

(6 pages)

NOVEMBER 2021

51311/SAZ5C

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. Write any two applications of Operations Research.

2. Define optimum solution.

3. Express the following L.P.P. in standard form.

$$\text{Minimize } Z = 5x_1 + 7x_2$$

Subject to the constraints $x_1 + x_2 \leq 8$

$$3x_1 + 4x_2 \geq 3$$

$$6x_1 + 7x_2 \geq 5$$

$$\text{and } x_1, x_2 \geq 0$$

4. Define shadow price.

5. Define dual simplex method.

6. Write the necessary and sufficient condition for the existence of a feasible solution to the transportation problem.
7. Write the difference between the transportation problem and assignment problem.
8. How do you convert an unbalanced assignment problem into a balanced?
9. Write down the rules to determine saddle point.
10. State the conditions for applying graphical solution to the games.
11. What is CPM?
12. Write the types of simulation.

SECTION B — (5 × 5 = 25 marks)

Answer any FIVE questions.

13. Write down the Limitations of Linear Programming.

14. Solve the following LPP by using graphical method:

$$\text{Maximize } z = 3x_1 + 4x_2$$

$$\text{Subject to the constraints } 4x_1 + 2x_2 \leq 80$$

$$2x_1 + 5x_2 \leq 180$$

$$\text{and } x_1, x_2 \geq 0$$

15. Write an algorithm for Dual simplex method.
16. Use Vogel's approximation method to find an initial basic feasible solution of the following transportation problem.

	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	Available
<i>A</i>	11	13	17	14	250
<i>B</i>	16	18	14	10	300
<i>C</i>	21	24	13	10	400
Demand	200	225	275	250	

17. Write an algorithm for processing n jobs through m machines.

18. Find the range of value of p and q that will render the entry $(2, 2)$ a saddle point for the game:

Player A	Player B		
	B_1	B_2	B_3
A_1	2	4	5
A_2	10	7	q
A_3	4	p	6

19. Write down the methodology developed for simulation process.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

20. Solve the following L.P.P. by simplex method:

$$\text{Minimize } z = 8x_1 - 2x_2$$

$$\text{Subject to the constraints } -4x_1 + 2x_2 \leq 1$$

$$5x_1 - 4x_2 \leq 3$$

$$\text{and } x_1, x_2 \geq 0$$

21. Use two-phase simplex method to solve the following L.P.P.

$$\text{Maximize } z = 5x_1 - 4x_2 + 3x_3$$

Subject to the constraints

$$2x_1 + x_2 - 6x_3 = 20$$

$$6x_1 + 5x_2 + 10x_3 \leq 20$$

$$8x_1 - 3x_2 + 6x_3 \leq 50$$

and $x_1, x_2, x_3 \geq 0$

22. A departmental head has four subordinates, and four tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate, of the time each man would take to perform each task, is given in the matrix below:

	Men			
Tasks	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>
<i>A</i>	18	26	17	11
<i>B</i>	13	28	14	26
<i>C</i>	38	19	18	15
<i>D</i>	19	26	24	10

How should the tasks be allocated, one to a man, so as to minimize the total man-hours?

23. A company is currently involved in negotiations with its union on the upcoming wage contract. Positive signs in table represent wage increase while negative signs represent wage reduction. What are the optimal strategies for the company as well as the union? What is the game value?

Conditional costs to the company (Rs. in lakhs)

Company strategies	Union strategies			
	U1	U2	U3	U4
C1	0.25	0.27	0.35	-0.02
C2	0.20	0.16	0.08	0.08
C3	0.14	0.12	0.15	0.13
C4	0.30	0.14	0.19	0.00

24. Write an algorithm for programme evaluation and review technique.
