53 (CS 304) DTST

2019

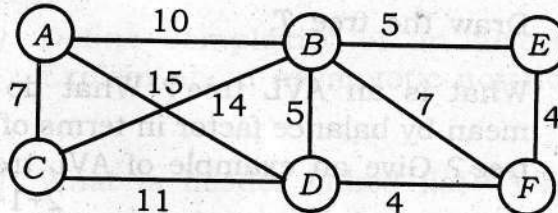# DATA STRUCTURE

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) Write an algorithm for selection sort. Compute its worst case time complexity. 6+3=9

   (B) Define minimum spanning tree. Convert the following weighted graph into minimum spanning tree. 2+4=6

Contd.

(C) Apply bubble sort technique to sort the following list of elements : 5

15, 10, 35, 25, 26, 5

2. (A) Write an algorithm for binary search technique. Explain why, the time complexity is $O(\log n)$ for a sorted array with size of n elements. 6+4=10

(B) Suppose the following sequence of elements of a binary tree in inorder and preorder respectively. 10

Inorder : Q, B, K, C, F, A, G, P, E, D, H, R

Preorder : G, B, Q, A, C, K, F, P, D, E, R, H

Draw the diagram of the tree.

3. (A) Suppose the following numbers are inserted inorder into an empty binary search tree (T) :

50, 33, 44, 22, 77, 35, 60, 40, 45, 65, 25

Draw the tree T. 5

(B) What is an AVL tree ? What do you mean by balance factor in terms of AVL tree ? Give an example of AVL tree. 2+1+2=5

(C) Insert the following sequence of elements into an AVL tree, starting with an empty tree. 10

10, 20, 15, 25, 30, 16, 18, 19, 35, 40

4. (A) How Breadth First Search (BFS) is different from Depth First Search (DFS) ? Apply BFS and DFS to the following graph taking 'A' as the starting point. 2+4+4=10
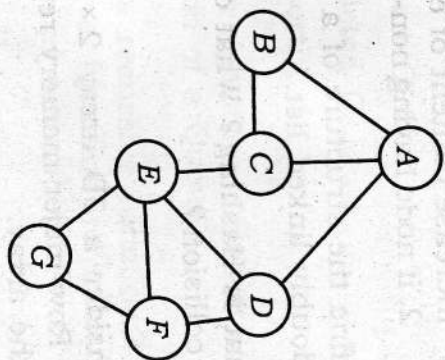
(B) Define complexity of an algorithm. Explain about asymptotic notation. 1+6=7

(C) What is header linked list ? What is the advantage of it ? 3

(A) Write an algorithm for each of following operations in a single linked list. 4×4=16

(i) Insert an element at the end of the linked list.

(ii) Insert at Jth position of the linked list.

(iii) Delete a node whose key information is given.

(iv) Increase content of every node by 2, if node having non-zero number.

(B) Define the structure of a node in C of a doubly linked list. 1

(C) What is Hashing? What do you mean by collision? 3

6. (A) Consider a 3D array 2 × 3 × 3. Show the the Row-major memory representation of the array. 8

(B) Consider the following arithmetic expression in postfix notation. Evaluate the expression using suitable data structure.

P : 7, 5, 2, +, *, 4, 1, 5, –, 1, – 7

(C) Find its equivalent prefix form of the above expression P. 5

7. (A) Consider an empty Queue maintained by a circular array with size 7. Draw the Queue structure and show respective values for FRONT and REAR variable to do the following : 5

(i) insert A, B, C, D then E, F

(ii) Deleted A, B

(iii) insert G, H

(iv) Deleted C, D

(v) insert I, J.

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

(C) What is recursive function? Write a recursive function to calculate the factorial of a number. 5