Register Number .....

M.E. DEGREE EXAMINATIONS: DECEMBER 2008

First Semester

COMPUTER SCIENCE AND ENGINEERING

P07CS102 Data Structures and Algorithms

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

Answer ALL Questions:-

PART A (20 x 1 = 20 Marks)

1. What is the worst case time complexity of binary insertion sort algorithm to sort 'n' elements?

(a) O (n) (b) O (n $\log_2$ n) (c) O ($\log_2$ n) (d) O (n^2)

2. If each node in a tree has value greater than every value in its left sub tree and has value less than every value in its right sub tree, the tree is known as

(a) complete tree (b) full binary tree (c) binary search tree (d) threaded tree

3. In how many ways can six men and six women be seated in a row if any person may sit next to any other person?

(a) 12! (b) 12! /2 (c) 6! (d) 6! /4

4. The post fix form of A$B * C-D + E/F/(G+H) is

(a) AB$C*D-EF/GH+/+ (b) AB$*C-D+EF/GH/+
(c) AB$C+D-EF/GH/-+ (d) AB$C-D*EF/GH/++

5. A complete binary tree with the property that the value at each node is at least as large as the values at its children is known as

(a) Binary search tree (b) AVL tree (c) completely balanced tree (d) Heap

6. What is the number of nodes in a complete binary tree of level 5?

(a) 15 (b) 25 (c) 63 (d) 71

7. A digital search tree is implemented as a tree with 'n' nodes each of which can contain 'm' pointers, corresponding to the 'm' possible symbols in each position of the key. The number of nodes that must be accessed to find a particular key is

(a) m (b) m^n (c)n (d) $\log_m$ n

8. If d_{max} is the maximum degree of the vertices in a graph G, the chromatic number of G is

(a) equal to d_{max} (b) less than or equal to d_{max}
(c) less than or equal to d_{max} +1 (d) greater than d_{max}

9. A graph G with 'n' nodes is bipartite if it contains

(a) n edges (b) a cycle of odd length (c) no cycle of odd length (d) n^2 edges

10. A simple graph with 'n' vertices and 'k' components can have at most

(a) n edges (b) n-k edges (c) (n-k)(n-k-1)/2 edges (d) (n-k)(n-k+1)/2 edges

11. Let A= {1, 2, 5, 8, 11}, which of the following is false?

(a) $\{5, 1\} \subseteq A$ (b) $\{8,1\} \in A$ (c) $\varphi \subseteq A$ (d) $\{2\} \subseteq A$

12. Let A ={x-x is an integer and $s^2 < 16$}

(a) $\{0, 1, 2, 3\} \subseteq A$ (b) $\{-3, -2, -1\} \subseteq A$ (c) $\varphi \subseteq A$ (d) $\{-4, -1, 2, 3\} \subseteq A$

13. An_____ is a collection of items into which items can be inserted arbitrarily and from which only the smallest item can be removed.

(a) descending priority queue (b) ascending priority queue
(c) FIFO queue (d) LIFO queue

14. $F(x) = (7x^6 + 3x^4 + 17x + 9) / ((0.01 x^3 * x^{-1}))$ is Big - O of what?

(a) F is $O(n^7)$ but not $O(n^6)$ (b) F is $O(n^6)$ but not $O(n^5)$
(c) F is $O(n^5)$ but not $O(n^4)$ (d) F is $O(n^4)$ but not $O(n^3)$

15. Which of the following sets are empty?

(a) $\{x|x$ is a real number and $x^2 - 1 = 0\}$ (b) $\{x|x$ is a real number and $x^2 + 1 = 0\}$
(c) $\{x|x$ is a real number and $x = 2x + 1\}$ (d) $\{x|x$ is a real number and $x^2 = -9\}$

16. Which kind of storage structure for strings, one can easily insert, delete, concatenate, and rearrange substrings?

(a) fixed length storage structure (b) variable length storage with fixed maximum
(c) linked list storage (d) array type storage

17. The average time required to perform a successful sequential search for an element in an array A(1 : n) is given by

(a) (n+1)/2 (b) $\log_{2n}$ (c) n (n+1)/2 (d) n2

18. Which of the following sorting algorithms has a worst case running time of $O(n^r)$ where $(1 < r < 2)$?

(a) bubble sort (b) insertion sort (c) shell sort (d) merge sort

19. A search technique where we keep expanding nodes with nodes with least accumulated cost so far is called

(a) Hill-climbing (b) Best-First (c) Branch-and-Bound (d) Divide-and-conquer

20. If you are not careful in your choice of hash functions it is possible to have collisions in which the search time goes to the order of O(?) in a search table of size N:

(a) 1 (b) log2N (c) N (d) N!

PART B (5 x 16= 80 Marks)

21.(a) Explain, in detail, about data structures and Abstract Data Types with suitable examples

(OR)

21.(b) (i) Explain about good programming practices. (6)

(ii) Discuss how you will calculate the running time of a program with a suitable example. (10)

22.(a) Narrate different methods of implementation of Lists

(OR)

22(b) Discuss about various methods of implementation of tree and Binary tree.

23.(a) Define: Dictionary. And write pseudo code for implementing Dictionary.

(OR)

23.(b) Write notes on (i) Depth first search (8)

(ii) Directed Acyclic Graph (8)

24.(a) (i) Discuss the issues in Memory Management (8)

(ii) Explain about Storage Compaction Problem (8)

(OR)

24.(b) Write about Garbage Collection Algorithms for equal sized blocks with pseudo code.

25.(a) Explain about Quick sort and Heap sort, in detail.

(OR)

25.(b) Discuss about various Algorithm Design Techniques, in detail.

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