BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSC **SEMESTER : VI**
BRANCH: MATHEMATICS **SESSION : SP/2025**

SUBJECT: MA309 OPTIMIZATION TECHNIQUES

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Statistical tables &Graph paper to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Solve graphically the following LPP. Maximize Z=2x+y Subject to: $x+y\geq 5; 2x+3y\leq 20; 4x+3y\leq 25; x,y\geq 0$	[5]	1	1,2,3
Q.1(b)	Solve the following LPP by Big-M method. Maximize Z=2x-3y Subject to: $-x+y\geq -2; 5x+4y\leq 46; 7x+2y\geq 32; x,y\geq 0.$	[5]	1	1,2,3
Q.2(a)	Find the dual of the following LPP Minimize z=-6x-8y+10z Subject to $x+y-z\geq 2; 2x-z\geq 1; x,y,z\geq 0$ Show that dual of the dual is the primal.	[5]	2	1,2,3
Q.2(b)	Solve the transportation problem using North West corner method & Vogel approximation method. Which method is better and why?	[5]	2	1,2,3

Origin/destination	D1	D2	D3	SUPPLY
O1	0	2	1	6
O2	2	1	5	9
03	2	4	3	5
DEMAND	5	15	10	

Q.3(a)	Solve the following integer programming problem by cutting plane method Maximize Z=2x+y Subject to: $x\leq 1.5$ $y\leq 1.5$ $x, y \geq 0$ and integer.	[5]	3	1,2,3
Q.3(b)	Solve by Branch and bound method. Max Z=8x+5y Subject to: $x+y\leq 6; 9x+5y\leq 45; x,y\geq 0$,integer.	[5]	3	1,2,3

PTO

Q.4(a) A project schedule has the following characteristics [5] 4 1,2,3

Activity	Duration
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
8-10	5
9-10	7

i). Construct the network. ii). Compute Earliest and Latest start time for each event. iii). Find the critical path,

Q.4(b) Q1b.Consider the following data for PERT network. Determine the critical path. What is the probability that project will be completed in 20days. [5] 5 1,2,3

ACTIVITY	A	M	B
1-2	1	2	3
2-3	1	4	7
2-4	1	2	9
3-5	1	2	9
4-5	2	3	4
5-6	2	3	4

Draw the network diagram showing critical path, expected activity duration and variances. What is the probability that the project will be completed in 12 days.

Q.5(a) The maintenance crew of a company is divided in two groups C_1 and C_2, which cares for maintenance of the machines. Crew C_1 is responsible for replacement of parts which are worn out, while crew C_2 oils, and resets the machine back for operation, The time in hours required by crews C_1 & C_2 on different machines which need working on them are as follows: [5] 5 1,2,3

Machine	M_1	M_2	M_3	M_4	M_5	M_6	M_7
Crew C_1	8	6	10	11	10	14	4
Crew C_2	5	3	7	12	8	6	7

In which order should the machines be handled by crew C_1 and C_2 so that the total time taken is minimum. Do all necessary calculations.

Q.5(b) Six jobs have to be processed on three machines A, B &C in the order ABC. The time taken by each job on each machine (in hours) is given below. Each machine can process only one job at a time. [5] 5 1,2,3

JOB	I	J	K	L	M	N
Machine A	12	8	7	11	10	5
Machine B	7	10	9	6	10	5
Machine C	3	4	2	5	1.5	4

Determine the sequence so as to minimize the processing time.

::::::01/05/2025::::::M