

Time:

Total Marks: 70

- Q.1 (a) Define Operations Research. State various applications of Operations Research. 08
- (b) A farmer has 1000 acres of land on which he can grow corn, wheat or soyabean. Each acre of corn costs Rs 100 for preparation, requires 7 men-days of work and yields a profit of Rs 30. An acre of wheat costs Rs. 120 to prepare requires 10 men-days of work and yields a profit of Rs. 40. An acre of soyabean costs Rs. 70 to prepare, requires 8 men-days of work and yield a profit of Rs. 20. if the farmer has Rs. 1,00,000 for preparation and can count an 8000 men-days of work, determine how many acres should be allocated to each crop to maximize profit ? 06

OR

- Q.1 (a) Define: (i) Basic Solution, 08
(ii) Slack Variable,
(iii) Surplus Variable, and
(iv) Artificial Variable
- (b) Solve the following linear programming problem using Graphical Method. 06

$$\text{Maximize } Z = 6X_1 + 8X_2$$

subject to

$$5X_1 + 10X_2 \leq 60$$

$$4X_1 + 4X_2 \leq 40$$

$$X_1, X_2 \geq 0$$

(c)

07

- Q.2 (a) Write a brief note on assumptions of Linear Programming Problem. 08
Obtain the dual of the following primal LP problem. 06

$$\text{Maximize } Z = 60X_1 + 90X_2$$

$$\text{subject to } X_1 + 2X_2 \leq 40$$

$$2X_1 + 3X_2 \leq 90$$

$$X_1 - X_2 \geq 10 \quad X_1 \geq 0, X_2 \geq 0$$

(b)

10

OR

- Q.2 (a) Give steps for solving linear programming problem using Two phase Method. 06

(b) Solve the following L.P.P. by Big M - Method.

08

$$\text{Min } Z = 12X_1 + 20X_2$$

Subject to constraints:

$$6X_1 + 8X_2 \geq 100$$

$$7X_1 + 12X_2 \geq 120$$

$$\text{and } X_1, X_2 \geq 0.$$

Q.3 (a) Describe the transportation problem involving m- origins and n - destinations. 04

(b) Find Initial Basic feasible solution using – 09

(i) North-West corner rule,

(ii) Least Cost Method, and

(iii) Vogel's Approximation Method.

Destination

Source	D	E	F	G	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

Find Initial Transportation cost in each case.

OR

Q.3 (a) What is degeneracy in Transportation problem? Explain how to resolve degeneracy in a transportation problem 06

(b) Given the following transportation problem, 08

WAREHOUSE	FACTORIES				REQUIRMENTS
	A	B	C	D	
1	13	14	25	10	110
2	50	9	11	21	90
3	31	17	12	13	120
4	8	6	17	50	230
5	20	10	15	17	160
AVAILABILITY	200	175	150	25	

Find an optimal transportation schedule. Compute optimal Cost.

Q.4 (a) Explain the Hungarian method of solving Assignment problem. 07

(b) A departmental store has 5 employees with jobs to be performed . The time (In hours) each man will take to perform each job is given in the effectiveness matrix. 07

JOBS ↓	EMPLOYEES				
	1	2	3	4	5
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the job be allocated so as to minimize the total man- hours?

OR

- Q.4 (a) Give the difference between Transportation Problem and Assignment problem. How assignment Problem can be viewed as Transportation Problem. 06
- (b) A salesman has to visit 5 cities A, B, C, D & E. The intercity distances are tabulated below: 08

From / To	A	B	C	D	E
A	-	12	24	25	15
B	6	-	16	18	7
C	10	11	-	18	12
D	14	17	22	-	16
E	12	13	23	25	-

Note that the distances (in Km.) between 2 cities need not be same both ways. If the salesman starts from City A and has to come back to city A, which route would you advise him to take so that total distance traveled by him is minimized?

- Q.5 (a) Explain giving example each of the following: 06
- (i) Game (ii) Zero-Sum game, and (iv) Value of the game.
- (b) Find the sequence that minimizes the total elapsed time to complete the following tasks. Each job is processed in the order ABC. 08

Machine ↓ Jobs →	1	2	3	4	5	6	7
Machine A	12	6	5	11	5	7	6
Machine B	7	8	9	4	7	8	3
Machine C	3	4	1	5	2	3	4

OR

- Q.5 (a) Explain Johnson algorithm for processing n jobs 3 machine problem. 08
- (b) Solve the following 3 x 5 game using dominance property. 06

		Player B				
		1	2	3	4	5
Player A	1	2	5	10	7	2
	2	3	3	6	6	4
	3	4	4	8	12	1