

AE-812

M.A./M.Sc. (Final)
Term End Examination, 2016-17

MATHEMATICS

Optional

Paper - VIII

Operations Research

[illegible]

Note : Attempt any **five** questions. The figures in the right-hand margin indicate marks.

1. (a) By using Simplex method solve the following Linear Programming Problem : 12

Minimize $Z = x_2 - 3x_3 + 2x_5$ subject to
the constraints

$$3x_2 - x_3 + 2x_5 \leq 7$$

$$-2x_2 + 4x_3 \leq 12$$

$$-4x_2 + 3x_3 + 8x_5 \leq 10$$

$$x_2, x_3, x_5 \geq 0$$

(2)

- (b) Write the dual of the following Linear Programming Problem : 8

Min $Z = 3x_1 - 2x_2 + 4x_3$ subject to the constraints

$$3x_1 + 5x_2 + 4x_3 \geq 7$$

$$6x_1 + x_2 + 3x_3 \geq 4$$

$$7x_1 - 2x_2 - x_3 \leq 10$$

$$x_1 - 2x_2 + 5x_3 \geq 3$$

$$4x_1 + 7x_2 - 2x_3 \geq 2$$

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

2. Use Dual Simplex method to solve the following problem : 20

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

subject to

$$x_1 + x_2 \geq 1$$

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

$$x_1, x_2 \geq 0$$

(3)

3. Solve the following Transportation Problem : 20

		To			Available
From		2	7	4	5
		3	3	1	8
		5	4	7	7
		1	6	2	14
Required		7	9	18	Total = 34

4. Solve the minimal assignment problem whose effectiveness matrix is given by 20

	1	2	3	4
I	2	3	4	5
II	4	5	6	7
III	7	8	9	8
IV	7	5	8	4

5. (a) Find the value of $\text{Max } (y_1, y_2, y_3)$
subject to $y_1 + y_2 + y_3 = 5$,
 $y_1, y_2, y_3 \geq 0$ 10

(4)

- (b) Use the principle of optimality to find the maximum value of

$$Z = b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_nx_n$$

when $x_1 + x_2 + x_3 + \cdots + x_n = c$

and $x_1, x_2, \cdots, x_n \geq 0$,

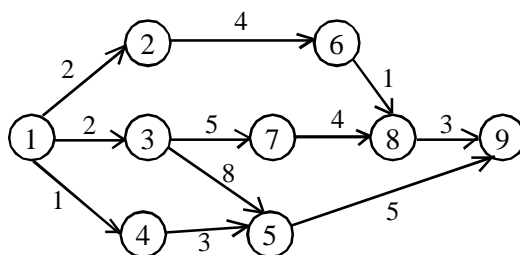
$b_1 > 0, b_2 > 0 \cdots b_n > 0$ 10

6. (a) Let $\{ V_{ij} \}$ be the Pay-off matrix for a two person zero sum game. If \underline{V} denotes the maxmin value and \bar{V} the minmax value of the game, then prove $\bar{V} \geq \underline{V}$. 10

- (b) Solve the following 2×3 game graphically : 10

	I	II	III
I	1	3	11
II	8	5	2

7. Find the critical path and calculate the slack time for each event for the following PERT diagram : 20



(5)

8. A project has the following time schedule :

Activity	Time in weeks
(1 – 2)	4
(1 – 3)	1
(2 – 4)	1
(3 – 4)	1
(3 – 5)	6
(4 – 9)	5
(5 – 6)	4
(5 – 7)	8
(6 – 8)	1
(7 – 8)	2
(8 – 9)	1
(8 – 10)	8
(9 – 10)	7

(6)

Construct a PERT Network and compute

(a) T_E and T_L for each event

(b) Float for each activity 20

9. (a) What is O.R. ? Write the scope of operations research in Agriculture, Finance, LIC and Industry. 10

(b) What is Goal Programming ? Formulate the goal programming and write the applications of goal programming. 10

10. Consider the Parametric Linear Programming Problem to

$$\text{Max } Z = (\lambda - 1) x_1 + x_2$$

subject to constraints

$$x_1 + 2x_2 \leq 10$$

$$2x_1 + x_2 \leq 11$$

$$x_1 - 2x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

(7)

Perform Complete Parametric Programming
Analysis. Identify all critical values of the
parameter λ and all optimum basic solutions. 20
