UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2022

Programme Name: B Tech (Advanced Material and Nanotechnology)　　**Semester** : III
Course Name : Applied Programming and Algorithm Design　　**Time** : 03hrs
Course Code : MECH2048　　**Max. Marks: 100**
Nos. of page(s) : 3
Instructions:

SECTION A

S. No.		Marks	CO
.Q 1	Illustrate the difference between Divide and Conquer Method and Dynamic Programming.	**4**	**CO3**
Q 2	Explain the difference between Binary Tree and Binary Search Tree (BST)?	**4**	**CO4**
Q 3	Write a short note on different Asymptotic Notations? Explain with diagrams.	**4**	**CO1**
Q 4	Differentiate between linear search and Binary search algorithm.	**4**	**CO2**
Q5	Explain the sum of subset problem.	**4**	**CO5**

SECTION B

Q 6	Write the algorithm to find the maximum element among three elements.	**10**	**CO1**

Q 7

Explain Greedy Method. What is fractional Knapsack Problem?

Solve this below mentioned fractional knapsack problem using Greedy method. Weight (W) of the Knapsack: 15 Kg. No of objects: 7

Object(O)	1	2	3	4	5	6	7
Profit(P)	5	10	15	7	8	9	4
Weight(w)	1	3	5	4	1	3	2

10　**CO3**

Q 8	Suppose there is a message and the frequencies of the different alphabets are given as: b = 50, r = 10, a = 3, k = 30, e = 2, s = 5. What should be the representation of these different characters based on the Huffman algorithm?	10	CO3
Q 9	Illustrate 4 Queens Problem with example.	10	CO5

<div align="center">SECTION-C</div>
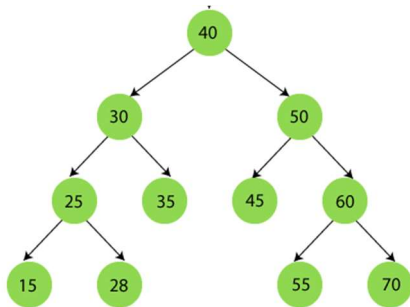
| Q 10 | Briefly explain about spanning tree. Draw a minimum cost spanning tree for the following diagram using Prim's Algorithm.
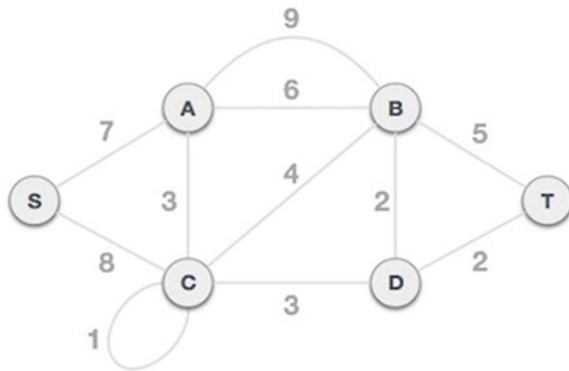
<div align="center">OR</div>

Find the in-order and Post-order traversal of the given tree.

 | 20

CO4 | |

| Q11 | Consider the matrices P, Q, R and T which are 6 x 5, 5 x 7, 7 x 3 and 3 x 9, respectively. What is the minimum number of multiplications required to multiply the four matrices? Compute the optimal sequence and optimal parenthesization for matrix multiplication. Also design the algorithms for the optimal sequence and optimal parenthesization through analyzing the space and time complexity.

OR

Suppose, these are the elements in an array

17,-10, 7, 19, 21, 23, -13, 31, 59

Explaining with different steps sort the elements by Quick Sort Algorithm. Write the time complexity of the algorithm in worst case and best case. | 20 | CO2 |