

2003000205030014
EXAMINATION OCTOBER 2024
BACHELOR OF SCIENCE (FIFTH SEMESTER)
OPERATION RESEARCH-I - LEVEL 3

[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: **OPERATION RESEARCH-I – LEVEL 3**
 - c. Subject Code No: **2003000205030014**
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:

--	--	--	--	--	--

Student's Signature

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

6

- 1) Dual of dual is primal LPP. True or False? Justify your answer with proper illustration.
- 2) Define: Basic feasible solution, Optimum basic feasible solution.
- 3) Define: Slack variable, Artificial variable.
- 4) State the general mathematical form of Linear programming problem.
- 5) Define: Bounded solution, Unbounded solution.

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

4

- 1) Write dual of the following primal LPP:

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

Subject to constraints,

$$2x_1 - x_2 + 3x_3 + x_4 = 1$$

$$x_1 + x_2 - x_3 + x_4 = 3$$

and $x_1, x_2 \geq 0$; x_3, x_4 are unrestricted in signs.

- 2) Obtain the dual of the following LPPs:

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

Subject to constraints,

$$\begin{aligned}
 x_1 + x_2 + x_3 &\leq 10 \\
 2x_1 + 0x_2 - x_3 &\leq 100 \\
 2x_1 - 2x_2 - 3x_3 &\leq 160
 \end{aligned}$$

Q.2 Answer the following: (Any one)

10

- 1) Solve the following LPP using Graphical Method:

$$Max Z = 2x_1 + x_2$$

Subject to constraints,

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 1$$

$$And x_1, x_2 \geq 0$$

- 2) Solve the following LPP using Graphical Methods:

$$Max Z = 2x_1 + 10x_2$$

Subject to

$$2x_1 + 5x_2 \leq 6$$

$$6x_1 + \leq 30$$

$$And x_1, x_2 \geq 0$$

Q.3 Answer the following. (Any one)

10

- 1) Solve the following LPP using Simplex Method:

$$Max Z = x_1 - 3x_2 + 2x_3$$

Subject to constraints;

$$3x_1 - x_2 + 3x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$And x_1, x_2, x_3 \geq 0$$

- 2) Solve the following LPP using Simplex Method:

$$Max Z = 3x_1 + 4x_2$$

Subject to constraints,

$$4x_1 + 2x_2 \leq 80$$

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

$$and x_1, x_2 \geq 0$$

Q.4 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:

$$\text{Min } Z = 600x_1 + 500x_2$$

Subject to constraints,

$$2x_1 + x_2 \geq 80$$

$$x_1 + 2x_2 \geq 60$$

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

Q.5 Answer the following. (Any One)**10**

- 1) Solve the following LPP using Two phase method:

$$\text{Min } Z = 7.5x_1 - 3x_2$$

Subject to constraints,

$$3x_1 - x_2 - x_3 \geq 3$$

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

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

- 2) Solve the following LPP using Big-M method:

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

Subject to constraints,

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

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

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

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