Roll No. .....

ED–2810

M. A./M. Sc. (Final) EXAMINATION, 2021

MATHEMATICS

(Optional)

Paper Fourth (*i*)

(Operations Research)

Time : Three Hours

Maximum Marks : 100

Note : All questions are compulsory. Attempt any *two* parts from each question. All questions carry equal marks.

Unit—I

1. (a) Use two-phase simplex method to solve the following Linear Programming Problem :

Maximize :

$$z = 5x_1 + 8x_2$$

Subject to the constraints :

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

$$x_1 + 4x_2 \geq 4$$

$$x_1 + x_2 \leq 5;$$

$$x_1, x_2 \geq 0$$

P. T. O.

(b) Use dual simplex method to solve the L.P.P.

Minimize :

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

Subject to the constraints :

$$x_1 - x_2 + x_3 \geq 4$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_2 - x_3 \geq 2$$

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

(c) What is Goal Programming ? Clearly state its assumptions.

Unit—II

2. (a) Solve the following transportation problem :

From	To			Available
	A	B	C	
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
Demand	6	10	15	

(b) Solve the following assignment problem :

	I	II	III	IV
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

(c) Distinguish between PERT and CPM. What is a critical Path ?

Unit—III

3. (a) Use dynamic programming to solve the following L. P. P. :

Maximize :

$$z = 3x_1 + 5x_2$$

Subject to the constraints :

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$3x_1 + 2x_2 \leq 18$$

and $x_1, x_2 \geq 0$.

(b) Solve the following game by linear programming technique :

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \text{Player B} \\ \begin{bmatrix} 1 & -1 & 3 \\ 3 & 5 & -3 \\ 6 & 2 & -2 \end{bmatrix} \end{array}$$

(c) Find the optimum integer solution to the following L. P. P. :

Maximize :

$$z = x_1 + 4x_2$$

Subject to the constraints :

$$2x_1 + 4x_2 \leq 7$$

$$5x_1 + 3x_2 \leq 15$$

$x_1, x_2 \geq 0$ and are integers.

Unit—IV

4. (a) Describe input-output analysis of industries.

   (b) Explain Petroleum Refinery operation as a L. P. P.

   (c) Explain briefly the blending problem as linear programming.

Unit—V

5. (a) Use the Kuhn-Tuker conditions to solve the following non-linear programming problem :

   Maximize :

$$z = 2x_1 - x_1^2 + x_2$$

   Subject to the constraints :

$$2x_1 + 3x_2 \leq 6$$

$$2x_1 + x_2 \leq 4$$

   and $x_1, x_2 \geq 0$.

   (b) Derive the Kuhn-Tuker conditions for the quadratic programming problem.

   (c) Use Beale's method to solve the following NLPP :

   Minimize :

$$z = 6 - 6x_1 + 2x_1^2 - 2x_1x_2 + 2x_2^2$$

   Subject to the constraints :

$$x_1 + x_2 \leq 2$$

   and $x_1, x_2 \geq 0$.