EXADEMY

ONLINE NATIONAL TEST

Course: UPSC – CSE - Mathematics Optional

Subject: Linear Programming **Time: 2 hours**

Total Questions: 8 **Total Marks: 100**

Q1. Solve graphically the following linear programming problem.

$$\text{Min. } Z = 3x_1 + 5x_2$$

Subject to $-3x_1 + 4x_2 \leq 12$

$2x_1 - x_2 \geq -2$

$2x_1 + 3x_2 \geq 12$

$x_1 \leq 4,\ x_2 \geq 2,$

$x_1, x_2 \geq 0$

10 Marks

Q2. Using simplex algorithm solve the problem

$$\text{Max. } Z = 2x_1 + 5x_2 + 7x_3$$

Subject to $3x_1 + 2x_2 + 4x_3 \leq 100$

$x_1 + 4x_2 + 2x_3 \leq 100$

$x_1 + x_2 + 3x_3 \leq 100$

$x_1, x_2, x_3 \geq 0$

10 Marks

Q3. Using simplex algorithm solve the problem

Max. $Z = -x_1 - x_2$

Subject to $3x_1 + 2x_2 \geq 30$

$-2x_1 + 3x_2 \leq -30$

$x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

12 Marks

Q4. Using simplex algorithm solve the problem

Max. $Z = 2x_1 + 3x_2$

Subject to $-x_1 + 2x_2 \leq 4$

$x_1 + x_2 \leq 6$

$x_1 + 3x_2 \leq 9$

x_1, x_2 unrestricted.

12 Marks

Q5. Find the dual of the following LPP

Min. $Z = x_1 + x_2 + x_3$

Subject to $x_1 - 3x_2 + 4x_3 = 5$

$x_1 - 2x_2 \leq 3$

$2x_2 - x_3 \geq 4$

$x_1, x_2 \geq 0$

x_3 is unrestricted.

11 Marks

Q6. Formulate the following LPP into dual problem and hence solve it:

Min. $Z_P = 3x_1 - 2x_2 + 4x_3$

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

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

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

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

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

$x_1, x_2, x_3 \geq 0$

15 Marks

Q7. An airline that operates seven days a week has timetable shown below. Crews must have a minimum layover of 5 hours between flights. Obtain the pairing of flights minimizes layover time away from home. For any given pairing the crew will be based at the city that results in the similar layover.

Delhi - Jaipur			**Jaipur - Delhi**		
Flight No.	**Depart**	**Arrive**	**Flight No.**	**Depart**	**Arrive**
1	7.00 AM	8.00 AM	101	8.00 AM	9.15 AM
2	8.00 AM	9.00 AM	102	8.30 AM	9.45 AM
3	1.30 PM	2.30 PM	103	12 Noon	1.15 PM
4	6.30 PM	7.30 PM	104	2.30 PM	6.45 PM

For each pair also mention the town where the crew should be based.

15 Marks

Q8. Solve the following transportation problem

		TO			
		1	2	3	Supply
From	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	34

15 Marks