53 (IT 304) DTST

2018

DATA STRUCTURE

Paper : IT 304

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

GROUP–A

1. Answer ***any ten*** questions from the following : 1×10=10

   (i) What is the minimum number of stacks of size n required to implement a queue of size n?

   (a) One

   (b) Two

   (c) Three

   (d) Four

(ii) The postfix expression for the infix expression A + B * (C + D) / F + D * E is :

(a) AB + CD + *F / D + E*

(b) ABCD + *F/+ DE* +

(c) A * B + CD / F * DE +

(d) None of these

(iii) The other name for prefix notation is :

(a) Reverse polish

(b) Polish

(c) Infix

(d) None of the above

(iv) The number of elements that can be removed from the stack at any time is :

(a) 3

(b) 4

(c) 0

(d) 1

(v) If data is a circular array of MAX elements and rear is an index into that array, what is the formula for the index after rear ?

(a) (rear % 1) + MAX

(b) rear % (1 + MAX)

(c) (rear + 1) % MAX

(d) rear + (1 % MAX)

(vi) Which of the following sorting techniques requires extra space, then the data to be sorted ?

(a) Selection Sort

(b) Merge Sort

(c) Bubble Sort

(d) Quick Sort

(vii) The evaluation of the postfix expression 3, 5, 7, *, +, 12, % is :

(a) 2

(b) 3

(c) 0

(d) 3.17

(viii) In an AVL tree the balancing is needed when balancing factor of any node becomes

(a) 1 or –1

(b) 0 or –1

(c) –2 or 2

(d) –1 or 0

(ix) The value in a BST can be sorted in ascending order by using which of the following traversals ?

(a) Pre-order

(b) In-order

(c) Post-order

(d) Level-order

(x) A complete graph of 5 nodes has ..... number of edges.

(a) 5

(b) 10

(c) 15

(d) 20

(xi) Breadth-first-search algorithm uses ..... data structure.

(a) Stack

(b) Queue

(c) Binary tree

(d) Heap

(xii) Which of the following methods has the best case complexity for searching ?

(a) Hashing

(b) Sequential

(c) Random

(d) Binary

GROUP–B

Answer ***any five*** *questions.*

2. (a) Write an algorithm to convert an infix expression to its postfix form using stack.

(b) Convert $((A+B)*C-(D-E))\wedge(F+G)$ into its postfix form using stack.

9+9=18

3. Consider an array containing the following 8 integers : 18

35, 15, 75, 25, 55, 65, 85, 45

Suppose you want to sort the array using

(a) Insertion Sort

(b) Bubble Sort

(c) Selection Sort

4. (a) Write a recursive C function to search an element from a set of elements using Binary Search. 5

(b) Write a recursive C function for the solution to the Tower of Hanoi problem. 5

(c) Draw the recursive tree of Tower of Hanoi. 8

5. (a) Write a C function for insertion of a data item after a specified data intern into a linear linked list. 10

(b) Write a C function to print of a linear linked list in reverse order. 8

6. *(a)* Construct the expression tree for the following expression tree : 5

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

(b) Construct a binary tree from pre- and in-order traversal. 8

Pre – order : A B D I E J C F G K

In – order : D I B E J A F C K G

8

(c) Show how the following integers can be inserted in an empty binary search tree in the order they are given : 5

50, 30, 10, 90, 100, 40, 60, 20

7. *(a)* Show the steps in creation of a height balanced binary AVL tree using insertion of items in the following order. Show the steps required with diagrams. March, May, November, August, April, January, December, July, February, June, October, September. 10

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

50, 40, 60, 30, 70, 20, 80, 10, 90, 9, 99. 8

8. *(a)* Explain with suitable example the principal operation of Quick Sort. 10

(b) Show how Merge Sort algorithm will sort the following array in increasing order :

100, 90, 80, 70, 60, 50, 40, 30, 20. 8
