

MCA 4th Semester Examination

Operational Research (NS)

MCA-403

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question each from the section A, B, C and D. Section E is compulsory.

SECTION - A

1. Solve the linear programming problem by graphical method

$$\text{minimize } z = 100x_1 + 200x_2$$

subject to constraints

$$x_1 + x_2 \leq 40$$

$$3x_1 + x_2 \leq 60$$

$$x_1 + 6x_2 \leq 60 \text{ and } x_1, x_2 \geq 0 \quad (12)$$

2. Use Big M method to maximize $z = 6x_1 + 4x_2$ subject to the constraints

$$2x_1 + 3x_2 \leq 30$$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 3 \text{ and } x_1, x_2 \geq 0 \quad (12)$$

SECTION - B

3. (a) State the objectives, advantages and disadvantages of network analysis. (6)

- (b) Distinguish between PERT and CPM. What is a critical path? (6)

4. Use duality to solve the linear programming problem

Maximize $z = 2x_1 + x_2$ subject to constraints

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 1 \text{ and } x_1, x_2 \geq 0 \quad (12)$$

SECTION - C

5. (a) Find out minimum cost solution for the following transportation problem which has the cost structure as

From	To			
	P	Q	R	Availability
A	16	19	12	14
B	22	13	19	16
C	14	28	8	12
Requirement	10	15	17	

(6)

- (b) What is a balanced transportation problem? What are its applications? (6)

6. A company has factories at F_1, F_2, F_3 , which supply warehouses at w_1, w_2 and w_3 . Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouses requirements are

180, 120 and 150 units respectively. Unit shipping cost (In rupees) are as follows:

Factory	Warehouse			Supply
	w ₁	w ₂	w ₃	
F ₁	16	20	12	200
F ₂	14	8	18	160
F ₃	26	24	16	90
Demand	180	120	150	350

Determine the optimal distribution for this company to minimize shipping cost. (12)

SECTION - D

7. (a) For the game problem prescribed by pay-off matrix of player A and is given by

$$\begin{array}{c}
 \text{B} \\
 \begin{array}{cc}
 \text{I} & \text{II} \\
 \text{A I} & \begin{bmatrix} 2 & 5 \end{bmatrix} \\
 \text{II} & \begin{bmatrix} 7 & 3 \end{bmatrix}
 \end{array}
 \end{array}$$

Determine the value of the game and optimum strategies for two players. (6)

- (b) What is game theory? What are various types of games? (6)
8. (a) Explain ABC analysis. What are its advantages and limitations, if any? (6)
- (b) What are the types of inventory? Why they are maintained? Explain the various costs related to inventory. (6)

SECTION - E

9. (a) What is operational research?
 (b) What is North West Corner method?
 (c) Describe basic feasible solution.
 (d) Define: Primal problem and dual problem.
 (e) Describe decision tree analysis.
 (f) Explain the terms: pure strategy and mixed strategy.
 (g) What is transportation problem?
 (h) Describe briefly the EOQ concept.
 (i) What is a critical path?
 (j) Explain the concept of value of game.
 (k) Explain the use of artificial variables in linear programming.
 (l) What is the significance of operational research? (12×1=12)