Reg No.										

प्रज्ञानं ब्रह्म

Manipal

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MANIPAL INSTITUTE OF TECHNOLOGY
(Constituent Institute of Manipal University)
MANIPAL-576104

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MANIPAL INSTITUTE OF TECHNOLOGY

FIFTH SEMESTER B.E (CSE) DEGRE MAKE-UP EXAMINATION
DECEMBER 2011
DESIGN AND ANALYSIS OF ALGORITHMS (CSE 301)
(REVISED CREDIT SYSTEM)
27-12-2011

TIME: 3 HOURS MAX.MARKS: 50

Instruction to Candidates

- Answer **any five** full questions

1 a) Write a pseudocode for an algorithm for finding real roots of equation $ax^2+bx + c = 0$ for arbitrary real coefficients a, b, and c. 3Marks

b) Write a recursive function to find the number of binary digits in the binary representation of a positive decimal integer and compute the efficiency of the algorithm. 3Marks

c) Use the informal definitions of Θ,Ω, and O to determine whether the following assertions are true or false. 2Marks

a. $n(n+1)/2 \in O(n^3)$ **b.** $n(n+1)/2 \in O(n^2)$

c. $n(n+1)/2 \in \Theta(n^3)$ **d.** $n(n+1)/2 \in \Omega(n)$

d) List the general plan for analyzing Time Efficiency of Recursive Algorithms. 2Marks

2 a) Write an improved bubble sort algorithm whose efficiency is linear in best case and quadratic in worst case. 3Marks

b) Apply quicksort to sort the list E,N,T,R,E,P,R,E,N,E,U,R in alphabetical order. Draw the tree of the recursive calls made. 4Marks

c) Set up and Solve the recurrence relation for number of multiplications required by Stassen's multiplication (ignoring the number of additions made). 3Marks

3 a) Consider the following version of insertion sort. 3Marks

```
ALGORITHM InsertSort2(A[0 .. n - 1])
for i ← l to n-1 do
   j← i-1
  while j >=0 and A[j] > A[j + 1] do
    swap( A[j], A(j + 1])
    j← j-1
```

What is its time efficiency? Compare the above algorithm with the actual insertion sort?

b) Write a pseudocode for generating permutations in lexicographic order. Analyze its time complexity. 4Marks

c) Construct a 2-3 tree and AVL tree for the list T,E,M,P,O,R,A,L 3Marks

4 a) Compute the efficiency of Bottom-up heap construction for the worst case. 3Marks

b) Apply the Boyer Moore algorithm to locate the pattern ABCBAB in the text of BCBABCBACCBABBCBABCBAB and count the number of comparisons made. 3Marks

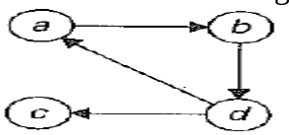
c) For the input 30, 20, 56, 75, 31, 19,47,28,52 and hash function $h(K) = K \bmod 11$ 4Marks

i) Construct the open hash table.

ii) Find the largest number of key comparisons in a successful search in this table.

iii) find the average number of key comparisons in a successful search in this table.

5 a) Apply Warshall's algorithm to find the transitive closure of the following digraph. Check whether the algorithm is in place. Justify your answer. 4Marks



b) Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem and find the optimal subset**.** Capacity W=5. **(SHOW ALL THE STEPS).** 6Marks

ITEM	WEIGHT	VALUE
1	2	12
2	1	10
3	3	20
4	2	15

6 a) Draw a decision tree for sorting the three elements using selection sort method. 3Marks

b) Construct a Huffman code of the following data: **(**all the left edges should be labeled by 0 and all the right edges by 1) 3Marks

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

Decode the text whose encoding is 100010111001010

c) Draw the State-space tree of the branch-and-bound algorithm to find the shortest Hamiltonian circuit for the graph given below. 4Marks