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

CLASS: BTECH
BRANCH: CSE

SEMESTER : 5TH
SESSION : MO/2025

SUBJECT: CS341 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. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Maximize $z=x+y$ subject to the constraints $x+y \leq 1$, $-3x+y \geq 3$; $x, y \geq 0$.	[5]	1	2,3
Q.1(b)	Use dual simplex method to solve the following linear programming problem, Minimize $Z=x_1+2x_2+3x_3$ subject to the constraints: $x_1- x_2+ x_3 \geq 4$, $x_1+x_2+2x_3 \leq 8$, $x_2-x_3 \geq 2$; $x_1, x_2, x_3 \geq 0$.	[5]	1	
Q.2	Use Gomory's method to solve the following linear programming problem, Maximize $Z=3x+4y$ subject to the constraints: $3x+2y \leq 8$, $x+4y \leq 10$; $x, y \geq 0$ and are integers.	[10]	2	2,3
Q.3(a)	Discuss the characteristics of the dynamic programming problem.	[5]	3	2
Q.3(b)	Use dynamic programming to find the value of Maximize $z=y_1 \cdot y_2 \cdot y_3$ subject to the constraints: $y_1+ y_2+ y_3=5$ and $y_1, y_2, y_3 \geq 0$.	[5]	3	4
Q.4(a)	Explain Kuhn-Tucker conditions and Hessian matrix.	[5]	4	2
Q.4(b)	Use the method of Lagrangian multipliers to solve the following non-linear programming problem: Minimize $Z=2x_1^2+x_2^2+3x_3^2+10x_1+8x_2+6x_3-100$ subject to the constraints: $x_1+x_2+x_3=20$.	[5]	4	3,4
Q.5(a)	Explain {(M/M/1):(N/FIFO)} queuing system and solve it under steady state condition.	[5]	5	4
Q.5(b)	Arrivals at a telephone booth are following Poisson law of distribution with an average time of 10 minutes between one arrival and the next. Length of a phone call is assumed to be distributed exponentially with mean 3 minutes. (a) What is the probability that a person arriving at the booth will have to wait? (b) What is the average length of queue that form from time to time?	[5]	5	4

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