Register No: …………………..

B.TECH., DEGREE EXAMINATIONS: NOV/DEC 2012

Third Semester

INFORMATION TECHNOLOGY

CSE104: Design and Analysis of Algorithms

Time: Three Hours   **Maximum Marks: 100**

Answer All the Questions

PART A (10 x 1 = 10 Marks)

1. Which of the the following shows the correct relationship among some of the more common computing times for alogrithms

    a) $O(\log n) < O(n) < O(n*\log n)) < O(n^2) < O(2^n)$ b) $O(n) < O(\log n) < O(n*\log n) < O(n^2) < O(2^n)$

    c) $O(\log n) < O(n) < O(n*\log n) < O(2^n) < O(n^2)$ d) $O(\log n) < O(n) < O(n*\log n) < O(n^2) < O(2^n)$

2. If f= O(h) and g=O(k) then

    a) $f + g = o(h+k)$ b) fg=O(hk)   c) both (a) and (b)   d) b.fg=O(h/k)

3. The running time T(n) where (n) is the input size of a recursive algorithm is given as follows

    T (n) = 1+T(n-1) if n>1

    $\quad\quad$ = d if ,<= 1

    a) n^2 b) n^3 c) n^n d) n

4. In the following C function, let n <= m

    Int gcd(n,m)

    {

    $\quad$ If(n%m == 0) return m;

    $\quad$ n=n%m;

    $\quad$ return gcd(m,n)

    }

    How many recursive calls are made by this function?

    a) $\Theta(\log_2 n)$ b) $\Omega(n)$ c) $\Theta(\log_2\log_2 n)$ d) $\Theta(sqrt(n))$

5. Which one of the following in place sorting algorithms needs the minimum number of swaps?

    a) Quick sort   b) Insertion sort   c) Selection sort   d) Heap Sort

6. Identify the correct statements about DFS traversal

    I. It can be used to determine whether a graph is acyclic or not

    II. It identify the connected component of an undirected graph

III. Traverses a single path of the graph until it visits a node with no successor

a) I and III   b) II and III

c) I and II   d) I, II and III

7. In a binary heap containing n numbers, the smallest element can be found in time

a) $\theta(n)$ b) $\theta(\log n)$ c) $\theta(\log \log n)$ d) $\theta(1)$

8. The time required to find the shortest path in a graph with 'n' vertices and 'e' edges

a) $O(e)$ b) $O(n)$ c) $O(e^2)$ d) $O(n^2)$

9. The following is the example of backtracking techniques

a) Huffman   b) Hamiltanian circuit   c) subset sum   d) b &C

10. Algorithm which solves the single source shortest path problem is

a) Dijkstra's   b) Floyd's   c) Prim's   d) Warshall's

PART B (10 x 2 = 20 Marks)

11. What are the types of algorithm efficiencies?

12. Write a non-recursive algorithm for finding the number of binary digits for a positive decimal integer.

13. What is the basic operation in the Tower of Hanoi problem and give the recurrence relation for the number of moves?

14. What are the two variations of algorithm visualization?

15. What is a tree edge and cross edge?

16. What is the difference between quicksort and mergesort?

17. What are the drawbacks of AVL trees?

18. Define Spanning Tree.

19. Explain promising and non promising node.

20. Mention two reasons to terminate a search path at the current node in a state-space tree of a branch and bound algorithm.

PART C (5 x 14 = 70 Marks)

21. a) (i)   Design an algorithm to find all the common elements in two sorted lists of numbers.   (7) What is the maximum number of comparisons makes if the lengths of the two given lists are m and n, respectively?

     (ii)   What are the fundamental steps involved in algorithmic problem solving?   (7)

(OR)

b) (i) Briefly discuss about the important problem that is used in data structure (7)

(ii) What are all the different types of Asymptotic notations used to analysis the algorithm, Explain them in detail. (7)

22. a) (i) Write an algorithm to find which number occurs more time in the unsorted array. And also analysis the algorithm. (7)

(ii) Write a recursive algorithm for computing the sum of the first n cubes: (7)
$S(n) = 1^3 + 2^3 + \dots + n^3$.

Set up the recurrence equation and find the time complexity of this algorithm

(OR)

b) (i) What are the features that are desired in algorithm animation? (7)

(ii) Design a recursive algorithm for computing 2^n for any non negative integer n that is based on the formula $2^n = 2^{n-1} + 2^{n-1}$ (7)

Set up the recurrence equation and analyze it.

23. a) What is Brute-Force String Matching. Write down the Brute-Force String Matching algorithm and also explain with an example

(OR)

b) (i) Find out the breath first and depth first search of the following graph (7)
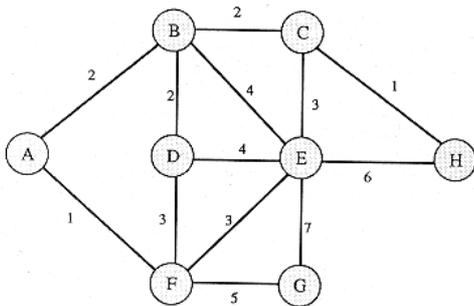
(ii) Find out the inorder, preorder and post order of the following graph (7)
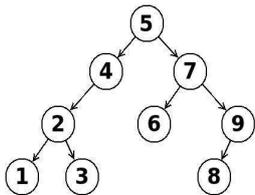
24. a) Define optimal binary search tree. What is catalan number. Explain optimal binary search tree in detail and explain with the following example
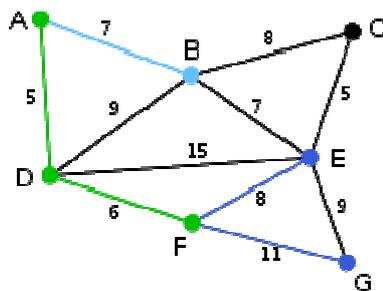
key	A	B	C	D
probability	0.1	0.2	0.4	0.3

(OR)

b) (i) Solve the all-pairs shortest-path problem for the digraph with the following weight matrix: (7)

$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix}$$

(ii) Find out the minimum spanning tree the following graph using Kruskals algorithm (7)

25. a) What is subset sum problem nad also find the sub set sum of A= {1,2,5,6,8} and d=9

(OR)

b) Solve the following instance of the knapsack problem by the branch and bound algorithm

item	weight	value	
1	10	$100	
2	7	$63	W – 16
3	8	$56	
4	4	$12	

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