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Roll No.

NS.H

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

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

$$z = 5x_1 + 8x_2$$

Subject to the constraints :

$$3x_1 + 2x_2 \ge 3$$

 $x_1 + 4x_2 \ge 4$
 $x_1 + x_2 \le 5;$
 $x_1, x_2 \ge 0$

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

 $z = x_1 + 2x_2 + 3x_3$

Subject to the constraints :

$$x_{1} - x_{2} + x_{3} \ge 4$$
$$x_{1} + x_{2} + 2x_{3} \le 8$$
$$x_{2} - x_{3} \ge 2$$
$$x_{1}, x_{2}, x_{3} \ge 0$$

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

Unit—II

2. (a) Solve the following transportation problem :

From	То			Available
	А	B	С	Available
Ι	6	8	4	14
II	4	9	8	12
III	1	2	6	5
Demand	6	10	15	

(b) Solve the following assignment problem :

	Ι	II	III	IV
А	10	12	19	11
В	5	10	7	8
С	12	14	13	11
D	8	15	11	9

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

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Unit—III

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

Maximize :

$$z = 3x_1 + 5x_2$$

Subject to the constraints :

$$x_1 \le 4$$
$$x_2 \le 6$$
$$3x_1 + 2x_2 \le 18$$

and $x_1, x_2 \ge 0$.

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

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

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

Maximize :

$$z = x_1 + 4x_2$$

Subject to the constraints :

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

 $5x_1 + 3x_2 \le 15$

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

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Unit-IV

- 4. (a) Describe input-output analysis of industries.
 - Explain Petroleum Refinery operation as a L. P. P. (b)
 - Explain briefly the blending problem as linear (c) programming.

Unit—V

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

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

Subject to the constraints :

$$2x_1 + 3x_2 \le 6$$
$$2x_1 + x_2 \le 4$$

and $x_1, x_2 \ge 0$.

- (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 :

$$x_1 + x_2 \le 2$$

and $x_1, x_2 \ge 0$.

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