Total No. of printed pages = 5

Co-401/DSUC/4th Sem/Comp/2017/M

DATA STRUCTURE USING C

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer question No.1 and any *four* questions from the rest.

1. (a) State true or false : 1×5=5

(i) POP operation in a stack can cause overflow.

(ii) A tree is also a graph.

(iii) In postorder traversal of tree, the root node is visited at last.

(iv) The name of an array with no subscript always refers to the address of the initial array element.

[Turn over

(v) Overflow will occur with linked list when AVAIL = NULL and there is an insertion.

(b) Fill up the blanks : 1×5=5

(i) In linked list linear order is given by means of _____.

(ii) Recursion uses _____ as an internal data structure.

(iii) The maximum level of any leaf in the tree is also known as _____ of the tree.

(iv) Space complexity of an algorithm indicates its _____ requirement.

(v) A graph may be represented using _____.

2. (a) Write an algorithm for the Quicksort and find its complexity for the worst case. 8

(b) What is an array ? Write algorithms for inserting and deleting elements in the array. 2+5=7

3. (a) Consider the algebraic expression $E = (2x+y)(5a-b)^3$ 3+3=6

(i) Draw the tree T which corresponds to the expression E.

(ii) Find the prefix polish expression P which is equivalent to E and find the preorder of T.

(b) Consider the following arithmetic expression P, written in postfix notation : 4

P : 12, 7, 3, –, /, 2, 1, 5, +, *, +

Translate P into its equivalent infix expression and evaluate it.

(c) Write the algorithm for Linear Search and find its complexity. 5

4. (a) Suppose LIST be a linked list in memory. Write an algorithm which deletes the last node from LIST. 7

(b) A binary tree T has 9 nodes. The inorder and preorder traversal of T yield the following sequence of nodes : 8

Inorder : E A C K F H D B G

Preorder : F A E K C D H G B

Draw the tree.

5. (a) Let S and T be character variables such that

S = 'JOHN PAUL JONES'

T = 'A THING OF BEAUTY IS A JOY FOREVER'

Determine the following : 7

(i) SUBSTRING(S,4,8) and SUBSTRING (T,10,5)

(ii) INDEX(S, 'JO')

(iii) SUBSTRING(T,28,3) // 'GIVEN'

(iv) INSERT(S,11,'AND')

(v) DELETE(S,6,5)

(vi) REPLACE(S,'PAUL','DAVID')

(b) State Tower of Hanoi problem. Write an algorithm that gives a recursive solution to the Towers of Hanoi problem for n disks. Illustrate it for n = 4 (i.e. 4 disk) 2+3+3=8

6. (a) Suppose Q is an arithmetic expression written in infix notation. Write an algorithm to find the equivalent postfix expression P. 5

(b) Write algorithms for BFS and DFS on a graph. 10

7. Write short notes on any *three* : 5×3=15

(i) Pointers

(ii) Two-way List

(iii) Algorithm Complexity

(iv) Priority Queue

(v) Heap

(vi) Radix Sort.