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



FIFTH SEMESTER B.E (CSE) DEGREE END SEMESTER EXAMINATION
NOVEMBER/DECEMBER 2010
DESIGN AND ANALYSIS OF ALGORITHMS (CSE 301)
(REVISED CREDIT SYSTEM)
 27-12-2010

TIME: 3 HOURS

MAX.MARKS: 50

Instruction to Candidates

- Answer **any five** full questions

- 1 a). Explain the algorithm design and analysis process with a neat diagram. 3Marks
 b). Set up and solve a recurrence relation for the number of calls made by tower of Hanoi algorithm using backward substitution method. 3Marks
 c). Indicate whether the first function of each of the following pairs has a smaller, same, or larger order of growth than the second function. Show the steps of the solution.
 i) $\log_2 n$ and $\log_2 n^2$ ii) 2^{n-1} and 2^n iii) $(n-1)!$ and $n!$ iv) $\log_2 n$ and $\ln n$ 4Marks

- 2a). Design a brute-force algorithm for the problem of counting, in a given text, the number of substring start with an A and end with a B. (EX: Text=CABAAZBQA count=4) and determine its efficiency class. 3Marks
 b). Apply quick sort to sort the list E,X,A,M,P,L,E in alphabetical order and draw the tree of recursive calls with L and R values. 4Marks
 c). Compute the product $a*b$, given $a=1234$ and $b=5678$ using the concept of multiplication of large integers of divide-and-conquer method. 3Marks

- 3a). Write a DFS algorithm to check whether the given graph is connected or not. What is the time efficiency of the above algorithm? 4Marks
 b). Generate all permutations of { 1, 2, 3 } by Johnson-Trotter algorithm (mark the key element in each combination). 2Marks
 c). Write an algorithm to construct 2-3 tree for a given list of n integers and construct a 2-3 tree for the list 9,5,8,3,2,4,7. 4Marks

- 4a). Write the pseudo code for the bottom-up heap algorithm and construct the heap for the list C,O,M,P,U,T,I,N,G. 3Marks
 b). Apply the Boyer Moore algorithm to locate the pattern TATTCTT in the following DNA sequence: TTATAGATCTCGTATTCTTAT 4Marks

c) Write an algorithm for closed hashing using linear probing method. The collision should be avoided and the algorithm should deal with the below functions.

i) Insertion ii) Searching iii) Deletion

3Marks

5 a) Compute the binomial coefficient $C(6,3)$ by applying dynamic programming algorithm.

Find the order of growth of the functions i) $C(n, n/2)$ ii) $C(n, 2)$ for even n 's.

1+1+1=3Marks

b) Solve the all-pairs shortest path problem for the digraph with the weight matrix

3Marks

0	2	∞	1	8
6	0	3	2	∞
∞	∞	0	4	∞
∞	∞	2	0	3
3	∞	∞	∞	0

c) Solve the knapsack problem using memory functions. $W=6$

4Marks

ITEM	WEIGHT	VALUE
1	3	25
2	2	20
3	1	15
4	4	40
5	5	50

6. a) Draw a decision tree and find the key comparisons in the worst and average cases for the five element binary search method.

$1\frac{1}{2} \times 2 = 3$ Marks

b) Construct a Huffman code of the following data:

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

Decode the text whose encoding is 100010111001010

2+2=4Marks

c) Apply backtracking method to solve the following instance of the subset-sum problem: $S=\{1,2,5,6,8\}$ and $d=9$

3Marks
