53 (IT 304) DTST

## 2021

## DATA STRUCTURES

Paper : IT 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 the differences between stack and queue with examples.     4

   (b) Write an algorithm to convert an infix expression to its postfix form using stack.     8

   (c) Convert $A \$ B * C - D + E / F / (G + H)$ into its postfix form using stack.     8

2. (a) Construct the expression tree for the following expression tree :

   $$E = (2a + 5b)(x - 7y)^4.$$     4

(b) Write the recursive function in *C* for the Tower of Hanoi problem. 6

(c) Draw the recursive tree of Hanoi. 10

3. (a) Write a function to add a node in a linked list. 10

(b) Complete the following function for reversing the elements of a linked list. 10

4. (a) Construct a binary tree from a pre and in-order traversal : 10

Pre-order   *A B D I E J C F G K*
In-order    *D I B E J A F C K G*

(b) Show how the following integers can be inserted in an empty binary search tree in the order they are given : 50, 30, 10, 90, 100, 40, 60, 20, 110. 10

5. (a) Insert the following keys in order given to build them into an AVL tree 10

   *a z b y c x d w e v*

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(b) Construct a B-tree of order 3 with the following data :     10

     50, 40, 60, 30, 70, 20, 80, 10, 90, 9, 99

6. (a) Write an algorithm for Merge sort.     10

   (b) Show how the merge sort algorithm with sort the following array in increasing order :     10

     100, 90, 80, 70, 60, 50, 40, 30, 20

7. Consider an array containing the following 8 integers : 30, 10, 70, 20, 50, 60, 80, 40. Suppose we want to sort the array using (a) Insertion sort (b) Selection sort. Show the content of an array after every pass.     20