Name: Enrolment No:	UPES UNIVERSITY OF TOMORROW

UPES
End Semester Examination, Dec 2024

Course: Algorithm Design and Analysis   Semester: 1st
Program: MTech   Time   : 03 hrs.
Course Code: CSEG7028   Max. Marks: 100

Instructions: Attempt all the questions.

<div align="center">

SECTION A
(5Qx4M=20Marks)
Note: Attempt all the questions.

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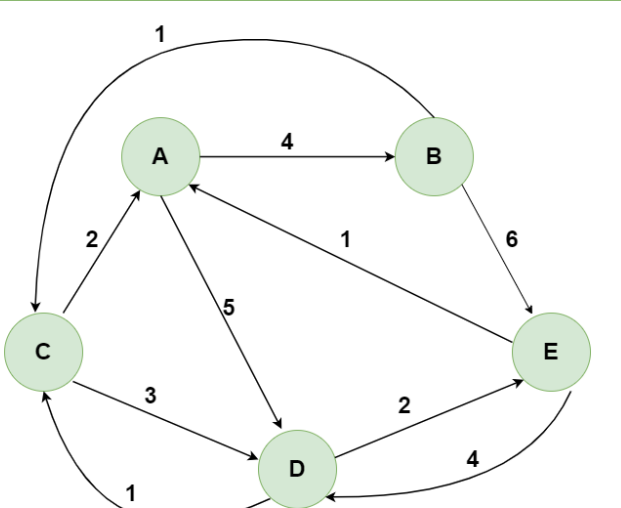| S. No.		Marks	CO
Q 1	Solve the following recurrence relation using recursion tree method. $T(n) = T(n/3) + T(2n/3) + n$	4	CO2
Q 2	Explain P, NP, NPC and NP-Hard.	4	CO1
Q 3	1. $m(x) = 2^{x^2}$ 2. $f(x) = e^{2x}$ 3. $h(x) = e^x$ 4. $g(x) = x^{10}$ 5. $q(x) = x^5$ 6. $n(x) = x^{\log(x)}$ 7. $p(x) = x^{1/3}$ 8. $k(x) = \log(x)$ Arrange all the above functions in increasing order.	4	CO3
Q 4	Sort the array using Quick Sort. < 4, 3, 1, 2, 5, 9, 7, 10 , 6>	4	CO3

Q 5	Define the complexity of following function.
	int F(int n) {
	if (n <= 1) {
	return n; }
	return F(n - 1) + F(n - 2); }
		4	CO2

|	SECTION B (4Qx10M= 40 Marks) Note: Attempt all the questions.		
Q 6	Determine an LCS of 1, 0, 0, 1, 0, 1, 0, 1 and 0, 1, 0, 1, 1, 0, 1, 1, 0	10	CO3
Q 7	Explain the N-queen problem and provide 2 solutions for 8-queen problem.	10	CO1
Q 8	Explain and analyze the complexity of Knuth-Morris-Pratt algorithm.	10	CO1
Q 9	Apply Huffman encoding to create a Huffman Tree for the following given file, consisting of symbols and their respective frequencies, and evaluate the resulting memory savings achieved through this encoding process. 	Symbol	a	e	i	o	u	s	t
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Frequency	10	15	12	3	4	13	1 | **OR** The Job Scheduling Problem is a classic optimization problem in computer science and operations research, where the goal is to find an optimal way to schedule a set of jobs on one or more machines while minimizing some cost or maximizing some performance criteria. Write the algorithm based on Greedy strategy to schedule n jobs in single machine and assume the deadline & penalty for individual job.	10	CO4
	SECTION-C (2Qx20M=40 Marks) Note: Attempt all the questions.		
Q 10	Apply all pair shortest path algorithm in following graph. 	20	CO4

| Q 11 | Define the Prim's algorithm for generating the minimum spanning tree and analyze the complexity. Apply the Prim's algorithm on the following graph and generate the minimum spanning tree.

Note: assume 0 is the source node.
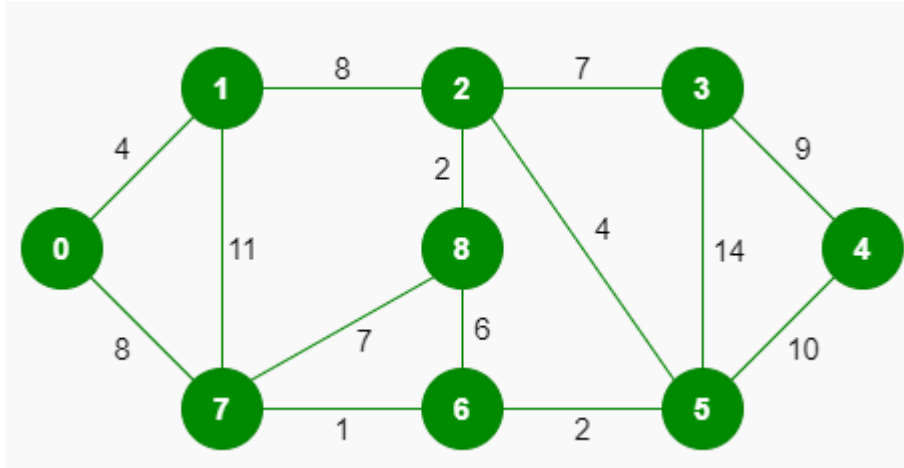
OR

Explain the different graph traversal techniques with complexity and apply the Depth First Search on following graph.

 | 20 | CO3 |