Candidate Seat no.....

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Fifth Semester of B. Tech (CE) Examination

November-December 2015

CE315 Design and Analysis of Algorithm

Date: 26.11.2015, Thursday **Time: 10.00 a.m. To 01.00 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.** **[07]**

(a) What is Asymptotic Notation?

(b) What are the different parameters to analyze any algorithm?

(c) Arrange the following in smaller t greater:
$O(1), O(loglogn), O(nlogn), O(n^2), O(2^n), O(\log(n!)), O(n!), O(4^n)$

(d) What is the worst-case complexity of the following code fragment?

```
for (i = 0; i < N; i++) {
  for (j = N; j > i; j--) {
    sequence of statements
  }
}
```

(e) Can we apply Master's theorem on the recurrence equation: $T(n)=T(n-1)+c$?

(f) Suppose that instead of dividing in half at each step of Merge Sort, you divide into thirds, sort each third, and finally combine all of them using a three-way merge subroutine. What is the overall asymptotic running time of this algorithm?

(g) Find the big O notation, given $f(n)= 7n^2 + 8n$.

Q – 2 (a) Differentiate between Greedy approach and Dynamic approach. **[04]**

(b) Answer the questions below (Any Two) **[10]**

(i) Solve the following using Master's theorem:
1. $T(n) = 2T(n/4) + 1$
2. $T(n) = 3T(n/3) + n$

(ii) Solve the following recurrence equation using Iteration method.

$T(n)= T(n-1)+T(n-2)+c$ if $n>1$

$T(n)=1$ if $n=0$ or $n=1$

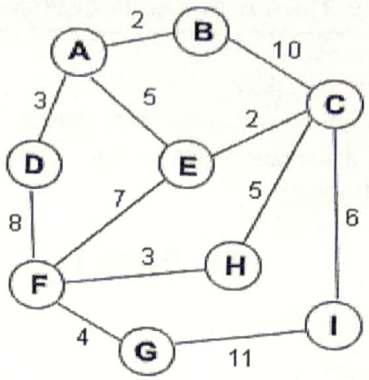
(iii) Find the time complexity of Merge Sort using Recurrence Tree method.

Q - 3 **Answer the questions below.**

(a) Given a finite set of distinct coin types, say 50, 20, 10,5,2,1 pcs, and any integer amount C. Each type is available in unlimited quality. Write greedy algorithm to find the exact **[04]**

change with minimum no. of coins. What is the complexity of algorithm?

(b) What is minimum spanning tree? Write and explain kruskal's Algorithm for the given example. **[05]**



(c) Write and explain exponential algorithm for X^{21}. **[05]**

OR

Q – 3 Answer the questions below.

(a) Let S= {a,b,c,d,e} be a collection of objects with benefits-weight values as follows: a: (30,5) , b: (20,10) , c: (100,25) , d: (90,30) , e: (160,40) . What is an optimal solution to the fractional knapsack problem for S assuming the sack can hold objects with total weight 60? **[04]**

(b) List out any two applications of minimum spanning tree. Write and explain prim's algorithm with any example. **[05]**

(c) Calculate 5678*4321 using divide and Conquer strategy. Compare it with traditional multiplication in terms of number of multiplications required. **[05]**

SECTION – II

Q - 4 Answer the questions below.

(a) Define Class NP problem. **[01]**

(b) What is preprocessing and matching time for Rabin-Karp algorithm? **[01]**

(c) Compare NP-Complete and NP-Hard problem. **[01]**

(d) List out the applications of Depth First Search. **[02]**

(e) Explain the terms with an example: Tree edge, Back Edge, Cross edge **[02]**

Q – 5 (a) Explain two elements of dynamic programming with respect to binomial coefficient problem. **[05]**

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Q – 5 (b) Solve the following Task Assignment problem for minimization. **[05]**

	Task1	Task2	Task3
Person A	10	20	25
Person B	20	23	26
Person C	12	16	25

Q - 5 (c) Compare Backtracking and Branch and Bound using an example. **[04]**

OR

Q – 5 (a) Generate solution for 5-Queen's problem. Draw a pruned state space tree for the problem. **[05]**

Q – 5 (b) Given the four matrices P_{5*4}, Q_{4*6}, R_{6*2}, T_{2*7}. Find the optimal sequence for the computation of multiplication operation. **[05]**

Q – 5 (c) Write and explain Naive string matching algorithm with an example. **[04]**

Q – 6 **Attempt Any Two:** **[14]**

(a) Solve the following 0/1 knapsack problem using Dynamic Programming. There are 4 objects whose weights and values are given in the following arrays :Weight w = { 5,4,6,3} and value v = { 10,40,30,50}. Find out the optimal knapsack objects for weight capacity of 10 units.

(b) Write General recurrence equation for divide and conquer technique. Explain how Strassen's Matrix multiplication can be done efficiently by using divide and conquer technique.

(c) Determine the Longest Common Subsequence of given two strings:

S1: EXPONENTIAL

S2: POLYNOMIAL

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