53 (CS 304) DTST

2019

DATA STRUCTURE

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)* Define complexity of an algorithm. Discuss about asymptotic notation with the help of example. 10

   (B) Write the algorithm/pseudocode for binary search technique. What is 3D array? 10

2. *(A)* Evaluate the following expression using suitable data structure.

   $Q : 5 * (10/2 - 3) * (4 \uparrow 2 + 10) * 6 + 12$

   10

(B) What is recursion? Let 'n' denotes a positive integer. Suppose a function L is defined recursively as follows :

$$L(n)=\begin{cases}0 & \text{if } n=1\\ L(\lfloor n/2\rfloor)+1 & \text{if } n>1\end{cases}$$

Here $[k]$ denotes the "floor" of k, that is, the greatest integer which does not exceed k.

(i) Find $L(25)$.

(ii) Find $L(10)$. 5

(C) Define the following terms related to binary tree : 5

(i) Path

(ii) Leaf node

(iii) Full binary tree.

3. (A) Write algorithm/C-routines to do the following list of operations for a simple linked list. 16

(i) Insert a node at the 5th position.

(ii) Delete a node from end of the linked list.

(iii) Count the number of nodes.

(iv) Insert a node at the end of the linked list.

(B) Explain about threaded binary tree. 4

4. (A) Write an algorithm/pseudocode for insertion and delete operation of a Queue. 10

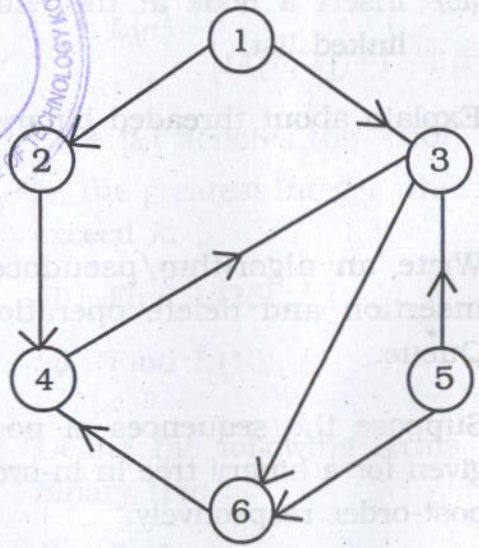
(B) Suppose the sequences of nodes are given for a binary tree in in-order and post-order respectively.

In-order : D H B E A F C I G J
Post-order : H D E B F I J G C A

Draw the diagram of the tree. 10

5. (A) Write down the algorithm/pseudocode for Quick sort. Find its time complexity. 10

(B) Find the outputs of depth-first traversal and breadth-first traversal of the following graph taking '1' as the starting node. 10

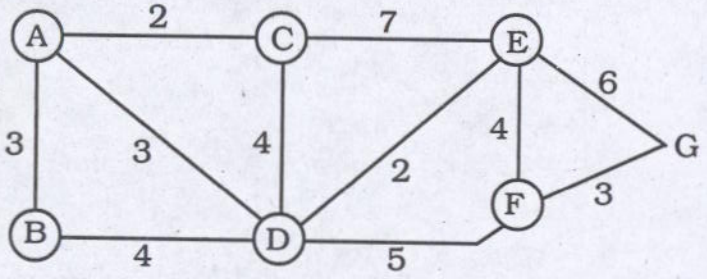


6. (A) Create an AVL tree starting with an initially empty tree with the following elements being inserted in order :
50, 70, 60, 40, 30, 20, 10, 95, 90, 92, 100, 96, 88, 77, 82, 11.
10

(B) What is hashing? What you mean by collision? 5

(C) What is the optimal height of a Binary Search Tree (BST) and why is it so? 5

7. (A) What do you mean by minimum spanning tree? Consider the following graph and find the minimum spanning tree using Prim's algorithm. 10



(B) Sort the following list using bubble sort technique. Find complexity of bubble sort.
50, 40, 20, 45, 30, 10, 5
6

(C) Write an algorithm/pseudocode for push operation of a STACK.
4