

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
(MID SEMESTER EXAMINATION SP/2025)

CLASS: IMSC  
BRANCH: MATHEMATICS

SEMESTER : VI/ADD  
SESSION : SP/2025

**SUBJECT: MA309 OPTIMIZATION TECHNIQUES**

TIME: 02Hours

FULL MARKS: 25

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Graph paper will be supplied to the candidates

- Q.1(a) Solve the following LPP graphically. [2]    CO 1    BL 1,2,3  
 Minimize  $Z=x_1+7x_2$   
 Subject to:  
 $-x_1+2x_2 \leq 8,$   
 $x_1-x_2 \leq 4$   
 $x_1, x_2 \geq 0$

- Q.1(b) Solve the following LPP by M-method [3]    1    1,2,3  
 Maximize  $Z=3x_1+2x_2$   
 Subject to:  
 $2x_1+x_2 \leq 2$   
 $3x_1+4x_2 \geq 12$   
 $x_1, x_2 \geq 0$

- Q.2(a) Find the dual of the following LPP. [2]    1    1,2,3  
 Maximize  $Z=3x_1-x_2+x_3$   
 Subject to:  
 $4x_1-x_2 \leq 8$   
 $8x_1+x_2+3x_3 \geq 12$   
 $5x_1-6x_3 \leq 13$   
 $x_1, x_2, x_3 \geq 0$

- Q.2(b) Consider a LPP with optimum solution as [3]    1    1,2,3  
 Maximize  $T=30x+10y+50z$   
 Subject to:  
 $6x+3y+5z \leq 450$   
 $3x+4y+5z \leq 300$   
 $x, y, z \geq 0$

Basic	x	y	z	$s_1$	$s_2$	solution
T	0	30	0	0	10	3000
$s_1$	3	-1	0	1	-1	150
z	3/5	4/5	1	0	1/5	60

Where  $s_1$  and  $s_2$  are the slack variables respectively.  
 Discuss the effect of changing [450,300] to [500,350] on the optimum solution.

- Q.3(a) Solve the transportation problem by Vogel Approximation method. [2]    2    1,2,3

	D1	D2	D3	D4	Supply
O1	5	2	4	3	22
O2	4	8	1	6	15
O3	4	6	7	5	8
Demand	7	12	17	9	

- Q.3(b) Find the optimal solution of 3(a) by MODI method. [3]    2    1,2,3

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- Q.4(a) Distinguish between transportation and Assignment problem. [2] 2 1,2,3  
 Q.4(b) Determine the optimum assignment schedule of assigning five jobs to five persons. The assignment costs are given as follows: [3] 2 1,2,3

	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

- Q.5(a) Set up of the revised simplex method for solving LPP by showing one iteration only [2] 3 1,2,3  
 .  
 Maximize  $Z=2x+y$   
 Subject to  
 $3x+4y \leq 6; 6x+y \leq 3; x, y \geq 0.$   
 Q.5(b) Solve 5(a) by revised simplex method showing the next iteration and final solution. [3] 3 1,2,3

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