

AI-1552 CV-19  
M.A./M.Sc. (Final)  
Term End Examination, 2020-21  
MATHEMATICS  
(Operations Research)  
Paper - VIII

Time : Three Hours]

[Maximum Marks : 100  
[Minimum Pass Marks : 36

Note : Answer any five questions. All questions carry equal marks.

1. (a) Define Or and discuss its scope.  
(b) Solve the L.P.P.

$$\text{Max} Z = 3x_1 + 5x_2 + 4x_3$$

$$\text{s.t. } 2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_3 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

2. State and prove fundamental Theorem of Linear Programming

3. Solve following L.P.P. by the dual simplex Algorithm

$$\text{Min} Z = x_1 + 2x_2 + 3x_3$$

$$\text{s.t. } 2x_1 - x_2 + x_3 \geq 4$$

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

$$x_2 - x_3 \geq 2$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

4. For the following L.P.P.

$$\text{Min} = \lambda x_1 - \lambda x_2 - x_3 + x_4$$

$$\text{s.t. } 3x_1 - 3x_2 - x_3 + x_4 \geq 5$$

$$2x_1 - 2x_2 + x_3 - x_4 \leq 3$$

$$\text{and } x_1, x_2, x_3, x_4 \geq 0$$

Find the range of  $\lambda$  over which the solution remain basic feasible and optimal

5. Solve the following transportation problem

From	To			Supply
	1	2	3	
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	24

6. (a) Write a note on dynamic programming.  
(b) Solve by dynamic programming method.

$$\text{Max } Z = x_1 \cdot x_2 \cdot x_3$$

$$\text{s.t. } x_1 + x_2 + x_3 = 5$$

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

7. (a) Solve the game by graphical method.

$$A \begin{array}{c|cccc} 2 & -1 & 5 & -2 & 6 \\ -2 & 4 & -3 & 1 & 0 \end{array}$$

(b) Use the concept of dominance to solve the game whose pay-off matrix to the player A is

$$A \begin{array}{c|ccc} & \text{B} & & \\ & \text{I} & \text{II} & \text{III} \\ 1 & 7 & 2 & \\ 6 & 2 & 7 & \\ 5 & 1 & 6 & \end{array}$$

8. Draw a Network diagram on the basis of the following data

Activity	Duration(days)
1-2	2
1-4	2
1-7	1
2-3	4
3-6	1
4-5	5
4-8	8
5-6	4
6-9	3
7-8	3
8-9	2
9-10	2

Find the critical path, total duration and slack times.

9. Write a note on

- (i) Petroleum refinery operations
- (ii) Input/Output analysis
- (iii) Leontief system
- (iv) Decomposable economics

10. Write the dual of the following L.P.P. and solve. Find the solution of primal by final simplex table of dual problem.

$$\begin{array}{l} \text{Max } Z = 30x_1 + 23x_2 + 29x_3 \\ \text{s.t. } 6x_1 + 5x_2 + 3x_3 \leq 26 \\ 4x_1 + 2x_2 + 5x_3 \leq 7 \\ \text{and } x_1, x_2, x_3 \geq 0 \end{array}$$