53 (CS 304) DTST

2014

DATA STRUCTURES

Paper : CS 304

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. *(a)* Explain complexity of an algorithm. Discuss various asymptotic notations. 5+5=10

   (b) Write an algorithm/pseudocode for Binary Search Technique. 6

   (c) What do you mean by Data Structures ? Give some examples. 4

2. (a) Write algorithm/pseudocode for the following operations of a single linked list.

   (i) insert a node at the front of the list, (ii) delete a node from the end of the list, (iii) add the contents of all the nodes of the list. 4×3=12

   (b) Describe a Doubly Linked List and a Circularly Linked List. 4+4=8

3. (a) Explain the structures of stack and Queue. Find out their differences. 6+2=8

   (b) Write algorithm/pseudocode for push and pop operations of stacks using array representation. 5+5=10

   (c) Describe pointers as a useful data structure. 2

4. (a) Evaluate the following infix expression using stack : 6

   $$5*(6+2)-12/4$$

Or

Convert the following infix expression into its equivalent postfix expression.

$$((M + N)/L) \uparrow ((O - P) * Q)$$

(b) Define a strictly Binary Tree and a Complete Binary Tree. Give example of each. 6

(c) Justify Hashing as an efficient search technique. Discuss *any two* methods to handle collision. 2·5+5·5=8

5. (a) Write an algorithm/pseudocode for Insertion Sort or Quick Sort. Find out its average time complexity. 6+2=8

(b) Define a Binary Search Tree (BST). Write down algorithms for preorder, inorder and postorder traversals. 3+9=12

6. (a) Sort the following sequence of elements using Bubble Sort.

5, 10, 7, 20, 15, 12, 14, 30, 50, 40. 10

(b) Suppose the characters $\{a, b, c, d, e, f, g\}$ are stored in a BST. Draw a BST that is as tall as possible and contains all the above elements. Also draw another BST that is as short as possible and contain all these elements. **10**

Or

Represent the array $B(2, 3, 4)$ in three dimensional space. Depict the same array in memory. **10**

7. (a) What is a minimum spanning tree ? Using Prim's algorithm, determine the minimum spanning tree of the following graph : **2+6=8**
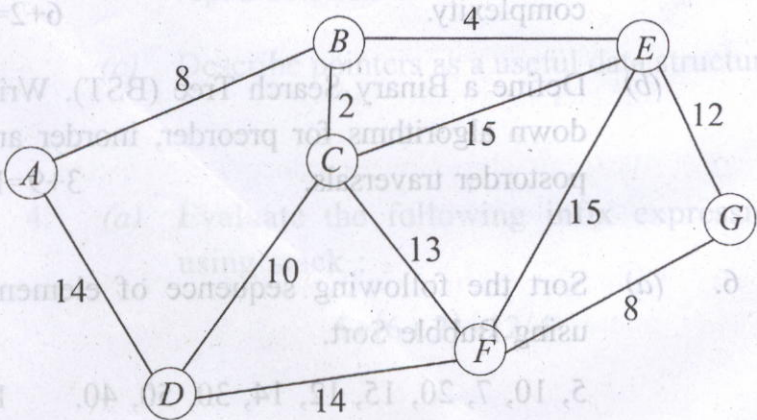

Fig. 1

(b) What do you mean by balance factor of a binary tree ? What is a balanced binary tree ? Write a few lines about *Bt*-trees.

$$1\cdot5+1\cdot5+3=6$$

(c) Differentiate between BFS and DFS traversals of a graph. 2

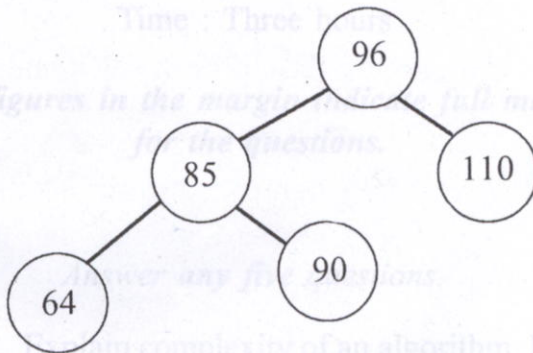*(d)* Insert 36 into the following AUL search tree. 4

Fig. 2