53 (CS 304) DTST

2021

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 abstract data types with example. 4

   (b) Define complexity of an algorithm. What is asymptotic notation ? Explain it. 2+6=8

   (c) What is multidimensional array ? Discuss row-major-order and column-major-order representation of 3D array. 8

Contd.

2. *(a)* State the advantages, if any, of a two-way list over a one-way list. 3

(b) Write an algorithm for each of the following operation of a one-way list: 5+5+3=13

(i) Insert an element after a node whose key information is given.

(ii) Delete a note from *n*th position.

(iii) Count the number of nodes in the list.

(c) Define circular-linked list. What are the advantages and disadvantages of it? 4

3. *(a)* Consider the following stack, where STACK is allocated $N = 6$ memory cells: 6

STACK : AAA, DDD, EEE, FFF, GGG, _____

Describe the Stack as the following operation take place:

(i) PUSH (STACK, KKK)

(ii) POP (STACK, ITEM)

(iii) PUSH (STACK, LLL)

(iv) PUSH (STACK, SSS)

(v) POP (STACK, ITEM)

(vi) PUSH (STACK, TTT)

(b) Sort the following set of elements in ascending order using Quick sort technique : 10

20, 15, 10, 5, 50, 60, 45, 30, 55, 80, 70, 75.

What is the average time complexity of quick sort ?

(c) What is recursion ? Write a recursive function to calculate factorial of a number. 4

4. (a) Write an algorithm for insert and delete operation of a Queue. 10

(b) Convert the following infix expression to postfix : 10

$Q : (A + B9D) / (E - F) + G$

5. (a) Define the following terminologies of a binary tree : 6

(i) Height

(ii) Internal and External node

(iii) Level of a node

(iv) Leaf node

(v) Full binary tree

(vi) Complete binary tree.

(b) What is Binary Search Tree (BST) ? Give an example. 4

(c) Write an algorithm for Insertion sort technique. What is the time complexity of insertion sort in worst and average case ? 10

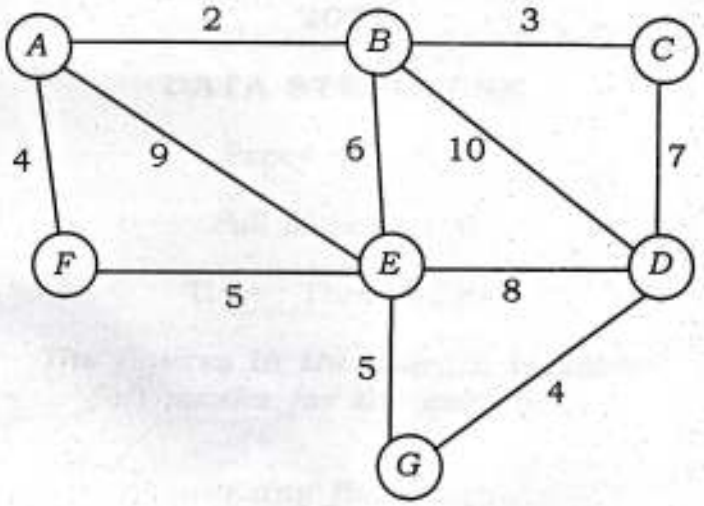
6. (a) Construct an AVL search tree with following set of elements in order : 12

20, 10, 30, 40, 50, 55, 52, 15, 25, 35, 32, 80, 60, 65, 58, 9, 5, 100, 110.

(b) Write an algorithm for Binary Search. What is the complexity of binary search ? 8

7. (a) Differentiate between Breadth-First Search (BFS) and Depth-First Search (DFS). 6

(b) What is Spanning tree? What is minimum spanning tree? Construct minimum spanning tree from the following graph: 12



(c) What is Hashing? What is collision in hashing? 2