

Note: 1. All Questions are compulsory.

2. Figures to right indicate full marks

Q1 A) Fill in the blanks (Any 8)

8 Marks

- 1) Maximin return, Maximax return and Minimax regret are criteria that ____
 - a. Can be used without probabilities
 - b. Lead to same optimal decision
 - c. None of the above
- 2) The assignment problem consists of following elements ____
 - a. A set n' jobs
 - b. A set of n' facilities
 - c. A set of cost one for each pair of job facilities
 - d. All of the above
- 3) Decision making is associated with ____
 - a. Individual level
 - b. Corporate levels
 - c. A and B both
 - d. None of the above
- 4) Constraints may represent ____
 - a. Limitations
 - b. Requirements
 - c. Balance Condition
 - d. None of the above
- 5) An unbalanced transportation problem is the one in which ____
 - a. The no. of jobs are not equal to no. of facilities
 - b. The total supply is not equal to requirement
 - c. Total supply is same as requirement
 - d. None of the above
- 6) The transportation problem is balanced if ____
 - a. Demand = Supply
 - b. Demand > Supply
 - c. Demand < Supply
 - d. None of the above
- 7) Assignment problem ____
 - a. Is a special case of transportation problem

- b. Can be solved with simple algorithm
- c. When treated as LP always has an optimal integer solution
- d. None of the above

8) In the business management decision making the operation research study helps to have _____

- a. Better control
- b. Better system
- c. Better decision
- d. All of the above

9) Linear programming is _____

- a. Constrained optimization model
- b. A constrained decision making model
- c. A mathematical programming model
- d. None of the above

10) _____ are application areas for Operation Research techniques

- a. Product management
- b. Personnel management
- c. Inventory management
- d. All of the above

B) Match the following (Any 7)

7 Marks

A

B

1. Slack Variable
2. EMV
3. EPPI
4. EOL
5. Maximax Criterion
6. Laplace
7. Graphical representation of decision problem
8. Maximazation
9. Minimization
10. Assignment optimality

No. of lines = Matrix

Towards the origin

Away from the origin

Criterion of Optimism

Decision tree

Expected pay off with perfect information

Expected monetary value

Expected opportunity loss

Probability of event

Artificial variables

Q2

- A) Following is the pay off table. Find the optimum decision using following criteria (i) Maximax (ii) Maximin (iii) Minimax Regret (iv) Laplace (v) Hurwicz ($\alpha = 0.7$)
8 Marks

Acts	States of Nature			
	S1	S2	S3	S4
A1	18	10	12	8
A2	16	13	9	10
A3	12	15	14	14

- B) Consider the following pay off table. Find optimum decision using (i) Maximax (ii) Maximin Criteria
7 Marks

States of Nature	Course of Action			
	A1	A2	A3	A4
S1	40	50	80	70
S2	50	70	85	60
S3	48	75	95	40

(OR)

- C) A retailer wants to decide how much stock of a product "X" to be kept for the next month. Monthly demand can be 10,20,30 and 40 units. Demand probabilities are 0.2, 0.3, 0.4 and 0.1. The selling price of a product is Rs 30/- and its purchasing cost is Rs 20/-. If any units are unsold, the unsold quantity can be disposed of at a scrap value of Rs 5/- per unit.
15 Marks

- Construct a payoff table using above data
- Using EMV technique find optimal decision
- Calculate EPPI and EVPI

Q3

- A. Construct a decision tree and using EMV criteria find the optimal decision
8 Marks

Acts	States of Nature			
	S1	S2	S3	S4
A1	18	12	15	8
A2	15	14	10	11
A3	13	16	19	15
Probability	0.3	0.3	0.25	0.15

- B. A manager has a choice between (i) Risky Contract promising Rs 7 lakhs with probability 0.6 and Rs 4 lakhs with probability 0.4 (ii) A diversified portfolio consisting of the contracts with each promising Rs 3.5 lakhs with probability 0.7 and Rs 2 lakhs with probability 0.3. Arrive at a decision by constructing decision tree and using EMV criteria.

7 Marks

(OR)

- C. A factory produces three varieties of a product. The fixed and variable costs are given below.

15 Marks

	Fixed Costs	Variable Costs
	Rs	Rs Per Unit
Type 1	200000	10
Type 2	320000	8
Type 3	600000	6

The likely demand under these situations are given below

Demand	Units
Poor	25000
Moderate	100000
High	150000

If the price of each type is Rs 20/- prepare the pay off table.

Q4

- A. A company produces two products Alpha and Beta. Costs per unit is Rs 40/- and Rs 30/- . One unit of Alpha needs 60 machine hours, ten labour hours and five unit of raw material. One unit of Beta needs 20 machine hours and 15 labour hours and 7 units of raw materials. Minimum consumption of machine and labour hours should be

1200 and 600 respectively. Maximum availability of materials is 350 units. Formulate as LPP and solve by graphical method.

8 Marks

- B. A company has three factories F1, F2, F3 with production capacity of 11, 13 and 19 units (in thousands). It has four warehouses W1, W2, W3 and W4 with demands of 6, 10, 12 and 15 units. Unit cost of transportation is given from each factory to each warehouse.

From / To	W1	W2	W3	W4
F1	42	32	50	26
F2	34	36	28	46
F3	64	54	36	82

Construct a transportation table and find initial feasible solution by North - West corner method

7 Marks

OR

C. $\text{Max } Z = 100 X_1 + 80 X_2$

Subject to constraints:

$$6X_1 + 4X_2 \leq 7200$$

$$2X_1 + 4X_2 \leq 4000$$

$$X_1, X_2 \geq 0$$

Find optimal solution by Simplex Method

15 Marks

Q5

- A. What is operation research with historical background and explain features of OR and methods of OR ?

15 Marks

OR

- B. Short notes (any 3)

15 Marks

- Methodology of operation research
- Application areas for operation research
- Decision making under Risk
- OR techniques
- Decision making under uncertainty