

2003000205030014 / 2011000305030014
EXAMINATION FEBRUARY -MARCH 2024
BACHELOR OF SCIENCE (FIFTH SEMESTER)
MATHEMATICS LEVEL-3
OPERATION RESEARCH-I EG-5001

[Time: As Per Schedule]

[Max. Marks: 50]

Instructions:

1. Fill up strictly the following details on your answer book

- a. Name of the Examination : **BACHELOR OF SCIENCE (FIFTH SEMESTER)**
 - b. Name of the Subject : **MATHEMATICS LEVEL-3
OPERATION RESEARCH-I EG-5001**
 - c. Subject Code No : **2003000205030014 / 2011000305030014**
2. Sketch neat and labelled diagram wherever necessary.
3. Figures to the right indicate full marks of the question.
4. All questions are compulsory.

Seat No:

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Student's Signature

Q.1 (a) Answer the following. (Any three)

6

1. State the Matrix representation of Linear Programming Problem.
2. Define: Artificial Variable, Unbounded solution.
3. Define: Feasible solution, Basic feasible solution.
4. Define: Surplus Variable, Non-Degenerate Basic feasible solution.
5. State the standard form of Linear Programming Problem.

(b) Write the dual of the following LPP. (Any One)

4

1. Obtain the dual of the following LPP:

$$\text{Max } Z = 2x_1 + 5x_2 + 6x_3$$

Subject to constraints,

$$5x_1 + 6x_2 - x_3 \leq 3$$

$$-2x_1 + x_2 + 4x_3 \leq 4$$

$$x_1 - 5x_2 + 3x_3 \leq 1$$

$$-3x_1 + 3x_2 + 7x_3 = 6$$

and x_1 is unrestricted in sign; $x_2, x_3 \geq 0$

2. Obtain the dual of the following LPP:

$$\text{Min } Z = 3x_1 - 2x_2 + 4x_3$$

Subject to constraints,

$$5x_1 + 5x_2 + 4x_3 \geq 7$$

$$6x_1 + x_2 + 3x_3 \geq 4$$

$$7x_1 - 2x_2 - x_3 \leq 10$$

$$x_1 - 2x_2 + 5x_3 \geq 3$$

$$4x_1 + 7x_2 - 2x_3 \geq 2$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

Q.2 Answer the following. (Any one)

10

1. Solve the following LPP using Graphical Method:

$$\text{Max } Z = 0.40x_1 + 0.30x_2$$

Subject to constraints,

$$2x_1 + x_2 \leq 1000$$

$$x_1 + x_2 \leq 800$$

$$x_1 \leq 400$$

$$x_2 \leq 700$$

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

2. Solve the following LPP using Graphical Method:

$$\text{Max } z = 50x_1 + 30x_2$$

subject to

$$2x_1 + x_2 \geq 18$$

$$x_1 + x_2 \geq 12$$

$$3x_1 + 2x_2 \leq 34$$

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

Q.3 Answer the following. (Any one)

10

1. Solve the following LPP using Simplex Method:

$$\text{Max } Z = 3x_1 - x_2$$

Subject to Constraints

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 2$$

$$x_2 \leq 4$$

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

2. Solve the following LPP using Simplex Method:

$$\begin{aligned} \text{Max } Z &= 3x_1 + 5x_2 + 4x_3 \\ \text{subject to} \\ 2x_1 + 3x_2 &\leq 8 \\ 2x_2 + 5x_3 &\leq 10 \\ 3x_1 + 2x_2 + 4x_3 &\leq 15 \\ \text{and } x_1, x_2, x_3 &\geq 0 \end{aligned}$$

Q.4 Answer the following. (Any one)

10

1. Solve the following LPP using Two Phase Method:

$$\begin{aligned} \text{Max } Z &= x_1 - 2x_2 - 3x_3 \\ \text{Subject to constraints,} \\ -2x_1 + x_2 + 3x_3 &= 2 \\ 2x_1 + 3x_2 + 4x_3 &= 1 \\ \text{and } x_1, x_2, x_3 &\geq 0 \end{aligned}$$

2. Solve the following LPP using Big-M Method:

$$\begin{aligned} \text{Min } Z &= 5x_1 + 2x_2 + 10x_3 \\ \text{Subject to constraints,} \\ x_1 - x_3 &\leq 10 \\ x_2 + x_3 &\geq 10 \\ \text{and } x_1, x_2, x_3 &\geq 0 \end{aligned}$$

Q.5 Answer the following. (Any one)

10

1. Solve the following LPP using Big-M Method:

$$\begin{aligned} \text{Min } Z &= 2x_1 + x_2 \\ \text{Subject to Constraints,} \\ 3x_1 + x_2 &= 3 \\ 4x_1 + 3x_2 &\geq 6 \\ x_1 + 2x_2 &\leq 4 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$

2. Write the dual of this LPP and then find the feasible solution by using Two Phase Method:

$$\begin{aligned} \text{Min } Z &= 4x_1 + x_2 \\ \text{Subject to constraints,} \\ 3x_1 + 4x_2 &\geq 20 \\ -x_1 - 5x_2 &\leq -15 \\ \text{and } x_1, x_2 &\geq 0 \end{aligned}$$
