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

CLASS: IMSc. **SEMESTER : IV**
BRANCH: QEDS **SESSION : SP/2024**

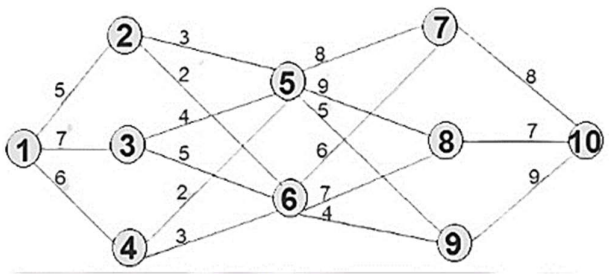
SUBJECT: ED213 OPTIMIZATION TECHNIQUES

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.**
6. **All the notations used in the question paper have usual meanings.**

		Marks	CO	BL
Q.1	Solve the travelling salesman problem given by the following data: $c_{12}=20, c_{13}=4, c_{14}=10, c_{23}=5. c_{25}=10, c_{34}=6, c_{35}=6$ and $c_{45}=20$, where $c_{ij}=c_{ji}$, and there is no route between the cities i and j, if a value of c_{ij} is not given.	[10]	CO2	2,3
Q.2	By solving dual of the following linear programming problem $\min z = 4x_1 + 3x_2 + 6x_3$ subject to $x_1 + x_3 \geq 2;\ x_2 + x_3 \geq 5;\ x_1, x_2 \geq 0$ compute the solutions of the primal and dual both. Hence, verify strong duality theorem.	[8+2]	CO1	1,2
Q.3(a)	Perform two iterations of steepest descent method to minimize the function $f(x_1, x_2) = 2(2x_1^2 - 2x_1x_2 + x_2^2)$ with initial starting point $x_0 = (1, 1)$.	[7]	CO3	3,4
Q.3(b)	Find the number of experiments to be conducted in Fibonacci method to obtain a value of $\frac{L_n}{L_0} = 0.0005$.	[3]	CO3	3
Q.4	Consider the following optimal simplex table (neglecting the integer constraints) for a maximization type integer linear programming problem. Find the integer solutions of both the variables $(x_1 \text{ and } x_2)$ using Gomory cutting plane algorithm.	[10]	CO4	4,5
Q.5	Apply dynamic programming technique to obtain the shortest path from node 1 to node 10 in the following network.	[10]	CO5	5,6

c_j			2	2	0	0
c_B	B	b	x_1	x_2	s_1	s_3
2	x_1	$\frac{4}{7}$	1	0	$\frac{2}{7}$	$-\frac{3}{7}$
2	x_2	$\frac{12}{7}$	0	1	$-\frac{1}{7}$	$\frac{5}{7}$
$z_j - c_j$			0	0	$\frac{2}{7}$	$\frac{4}{7}$



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