NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CSPC42- Design and Analysis of Algorithms

Programme: B.TECH **Session: JAN/2024**

Date: 28.02.2024 **Cycle Test-1** **Duration: 1 Hour** **Total Marks: 20**

Answer all the questions

1. Find the Time Complexity using the substitution method. ((CO1), 3 M)

$$T(n) = \begin{cases} 2T(n-1) - 1 & ;\text{if } n>0 \\ 1 & ;\text{otherwise} \end{cases}$$

(b)
```
Fun (int n)
{
    if(n==1) return;
    for (i=1; i<=n; i++)
     {
        for (j=1; j<= n; j++)
          printf("DAA");
     }
    Fun(n/2);
    Fun(n/2);
}
```

2. Write a pseudo code for prim's algorithm without using the min heap data structure. Analyze its time complexity. ((CO1, CO2), 4 M)
3. Suppose the letters *a, b, c, d, e, f* have the following probabilities 1/2, 1/4, 1/8, 1/16, 1/32, 1/32, respectively. Find the Huffman code for the given letters and what is the average length of Huffman codes. ((CO2), 3M)
4. Write a pseudo code for finding the smallest and largest elements in an unsorted array using Divide and Conquer technique. Analyze its time complexity. ((CO1, CO2), 4 M)
5. Write Dijkstra's algorithm and analyze its time complexity. Which of the following statements cannot be true? Justify your answers with examples. ((CO1, CO2), 6M)
   i) Dijkstra's algorithm works well for the Graph with negative weight edges but no negative weight cycle.
   ii) Dijkstra's algorithm works well for the Graph with negative weight edges and negative weight cycles.

*** Best Wishes***