

SPRING MID SEMESTER EXAMINATION-2023

Subject: **OPTIMIZATION TECHNIQUE**

Code: **MA-10003**



Full Marks: 20

Time: 1.5 Hrs

Answer any FOUR QUESTIONS including question No. 1 which is compulsory. The figures in the margin indicate full marks.

Use of graph paper to answer any question is strictly prohibited.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only

1. Answer the following questions

[5×1=5]

(a) Define Slack and Surplus variable in Linear Programming problem with examples.

(b) Write the standard form for the LPP:

$$\text{Maximize } Z = 2x_1 + 3x_2$$

Subject to

$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \geq -1$$

$$x_1, x_2 \geq 0$$

(c) What is the condition for leaving basic variable in Simplex method?

(d) Draw the feasible region for the following LPP

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

Subject to

$$x_1 + x_2 \leq 4$$

$$3x_1 + 8x_2 \leq 24$$

$$x_1, x_2 \geq 0$$

(e) Find an initial basic feasible solution of the following LPP

$$\text{Maximize } Z = 5x_1 + 3x_2$$

Subject to

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

2. Solve the following LPP by graphical method

[5]

$$\text{Maximize } Z = 2x_1 + 3x_2$$

Subject to

$$x_1 + x_2 \leq 30$$

$$x_1 \leq 30$$

$$x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

3. A furniture dealer deals in two items viz, tables and chairs. He has \$10,000 to invest and a space to store almost 60 pieces. A table cost him \$500 and chair of \$200. He can sell a table at profit of \$50 and a chair at a profit \$15. Assume that he can sell all the items that he buys. Formulate the problem as an LPP, so that he can maximize the profit.

[5]

4. Solve the following LPP by Graphical method

[5]

$$\text{Minimize } Z = 5x_1 + 4x_2$$

Subject to

$$4x_1 + x_2 \geq 40$$

$$2x_1 + 3x_2 \geq 60$$

$$x_1, x_2 \geq 0$$

5. Use Simplex Algorithm to solve the following LPP

[5]

$$\text{Maximize } Z = 40x_1 + 30x_2$$

Subject to

$$x_1 + x_2 \leq 12$$

$$2x_1 + x_2 \leq 16$$

$$x_1 \geq 0; x_2 \geq 0$$

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