Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2022

Course: Algorithm Design and Analysis **Semester: I**
Program: M.Tech (CSE) **Time : 03 hrs.**
Course Code: CSEG 7001 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

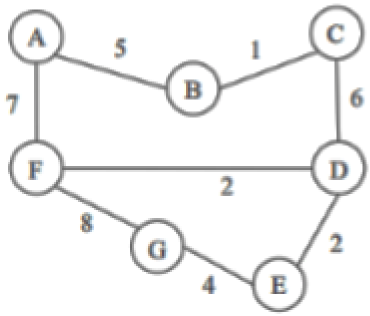
S. No.		**Marks**	**CO**
Q 1	Give the suitable examples to support the following argument that "Data structure plays an important role in efficiently solving the problems"	4	CO1
Q 2	Compute the time complexity for merge sort algorithm using recursion tree.	4	CO2
Q 3	What is optimal substructure and overlapping sub problem?	4	CO3

Q 4	Compute the Big Oh for the following.
	a) for(j=0;i<n-1;i++)
	A[i]=+;
	b) for(i=0;i<n;i++)
	for(j=i;j<n;j++)
	for(k=j;k<n;k++)
	A++;
		4	CO1

Q 5	Explain the P, NP, NP-hard, NP-complete classes? Give relationship between them?	4	CO4

SECTION B
(4Qx10M= 40 Marks)

Q 6	A=$\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$ B=$\begin{bmatrix} 3 & 4 \\ 5 & 1 \end{bmatrix}$ devise the algorithms to compute AxB with the following conditions. a) Algorithm-1's recurrence should be $8T\left(\frac{n}{2}\right)+\Theta(n^2)$ b) Algorithm-2's recurrence should be $7T\left(\frac{n}{2}\right)+\Theta(n^2)$	10	CO1,CO2

Q 7	Let G = (V, E) where V = {1, 2, 3, 4} and E = {(1, 2),(2, 3),(2, 4),(3, 4)} and suppose that k = 3, devise an algorithm such that adjacent nodes get different colors.	10	CO3
Q 8	Devise the algorithm to find k'th smallest element in given unsorted array of ‘n’ elements with O(n) time complexity.	10	CO2
Q 9	Compute the MST using Prim’s algorithm  (OR) Find an optimal Huffman code for the following a set of frequencies: a:40 b:20 c:10 d:45 e:80	10	CO3
SECTION-C (2Qx20M=40 Marks)			
Q10	Compute the best way to multiply a chain of matrices with the dimensions 4X10 10X3 3X12 12X20 20X7. Show your work.	20	CO3
Q11	Let T be a text of length n, and let P be a pattern of length m. Describe an O(n+m) time method for finding the longest prefix of P that is a substring of T. (OR) How the failure function of KMP algorithm works?	20	CO4