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Question Paper Code : 71188

M.E./M.Tech. DEGREE EXAMINATION, JUNE/JULY 2013.

First Semester

Computer Science and Engineering

CS 9212/CS 912 — DATA STRUCTURES AND ALGORITHMS

(Common to M.Tech. – Information Technology and M.Tech. Information and Communication Technology)

(Regulation 2009)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Define the black height of a node.

2.   The contents of an Array A are the elements {1, 2,..5}. Draw the initial tree to contain it and then sequence of trees resulting finally in a MAX - HEAP.

3.   Show that if a node in a BST has two children then its successor has no left child and its predecessor has no right child.

4.   The following sequence list the nodes of a Binary tree T in Preorder and Inorder respectively :
     Preorder :   1, 2, 3, 5, 8, 9, 6, 10, 4, 7
     Inorder   :   2, 1, 8, 5, 9, 3, 10, 6, 7, 4
     Construct a Binary Tree.

5.   Where can you find the smallest 3 elements in a MIN-HEAP?

6.   Show that the total number of nodes in a Complete Binary Tree of depth is $2^{d+1} - 1$.

7.   List out the advantage of Dynamic Programming over Greedy.

8.   Define NP- Complete Problem.

9.   What is Minimum Spanning tree? Write any two algorithm to find MST.

10. What is the purpose of Dijikstra's Algorithm?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Give an algorithm to reverse the elements of a single linked lists without using a temporary list. (6)

   (ii) Write algorithm to insert into and delete elements from a doubly linked list. (6)

   (iii) Write an algorithm to count the number of nodes in a given singly linked list. (4)

Or

(b) (i) Give the procedure to construct a stack with two Queue. (8)

   (ii) Describe the case analysis for Fibonacci series using recursion. (8)

12. (a) (i) Construct a min binomial heap with the following elements.

   3, 6, 8, 2, 16, 22, 14, 30, 9, 11 (12)

   (ii) Why heaps are used to implement priority queue? (4)

Or

(b) Explain Fibonacci Heap Deletion and Decrease Key operation using Cascading-Cut procedure with an example. (16)

13. (a) Explain insertion procedure in Red-Black tree and Insert the following sequence :

   { 20, 10, 5, 30, 40, 57, 3, 2, 4, 35, 25, 18, 22, 21} (16)

Or

(b) (i) Show the result of inserting 10, 17, 2, 4, 9, 6, 8 into an empty AVL tree. (8)

   (ii) Write the procedure to implement single and double rotations while inserting nodes in an AVL tree. (8)

14. (a) (i) State and Explain the algorithm to perform Quick sort. (8)

   (ii) Illustrate the operation of Quick sort on the following numbers

   A = {77, 44, 99, 66, 33, 55, 88, 22, 44 } (8)

Or

(b) Illustrate with procedure to find an optimal placement for 13 programs on three tapes T0, T1 and T2 where the programs are of lengths 12, 5, 8, 32, 7, 5, 18, 26, 4, 3, 11, 10 and 6. (16)

15. (a) Develop an algorithm for implementing '8 Queen Problem' using BACKTRACKING method. (16)

Or

(b) Explain 0/1 knapsack problem procedure with an example using dynamic programming. (16)

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