



Seat No. \_\_\_\_\_

**HAL-003-1173003**  
**M. Sc. (Statistics) (Sem. III) (CBCS)**  
**Examination**  
**June - 2023**  
**MS-303 : Optimizing Techniques**

**Faculty Code : 003**  
**Subject Code : 1173003**

Time :  $2\frac{1}{2}$  Hours / Total Marks : 70

- Instructions :** (1) Attempt all questions.  
(2) Each question carries equal marks.

- 1** Answer the following questions : (any **seven**) **14**
- (1) State the structure of transportation problem.
  - (2) What is transportation problem?
  - (3) What are the types of transportation problems?
  - (4) What is an assignment problem?
  - (5) State any two advantages for solving LPP by Big - M method.
  - (6) State any two advantages for solving LPP by two- phase Method.
  - (7) State any two advantages for solving LPP by dual simplex method.
  - (8) State any two advantages for solving LPP by simplex method.
  - (9) State the limitations of simplex method in LPP.
  - (10) State the limitations of dual simplex method in LPP.
- 2** Answer the following questions : (any **two**) **14**
- (1) Explain in detail properties of LP - Models.
  - (2) Write down the steps for formulating LPP.
  - (3) What are the steps for solving LPP by simplex method?

3 Answer the following questions : 14

- (1) Prove that Intersection of any two convex set is convex.
- (2) Solve the following LPP by two phase method.

$$\begin{aligned} \text{Minimize } Z &= x_1 + x_2 \\ \text{Subject to } 2x_1 + x_2 &\geq 4 \\ x_1 + 7x_2 &\geq 7 \\ \text{and} \\ x_1, x_2 &\geq 0 \end{aligned}$$

**OR**

3 Answer the following questions : 14

- (1) The set of all feasible solutions of LPP is a convex set.
- (2) Formulate the following problem into LPP:

Firm manufacturer 3 products A, B and C. The profits are 3 Rs., 2 Rs. and 4 Rs. respectively. The firm has two machines M1 and M2 below is the required time in minutes for each machine on each product.

	Products		
	A	B	C
M1	4	3	5
M2	2	2	4

Machines M1 and M2 have 2000 and 2500 machine minutes respectively. The firm must manufacture 100A's, 200B's and 50C's but not more than 150A's. Set up an LPP to maximize profit.

4 Answer the following questions : (any two) 14

- (1) Explain the simplex method for solving LPP through algorithm.
- (2) Prove that
  - (i) Every empty set is convex.
  - (ii) Every singleton set is convex.
- (3) The set of optimal solutions to the LPP is convex.

5 Answer the following questions : (any two)

14

(1) Solve the following LPP by simplex method.

$$\begin{aligned} \text{Minimize } & Z = x_1 - 3x_2 + 3x_3 \\ \text{Subject to } & 3x_1 - x_2 + 2x_3 \leq 7 \\ & 2x_1 + 4x_2 \geq -12 \\ & -4x_1 + 3x_2 + 8x_3 \leq 10 \\ & \text{and} \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

(2) Solve the following LPP by Big - M method.

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

(3) Solve the following Transportation problem using NWCM.

	Destination					
		A	B	C	D	Supply
Source	1	21	16	25	13	11
	2	17	18	14	23	13
	3	32	27	18	41	19
	Demand	6	10	12	15	43

(4) Solve the following LPP by dual simplex method :

$$\begin{aligned} \text{Maximize } & Z = -3x_1 - 2x_2 \\ \text{Subject to } & x_1 + x_2 \geq 1 \\ & x_1 + x_2 \leq 7 \\ & x_1 + 2x_2 \geq 10 \\ & x_2 \leq 3 \\ & \text{and } x_1, x_2 \geq 0 \end{aligned}$$