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Reg. No. :

Name :

Fifth Semester B.A./B.Sc./B.Com. Degree Examination, February 2024

First Degree Programme under CBCSS

Double Main Programme

Mathematics

Open Course

MM 1551.1 — OPERATIONS RESEARCH

(2020 Admission onwards)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **all** questions. Each questions carries **1** mark.

1. What you mean by an objective function in an LPP?
2. Define Optimal solution.
3. Define feasible solution.
4. What do you mean by balancing a transportation problem?
5. Vogel's approximation method is also called _____
6. Define pivot operation.
7. Define Unbounded solution.
8. Expand PERT.
9. Name any two methods to solve a linear programming problem.
10. If there are four decision variables in an LPP, which method will you use to find an optimal solution?

(10 × 1 = 10 Marks)

P.T.O.



PART – B

Answer any **eight** questions. Each questions carries **2** marks.

11. What are the three basic components of a linear programming problem?
12. Define Basic feasible solution.
13. What is $u - v$ method?
14. What are dummy warehouses and dummy markets?
15. Explain any two properties of LPP.
16. Give any applications of transportation model.
17. Define Slack variable.
18. Write the following LPP model in the standard form
Maximize $Z = x_1 + x_2$
S.T $-x_1 + 2x_2 \leq -3$
 $4x_1 - 3x_3 \leq -6$
 $x_1, x_2 \geq 0$.
19. Write the standard form of a transportation problem when total demand exceeds total supply.
20. Give an Example for network flow problem.
21. Determine the feasible space for $3x_1 + x_2 \leq 6$, $x_1, x_2 \geq 0$.
22. Define penalty in Vogel's approximation method.

(8 × 2 = 16 Marks)

PART – C

Answer any **six** questions. Each question carries **4** marks.

23. Using simplex method
Maximize $Z = 5x_1 + 3x_2$
Subject to $x_1 + x_2 \leq 2$
 $5x_1 + 2x_2 \leq 10$
 $3x_1 + 8x_2 \leq 12$
 $x_1, x_2 \geq 0$.



24. What are the steps in constructing a linear programming model?
25. Maximize $Z = x_1 + 2x_2$
 Subject to $x_1 + 2x_2 \leq 10$
 $x_1 + x_2 \geq 1$
 $x_2 \leq 4$
 $x_1, x_2 \geq 0$.
26. What are the basic steps of simplex method for a maximization problem?
27. Write a short note on approaches to find an initial basic feasible solution.
28. Explain Northwest corner rule.
29. Use North-west Corner method to find an initial basic feasible solution to the following transportation problem
- | | M ₁ | M ₂ | M ₃ | M ₄ | Warehouse Capacity |
|----------------|----------------|----------------|----------------|----------------|--------------------|
| W ₁ | 11 | 13 | 17 | 14 | 250 |
| W ₂ | 16 | 18 | 14 | 10 | 300 |
| W ₃ | 21 | 24 | 13 | 10 | 400 |
| Market Demand | 200 | 225 | 275 | 250 | |
30. Explain Project network.
31. Explain graphical method and its types.

(6 × 4 = 24 Marks)

PART – D

Answer any **two** questions. Each questions carries **15** marks.

32. Solve the following linear programming problem using simplex method

Maximize $Z = 3x_1 + 2x_2$

Subject to $-x_1 + x_2 \leq 4$

$3x_1 + 2x_2 \leq 14$

$x_1 - x_2 \leq 3$

$x_1, x_2 \geq 0$.



33. Determine an initial basic feasible solution to the following transportation problem using Vogel's approximation method.

	M ₁	M ₂	M ₃	M ₄	Supplies
W ₁	2	2	2	1	3
W ₂	10	8	5	4	7
W ₃	7	6	6	8	5
Demands	4	3	4	4	

34. Find an optimal solution to an assignment problem with the following cost matrix

	J ₁	J ₂	J ₃	J ₄
M ₁	10	9	7	8
M ₂	5	8	7	7
M ₃	5	4	6	5
M ₄	2	3	4	5

35. What are CPM and PERT? What are the differences and similarities between CPM and PERT?

(2 × 15 = 30 Marks)

