Candidate Seat no.....

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Fifth Semester of B. Tech (CE) Examination

Nov-Dec 2018

CE342 Design and Analysis of Algorithms/

CE315 Design and Analysis of Algorithm

Date: 22.11.2018, Thursday **Time: 10.00 a.m. To 1.00 p.m.** **Maximum Marks: 70**

Instructions:

1. The question paper comprises two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 **Answer the questions below.**

(i) State "Making change" problem. What is the worst case complexity of making change problem using greedy strategy? **[02]**

(ii) Differentiate Best Case and Worst Case Complexities with example. **[02]**

(iii) Differentiate Greedy and Dynamic Programming. **[03]**

Q - 2 (a) **Attempt the following: (Any Two)** **[10]**

(i) Solve the following Master's theorem:

A. $T(n) = 9\,T(n/3) + n$

B. $T(n) = T(2n/3)+1$

(ii) Analyze bubble sort algorithm to prove that worst case complexity is O(n^2).

(iii) What is the time complexity of the following code?

1.
```
function1()
 {
      int i=1, s=1;
      while(s<=n)
      {
           i++;
           s=s+i;
           printf("CHARUSAT");
      }

 }
```

2.
```
function2()
{
     int i, j, k,n;
     for(i=1;i<=n;i++)
```

```
{
    for(j=1; j<=i; j++)
    {
        for(k=1; k<=100; k++)
        {
            Printf("All the Best!");
        }
    }
}
}
```

Q-2 (b) What do you mean by Polynomial time complexity and Logarithmic time complexity? Which one is higher? Give examples of both. **[04]**

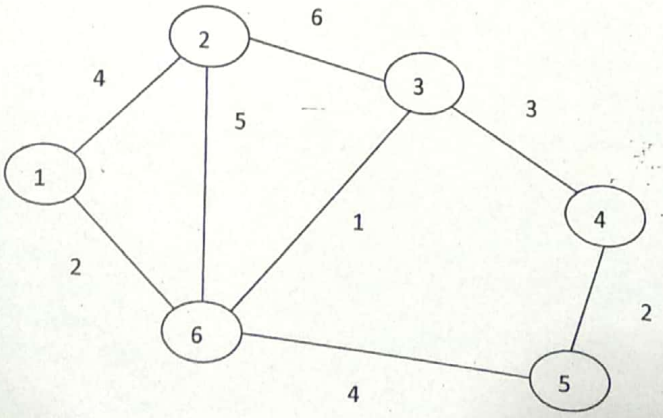
Q-2 (c) Write an algorithm of Quick Sort and derive its complexity in worst case. **[04]**

OR

Q-2 (c) Write the general recurrence equation to describe the running time of a divide and conquer algorithm. Using this equation analyze the time complexity of merge sort. **[04]**

Q – 3 **Answer the questions below.** **[10]**

(i) For the following example of Kruskal's Algorithm, First three edges added to solution set are {(3,6),(1,6),(4,5)}. How many sets will be there and what will be the members of the set after adding (4,5) edge? Find out all edges and cost of minimum spanning tree.

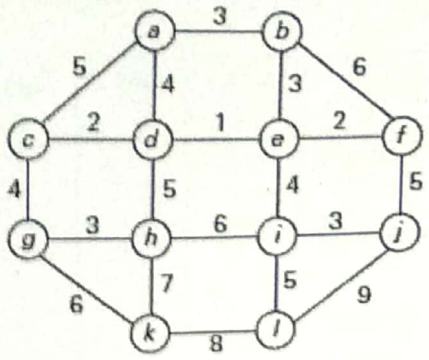


(ii) Explain greedy algorithm to solve following problem: Given an array of N=6 integers. You are allowed to rearrange the elements of the array. The task is to find the maximum value of SUM, where SUM is Σarr[i]*i, where i = 0, 1, 2….,5 and arr[]= {5,7,3,2,9,4}. Also show all possibilities of SUM and compare with optimal answer.

OR

Q – 3 Answer the questions below. **[10]**

(i) Solve the following instances of the single-source shortest-paths problem with vertex **a** as the source:



(ii) Solve the following job sequencing problem using greedy algorithm. What is the complexity of the problem?

Job Number	1	2	3	4	5	6
Profit	300	250	130	212	100	424
Deadline	4	2	3	3	3	3

SECTION – II

Q – 4 Answer the questions below.

(i) Consider an undirected graph G. Let GD be a depth first search traversal tree. Let u be a vertex and v be the first unvisited vertex after visiting u. What is the assumption about vertex u if (u,v) is not an edge? **[02]**

(ii) State True or False: **[02]**

(i) Traversal of a graph is different than tree because there can be a loop in the graph.

(ii) A graph G = (V, E) is a fully connected graph with |V|=n, then G does have n*((n-2)/2) edges.

(iii) LCS[i][j] is the length of the LCS of S[1..i] with T[1..j]. How can we solve for LCS[i][j] in terms of the LCS's of the smaller problems? Discuss two cases. **[03]**

Q – 5 (a) Explain the two properties of Dynamic programming using an example of Binomial coefficient. **[05]**

Q – 5 (b) A company has 4 machines available for assignment to 4 tasks. Any machine can be assigned to any task, and each task requires processing by one machine. The time required to set up each machine for the processing of each task is given in the table below. The **[05]**

company wants to minimize the total setup time needed for the processing of all four tasks. Find out optimal assignment of tasks to machines.

	Time (Hours)			
	Task 1	Task 2	Task 3	Task 4
Machine 1	13	4	7	6
Machine 2	1	11	5	4
Machine 3	6	7	2	8
Machine 4	1	3	5	9

Q - 5 (c) Explain the Rabin–Karp algorithm with an example. What is its complexity? **[04]**

OR

Q – 5(a) What is Divide and Conquer Technique? Apply this technique to find multiplication of 1234 and 5678. **[05]**

Q – 5 (b) Solve the 5- Queen Problem and draw pruned state space tree. **[05]**

Q – 5 (c) Show the comparisons the naive string matcher makes for the pattern P=0001 in the text T=000010001010001. **[04]**

Q – 6 **Attempt the following: (Any Two)** **[14]**

(i) Explain Strassen's matrix multiplication using Divide and conquer strategy.

(ii) Explain matrix chain multiplication problem. Parenthesize the following chain of matrices for optimal multiplication A,B,C,D,E where size of these matrices are 4x10, 10x3, 3x12, 12x20, 20x7.

(iii) Solve the following 0/1 knapsack problem using Branch and Bound method. Capacity of knapsack is 10.

Item No.	1	2	3	4
Weight	4	7	5	3
Value	40	42	25	12

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