



RAN-2003000205030014

T. Y. B. Sc. (Sem. - V) Examination October - 2025

Mathematics (Paper - Elective Generic-5001) Operation Research - I (Old)

Time: 2 Hours]

[Total Marks: 50

સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book.
- (2) All questions are compulsory.
- (3) Figures to the right indicate marks of the corresponding question.

Seat No.:

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Student's Signature

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

(06)

1. State the Matrix representation of Linear Programming Problem.
2. Define: Degenerate Basic feasible solution, Optimum Basic feasible solution.
3. Define: Artificial Variable, Feasible solution.
4. Giving illustration show that Dual of dual is primal LPP.
5. Define: Slack Variable, Surplus Variable.

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

(04)

1. Obtain the dual of the following LPP:

$$\text{Min } Z = x_1 + 2x_2$$

Subject to Constraints,

$$2x_1 + 4x_2 \leq 160$$

$$x_1 - x_2 = 30$$

$$x_1 \geq 10$$

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

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:

$$\text{Min } Z = 20x_1 + 40x_2$$

Subject to constraints,

$$\begin{aligned}
36x_1 + 6x_2 &\geq 108 \\
3x_1 + 12x_2 &\geq 36 \\
20x_1 + 10x_2 &\geq 100 \\
\text{and } x_1, x_2 &\geq 0
\end{aligned}$$

2. Solve the following LPP using Graphical Method:

$$\begin{aligned}
\text{Max } Z &= 2x_1 + x_2 \\
\text{Subject to Constraints,} \\
x_1 + 2x_2 &\leq 10 \\
x_1 + x_2 &\leq 6 \\
x_1 - x_2 &\leq 2 \\
x_1 - 2x_2 &\leq 1 \\
\text{and } x_1, x_2 &\geq 0
\end{aligned}$$

Q. 3. Answer the following. (Any one)

(10)

1. Solve the following LPP using Simplex Method:

$$\begin{aligned}
\text{Max } Z &= 3x_1 + 4x_2 \\
\text{Subject to constraints,} \\
4x_1 + 2x_2 &\leq 80 \\
2x_1 + 5x_2 &\leq 180 \\
\text{and } x_1, x_2 &\geq 0
\end{aligned}$$

2. Solve the following LPP using Simplex Method:

$$\begin{aligned}
\text{Max } Z &= 5x_1 + 3x_2 \\
\text{Subject to constraints,} \\
x_1 + x_2 &\leq 4 \\
5x_1 + 2x_2 &\leq 10 \\
3x_1 + 8x_2 &\leq 12 \\
\text{and } x_1, x_2 &\geq 0
\end{aligned}$$

Q. 4. Answer the following. (Any one)

(10)

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

$$\begin{aligned}
\text{Min } Z &= 3x_1 + 2x_2 \\
\text{Subject to Constraints,} \\
5x_1 + x_2 &\geq 10 \\
2x_1 + 2x_2 &\geq 12 \\
x_1 + 4x_2 &\geq 10 \\
\text{and } x_1, x_2 &\geq 0
\end{aligned}$$

2. Solve the following LPP using Two Phase Method:

$$\begin{aligned}
\text{Min } Z &= 3x_1 + 2x_2 \\
\text{Subject to constraints,} \\
2x_1 + x_2 &\geq 2 \\
3x_1 + 4x_2 &\geq 12 \\
\text{and } x_1, x_2 &\geq 0
\end{aligned}$$

Q. 5. Answer the following. (Any one)

(10)

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

$$\text{Max } Z = x_1 + 2x_2 + 3x_3 - x_4$$

Subject to Constraints,

$$x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

$$\text{and } x_1, x_2, x_3, x_4 \geq 0$$
