RAN-2003000205030014

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T. Y. B. Sc. (Sem. - V) Examination March - 2023

Mathematics (EG) : MTH - 5001

Operations Research - I

[Total Marks: 50

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **T. Y. B. Sc. (Sem. - V)**

Name of the Subject :

☛ **Mathematics (EG) : MTH - 5001 Operations Research - I**

Subject Code No.: **2003000205030014**

Seat No.:

Student's Signature

(2) All questions are compulsory.
(3) Figures to the right indicate marks of the question.
(4) Follow usual notations.
(5) Use of non-programmable calculator is allowed.

Que: 1

(a) **Answer any THREE as directed.** **[06]**

(1) When the Graphical method can be used to solve the LPP?

(2) Define: Surplus variables and Artificial variables.

(3) Define: Initial feasible solution.

(4) State the general form of LPP.

(5) Define: Basic solution.

Que: l

(b) **Write the dual of the following LPP. (Any ONE)** **[04]**

(1) *Maximize* $Z_x = 12x_1 - 15x_2 + 30x_3$

Subject to the constraints

$$-x_1 + 16x_2 + 13x_3 = 100$$
$$22x_1 + 43x_2 + 21x_3 = 540$$
$$\text{and } x_1, x_2, x_3 \geq 0$$

(2) *Minimize* $Z_x = x_1 + 3x_2 + 6x_3$

Subject to the constraints

$$2x_1 + 3x_2 + x_3 \geq 12$$
$$-x_1 + x_2 - 2x_3 = 20$$
$$x_1 + 4x_2 - 6x_3 \leq 15$$
$$\textit{and } x_1, x_2, x_3 \geq 0$$

Que:2 Attempt any TWO. **[20]**

(1) Use Graphical method to solve the following LPP.

Minimize $Z = 50x_1 + 20x_2$

Subject to the constraints

$$x_1 + x_2 \leq 600$$
$$x_1 - x_2 \geq 300$$
$$2x_1 + 3x_2 \geq 1200$$
$$\textit{and } x_1, x_2 \geq 0$$

(2) Use Graphical method to solve the following LPP.

Maximize $Z = 160x_1 + 240x_2$

Subject to the constraints

$$x_1 + x_2 \leq 18$$
$$60x_1 + 60x_2 \leq 720$$
$$x_1 \geq 4$$
$$x_2 \geq 6$$
$$\textit{and } x_1, x_2 \geq 0$$

(3) Use Simplex method to solve the following LPP.

Maximize $Z = 10x_1 + 15x_2 + 40x_3$

Subject to the constraints

$$10x_1 + 5x_2 + 2x_3 \leq 27$$
$$5x_1 + 10x_2 + 4x_3 \leq 22$$
$$x_1 + x_2 + 2x_3 \leq 5$$
$$\text{and } x_1, x_2, x_3 \geq 0$$

(4) Use Simplex method to solve the following LPP.

Maximize $Z = x_1 + 2x_2 + x_3$

Subject to the constraints

$$x_1 + x_2 \leq 3$$
$$x_2 + x_3 \leq 4$$
$$x_1 + x_3 \leq 5$$
$$\textit{and } x_1, x_2, x_3 \geq 0$$

Que:3 Attempt any TWO. **[20]**

(1) Use Two-Phase method to solve the following LPP.

Minimize $Z = 5x_1 + 6x_2 + 7x_3$

Subject to the constraints

$$3x_1 + 2x_2 + 3x_3 \geq 10$$
$$4x_1 + 3x_2 + 5x_3 \geq 12$$
$$\text{and } x_1, x_2, x_3 \geq 0$$

(2) Use Two-Phase method to solve the following LPP.

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

Subject to the constraints

$$x_1 + 3x_2 + x_3 \leq 5$$
$$2x_1 - x_2 + x_3 \geq 2$$
$$4x_1 + 3x_2 - 2x_3 = 5$$
$$\text{and } x_1, x_2, x_3 \geq 0$$

(3) Use Big-M method to solve the following LPP.

Maximize $Z = 5x_1 + 12x_2 + 4x_3$

Subject to the constraint

$$x_1 + 2x_2 + x_3 \leq 5$$
$$2x_1 + x_2 + 3x_3 = 2$$
$$\text{and } x_1, x_2, x_3 \geq 0$$

(4) Use Big-M method to solve the following LPP.

Minimize $Z = 5x_1 + 3x_2$

Subject to the constraints

$$2x_1 + 4x_2 \leq 12$$
$$2x_1 + 2x_2 = 10$$
$$5x_1 + 2x_2 \geq 10$$
$$\text{and } x_1, x_2 \geq 0$$

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