

COURSE CODE:11B1WMA832

MAX. MARKS: 30

COURSE NAME: Linear Programming and Applications

COURSE CREDIT: 03

MAX. TIME: 2 HRS

Note: All questions are compulsory.**Section A (1 x 6=6marks)**

Q1. For what values of $Z_j - C_j$, simplex method is terminated in Maximization linear programming problem.

Q2. Find all basic feasible solutions for $Max Z = 2x_1 + 3x_2$

$$s/t \quad 2x_1 + 3x_2 + 4x_3 = 5$$

$$3x_1 + 4x_2 + 5x_3 = 6$$

Q3. Solution of $Max Z = 4x_1 + 3x_2$

$$s/t \quad x_1 + x_2 \leq 4, \quad 3x_1 + x_2 \leq 12 \quad \text{and} \quad x_1, x_2 \geq 0 \quad \text{is unique or not.}$$

Q4. Write the dual of linear programming problem given in question number 3.

Q5. Write mathematical form of assignment problem.

Q6. Give an example of unbalanced assignment problem and which method is used for solving it.

Section B (3 x 3=9 marks)

Q7. Prove that the dual of the dual of the given primal problem is primal itself.

Q8. Solve the linear programming problem by simplex method.

$$Max R = 22x + 30y + 25z$$

$$s/t \quad 2x + 2y \leq 100$$

$$2x + y + z \leq 100$$

$$x + 2y + 2z \leq 100$$

$$x, y, z \geq 0$$

Q9. Solve the assignment problem for minimizing total time for doing all the jobs

Persons/Jobs	A	B	C	D	E
1	6	2	5	2	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8

Section C (3 x 5 =15 marks)

Q10. The manager of an oil refinery must decide on the optimal mix of two possible blending processes of which the inputs and outputs per production run are as follows:

Process	Input(Crude A)	Input(Crude B)	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amounts available of crude A and B are 200 units and 150 units respectively. Market requirement shows that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profit per production run from process 1 and 2 are Rs 300 and Rs 400 respectively. Formulate the problem as linear programming problem and solve it graphically.

Q11. Solve the linear programming problem by Big M method.

$$\text{Max } z = 2x_1 + 3x_2 - 5x_3$$

$$\text{s/t } x_1 + x_2 + x_3 = 7$$

$$2x_1 - 5x_2 + x_3 \geq 10$$

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

Q12. Solve the linear programming problem by dual simplex method.

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

$$\text{s/t } 2x_1 + 3x_2 \leq 30$$

$$x_1 + 2x_2 \geq 10$$

$$x_1 - x_2 \geq 0$$

$$x_1 \geq 5$$

$$x_2 \geq 0$$