

Total number of printed pages-7

53 (CS 304) DTST

2017

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) What do you mean by complexity of an algorithm ? How will you measure efficiency of an algorithm ? 2+2=4
- (b) Explain about Asymptotic notations for complexity of an algorithm. 6
- (c) What is complete binary tree ? What is the optimal height of a Binary Search Tree (BST) and why is it so ? What do you mean by Full Binary Tree ? 1+3+1=5

Contd.

- (d) Define the structure of a node of a single linked list in C program. Explain about pointers in C with the help of example. 5

2. (a) Consider the following three dimensional array - B [3] [2] [3]. Draw the memory representation of the array when we represent it in row-major-order and column major order.

$$4+4=8$$

- (b) Write *any four* Algorithm/Pseudocode given below for a single linked list.

$$3 \times 4 = 12$$

- (i) Delete a node from end of the linked list.
- (ii) Insert a node after a node pointed by a pointer 'ptr'.
- (iii) To print the number of non-zero element in the linked list.
- (iv) Insert a node at end of the linked list.
- (v) Free all the nodes.
- (vi) Delete a node whose ITEM information is given.

3. (a) Explain the terms infix expression, prefix expression and postfix expression. Convert the following infix expression to postfix :

$(A - 2 * (B + C) / E * F) + G$ use suitable data structure. 8

- (b) Write Algorithm/Pseudocode for push and pop operation of a stack. 6

- (c) Consider an empty queue maintained by a circular array with size 5. Draw the queue structure and show respective values for FRONT and REAR variable to do the following : 6

(i) insert A, B, and then C, D.

(ii) A Deleted

(iii) E and F inserted

(iv) B and C Deleted

(v) G and H inserted

(vi) Delete D.

4. (a) Draw the binary expression tree that represent the following postfix expression.

Postfix : $AB + C * D -$ 8

(b) Write short note on : 6
threaded binary tree.

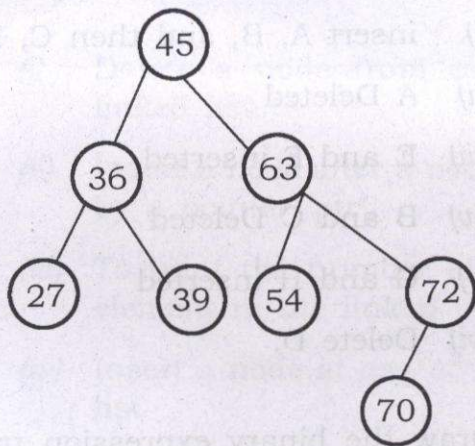
(c) What is recursion ? Write the recursive algorithm to find factorial of a number.
 $1+5=6$

5. (a) Sort the following sequence of elements using quick sort technique. What the time complexity of quick sort algorithm ?
15, 12, 9, 17, 20, 19, 22, 40, 35.

$$7+1=8$$

(b) Consider the following AVL tree.

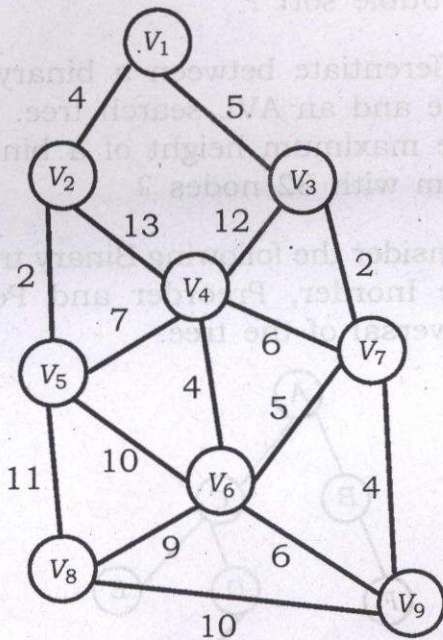
12



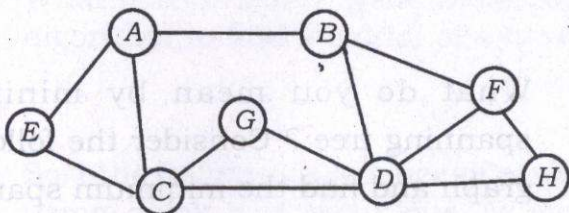
(i) Insert the following elements and show the resultant tree in every steps : 20, 15, 65, 90, 85, 50

- (ii) Delete the following elements and show the resultant tree in every steps : Delete 54, 45, 63, 72

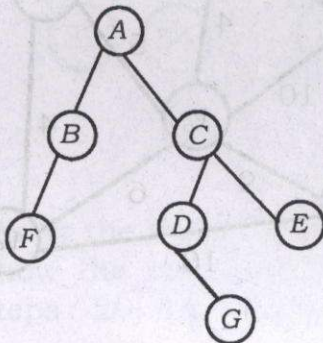
6. (a) What do you mean by minimum spanning tree ? Consider the following graph and find the minimum spanning tree using Prim's algorithm. 10



- (b) Consider the following graph. Find BFS and DFS traversal of the graph using suitable data structures. $5+5=10$



7. (a) Write an algorithm/pseudocode for bubble sort technique. What is the complexity of bubble sort? $5+1=6$
- (b) Differentiate between a binary search tree and an AVL search tree. What is the maximum height of a binary tree form with 32 nodes? $3+2=5$
- (c) Consider the following Binary tree. Find the Inorder, Preorder and Postorder traversal of the tree. 6



(d) Write an algorithm/pseudocode for insertion operation of a Queue.

3

