Reg No.

MANIPAL INSTITUTE OF TECHNOLOGY
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FIFTH SEMESTER B.TECH. (CSE) DEGREE MAKE-UP EXAMINATION
JAN. 2014
DESIGN AND ANALYSIS OF ALGORITHMS (CSE 303)
DATE: 03-01-2014

TIME: 3 HOURS   MAX.MARKS: 50

Instructions to Candidates
- Answer **any five** full questions.

1A. Define the asymptotic notations O, Ω, Θ and prove that $\frac{1}{2}n(n-1) \in \Theta(n^2)$

1B. List the general plan for analyzing time efficiency of recursive algorithms. Set up and solve the recurrence relation for the number of moves made by Tower of Hanoi algorithm using backward substitution method.

1C. Explain the fundamental steps in algorithm design and analysis process with a neat diagram.

(2½+3½+4)

2A. Analyse the time complexity of quicksort algorithm. Apply quicksort algorithm to sort the list *E, X, A, M, P, L, E* in alphabetical order and draw the tree of the recursive calls made

2B. Write Binary search algorithm and analyse its efficiency.

(6+4)

3A. Explain the procedure in multiplication of large integers using divide and conquer method and apply this to compute 2101 * 1130.

3B. Generate all permutations of {1, 2, 3, 4] by
    (i). the Johnson-Trotter algorithm.
    (ii). the lexicographic-order algorithm.

(5+5)

4A. Construct a 2-3 tree for the list C, O, M, P,U, T, I,N,G. Use the alphabetical order of the letters and insert them successively starting with the empty tree.

4B. Construct a heap for the list 1,8, 6, 5, 3, 7, 4 by top-down algorithm(by successive key insertions)

4C. Write and explain Horspool's algorithm and trace it to search for a pattern *MAHIMANI* in the text *NAME-MAHIMA-IS-MAHIMANIKA* and find the number of character comparisons.

(2½+2½+5)

5A. Write the algorithm that finds the composition of an optimal subset from the table generated by the bottom-up dynamic programming algorithm for the knapsack problem and find the optimal subset of the following instance of the knapsack problem after generating table (Capacity W=6)
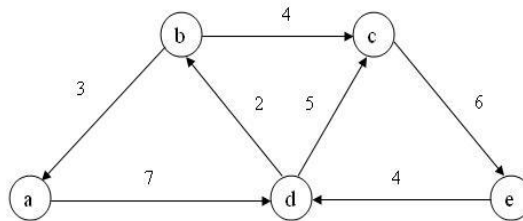
Item	Weight	Value
1	3	25
2	2	20
3	1	15
4	4	40
5	5	50

5B Find Minimum Spanning Tree using Prim's algorithm for the following graph.(Source vertex 'a')

(6+4)
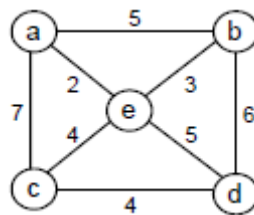
6A. Write Dijksta's algorithm and apply this algorithm to the following graph with vertex 'a' as the source and find all paths with path length.

6B. Write the Huffman's algorithm and construct a Huffman code for the following data

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

6C.What is P, NP-hard and NP-Complete problems? Explain

(3+4+3)

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