

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 854

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Unique Paper Code : 2362572301

**Name of the Paper : Mathematical Modelling for
Business**

**Name of the Course : Bachelor of Arts (Programme)
Operational Research**

Semester : III

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions from **Q.1** to **Q.7**.
3. **All** questions carry equal marks.

P.T.O.

1. (a) Describe EOQ concept. Derive Wilson's formula. (8)

(b) An item is produced at the rate of 8000 items in a year. The annual demand occurs is 2000 in a year. If the set up cost is Rs. 300 and holding cost is Re. 1.60 per unit of item per day, find the economic lot size for one run, assuming that the shortage are not permitted. Also find the time of cycle and minimum total cost for one run. (10)

2. (a) The demand for a purchased is 10,000 units per month and shortage are allowed. If the Unit cost is Rs. 20 per unit, the cost of ordering is Rs. 20 per order, the holding cost for one unit is Rs. 20% of value of inventory per year, the cost of one shortage is Rs. 10 per year, determine :

(i) The optimum purchase quantity.

(ii) The number of orders per year.

(iii) The optimum total yearly cost. (8)

(b) In a certain manufacturing situation the production is instantaneous and Demand is D . Show that the optimum order quantity is

$$Q = \sqrt{\frac{2 DC_0 (C_1 + C_2)}{C_1 C_2}}$$

Where C_1 , C_2 are the carrying cost and shortage costs per unit per year and C_0 is the set up Cost per run. (10)

3. (a) Determine the reorder point for the deterministic inventory without shortage with infinite replenishment. (8)

- (b) Find the optimal order quantity of a product for which the price-breaks are as follows :

Quantity (units)	Price per Unit (Rs.)
0 to 100	200
101 to 200	180
Above 200	160

The monthly demand of the product is 400 units.

The storage cost is 20 per cent per year of the price of the product per unit. The ordering cost is Rs. 50 per order. (10)

4. (a) State and prove elasticity theorem. (8)

- (b) Describe media allocation problem and formulate a mathematical model for it is a integer linear programming problem. (10)

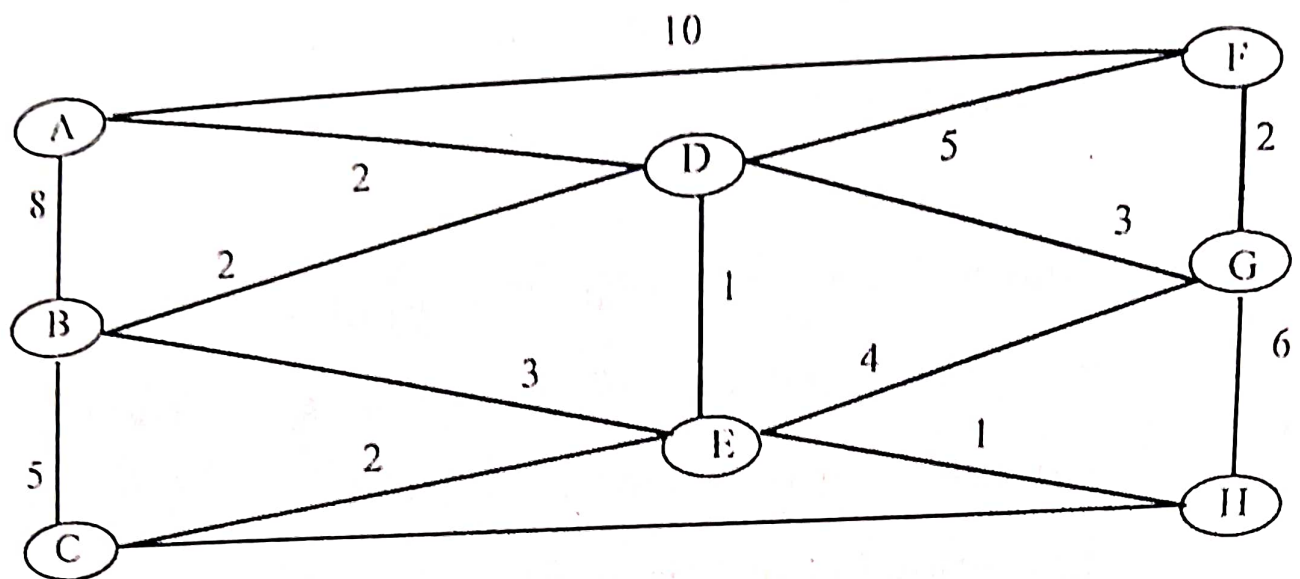
5. (a) Define marketing management and discuss various types of problems in marketing in which Operations Research help. (8)

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

	A	B
A	0.7	0.3
B	0.5	0.5

Assume that initial market share of two brands are 50% each. (10)

6. (a) Solve the minimum spanning tree problem for the network shown below: (8)



(b) What is the travelling salesman problem? Solve the following travelling salesman problem using branch and bound method (10)

	A	B	C	D	E
A	--	3	6	2	3
B	3	--	5	2	3
C	6	5	--	6	4
D	2	2	6	--	6
E	3	3	4	6	--

7. (a) An industrial project has the following data :

Activity	Immediate Predecessors
A	—
B	—
C	B
D	A, C
E	A, C
F	A, C
G	B
H	B
I	E
J	E, D
K	F, G, H
L	H
M	J, K, L

Develop a network diagram.

(8)

(b) Use Dijkstra's algorithm to find the shortest path from city 1 to city 5 for the given network.

(10)

