[This question paper contains 8 printed pages.]

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

**Sr. No. of Question Paper : 833** **G**

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) What is inventory management? Describe the relevant costs related to it. Also enumerate the relationship between ordering and carrying costs graphically? (8)

(b) A drug store sells 30 bottles of antibiotics per week. Each time it orders antibiotics, there is a fixed ordering cost of Rs. 10/order and a purchase cost of Rs. 10/bottle, assume that the annual holding cost is 20% of the cost of a bottle of antibiotics. I low many bottles of antibiotics should be ordered? What will be associated total cost? Suppose antibiotics spoil and cannot be sold if the spend more than one week in inventory, what would be the optimal ordering policy and associated costs? (10)

2. (a) Formulate and solve deterministic, continuous and uniform demand inventory model when production rate is finite, shortages arc not allowed and lead time is zero. Also find the reorder level when lead time is positive and constant. (8)

(b) What are the different objectives in setting up the market price for a product? Explain the various policies that are adopted in setting the prices. (10)

3. (a) Explain the need to inventory items. Describe in detail the ABC analysis. (8)

(b) MBL is a leading dealer of computer servers and networking devices. Servers arc expensive machines and therefore, the company follows a backordering policy. The carrying cost is Rs. 5,000/- per server per year and the ordering cost is

Rs. 1,200/- per order. The cost of shortage per server is estimated at Rs. 2,000/-. The annual demand of servers is 200 units, find (a) the optimal order quantity (b) the maximum shortage level and (c) the maximum inventory level. (10)

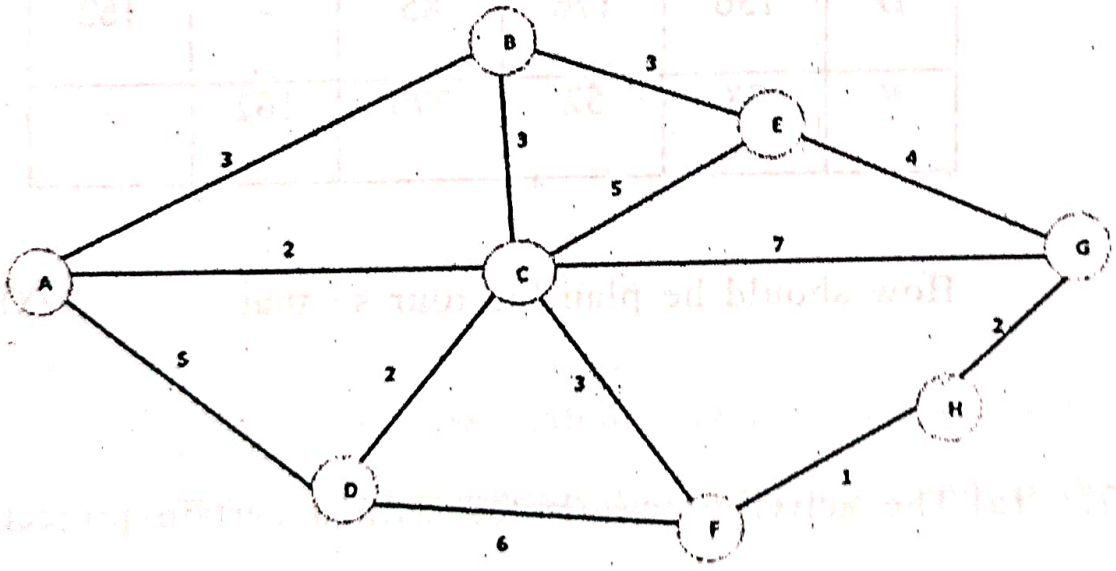
4. (a) Define Marketing Management. Explain the old and new concepts of marketing. (8)

(b) Derive the condition for advertising and selling price when quality is fixed. (10)

5. (a) Define marketing management and discuss various types of problems in marketing in which Operations Research help. (10)

(b) Explain the role of brand switching analysis in marketing management. (8)

6. (a) Consider the following network where the number in links represent actual distance between the corresponding nodes. Find one path, one cycle, one tree which is not a spanning tree. Find a minimal spanning tree. (10)



(b) A salesman is planning a tour to cities B, C, D & E starting from city A. The intercity distances arc shown in the following table

| | A | B | C | D | E |
|---|---|---|---|---|---|
| A | - | 103 | 188 | 136 | 38 |
| B | 103 | - | 262 | 176 | 52 |
| C | 188 | 162 | - | 85 | 275 |
| D | 136 | 176 | 85 | - | 162 |
| E | 38 | 52 | 275 | 162 | - |

How should he plan his tour so that. (8)

7. (a) The activities associated with a certain project are given below (10)

| Activity | Predecessors | Duration (Week) |
|---|---|---|
| A: | -- | 2 |
| B: | -- | 3 |
| C: | A | 2 |
| D: | B | 3 |
| E: | B | 2 |
| F: | C, D | 3 |
| G: | C, D | 2 |
| H: | C, D, E | 7 |
| I: | C, D, E | 5 |
| J: | H, F | 6 |

Develop the associated network for the project and find the minimum time of completion of the project. Also determine a critical path and critical activities for the project network, find Marly Start lime and Latest Finish Time of each activity.

P.T.O.

(b) Determine the critical path for the project network : (8)