JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-1 EXAMINATION- February, 2020

B. Tech VI/VIII/Semester & M. Tech II Semester

COURSE CODE: 10M11CI211   MAX. MARKS: 15

COURSE NAME: Advanced Algorithms

COURSE CREDITS: 3   MAX. TIME: 1 Hr

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1.

a) How many times the print statement is executed and what is the complexity of following codes? Write all the steps involved in calculation of complexity. **(CO-2)[1.5 marks]**

```
A()

{

int i,j,k,n;

for (i=1;i<=n;i++)

{

    for(j=1;j<=i²;j++)

    {

        for(k=1;k<=n/2;k++)

        {

            Printf("Hello");

        }

    }

}

}
```

b) Solve the following recurrence relation using back substitution method. Write all the intermediate steps involved in calculation. **(CO-2)[1.5 marks]**

$$T(n)=n+T(n-1) \; ; \; n>1$$
$$=1 \; ; \qquad n=1$$

Q2. We are given an array of n points in the plane, and the problem is to find out the closest pair of points in the array. This problem arises in a number of applications. For example, in air-traffic control, you may want to monitor planes that come too close together, since this may indicate a possible collision. Recall the following formula for distance between two points p and q.
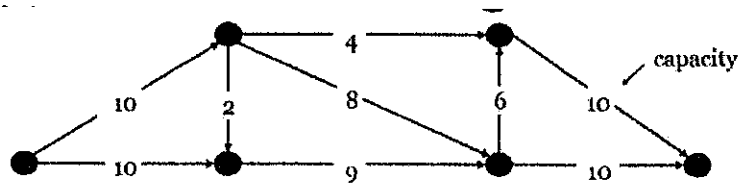
$$\|pq\| = \sqrt{(p_x - q_x)^2 + (p_y - q_y)^2}$$

The Brute force solution is O(n^2), compute the distance between each pair and return the smallest. We can calculate the smallest distance in O(nLogn) time using Divide and Conquer strategy. Write an algorithm in C++ for this problem using Divide and Conquer strategy. **(CO-3)[3 marks]**

Q3. It is not uncommon to combine two sorting algorithms to fulfil the performance requirements of the problem at hand. Discuss the scenario Where, Why and how, we will use the following combinations. **(CO-2)[3 marks]**
a) Insertion Sort and Merge Sort
b) Radix Sort and Counting Sort
c) Quick Sort, Merge Sort and External Sort

Q4. Write an algorithm for Fractional Knapsack and 0/1 Knapsack. Also evaluate the worthiness of both in context of greedy property. **(CO-3)[3 marks]**

Q5. Apply Ford Fulkerson Edmonds Karp Algorithm of Max Flow problem on the following graph. Find the maximum flow in the network. **(CO-4)(3 marks)**