them for Rs. 2.45/- each. He can not return unsold papers. Daily demand has the following distribution –

No. of Customers-	25	26	27	28	29	30	31	32
Probability-	0.03	0.05	0.05	0.10	0.15	0.15	0.12	0.10
		33	34	35	36			
		0.10	0.07	0.06	0.02			

If each day's demand is independent of the previous day's, how many papers he should order each day. (8,3)

4. (a) Discuss a multi-item, continuous, deterministic demand inventory model with constraint on number of orders placed per year. Also outline the procedure for determining the optimal order quantity.

(b) What is selective inventory control? Discuss various selective inventory control techniques. Explain ABC analysis in detail. (5,6)

SECTION II
(Marketing Management)

5. (a) Classify the market structure depending upon the nature of competitive conditions by giving an example of each.

(b) Derive the equilibrium conditions for a firm which makes decisions with respect to quality and advertising expenditure keeping price fixed, to maximize the profit. (6,5)

6. (a) Discuss and formulate a mathematical model for a media allocation problem.

(b) Discuss brand switching analysis in marketing management. (6,5)

7. (a) What are the various objectives, taken into account by a firm in setting up the market price of a product ?

(b) Formulate and solve a mathematical model to maximize sales with spatial allocation of promotional efforts in a single firm, single product, 2 market situation. (5½,5½)

8. (a) Discuss the problem of distribution decisions.

(b) Develop a mathematical model to determine the optimal location of a company's warehouse. (5,6)