(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 131405            Roll No.

# B.TECH.

## Theory Examination (Semester-IV) 2015-16

### DATA STRUCTURE

*Time : 3 Hours*                                    *Max. Marks : 100*

## Section-A

**Q1.** **Attempt all parts. All parts carry equal marks. Write answer of each part in short.**              **(2×10=20)**

(a)    What is an abstract data type? Is time and space complexity considered in defining ADT?

(b)    Perform evaluation of postfix expression using stack: *ABC* + *DE /– , where

A=5, B=6, C=2, D=12, E=4

(c) How does linked list differ from an array?

(d) At most, how many comparisons are required to search an element from a sorted vector of 1023 elements using the binary search algorithm ?

(e) Demonstrate how will you represent the following sparse matrix having integer values ?

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 9 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 5 & 0 & 0 & 0 \end{bmatrix}$$

(f) Generate a binary search tree for the list - 53, 65, 86, 78, 5, 25, 34, 29

(g) How will be the elements having same priority accessed from a priority queue?

(h) How many pointers are contained as data members in the nodes of a circular doubly linked list of integers with five nodes?

(i) Draw a directed weighted (assume random weights) graph having 5 vertices and each node having drgree 4.

(j) A certain sorting algorithm is applied to the following data set 45,1,27,36,54,90.After two passes the re-arrangement of the data is 1, 27, 45, 36, 54, 90. Identify the sorting algorithm that was applied ? Justify the answer.

## Section-B

Q2. Attempt any five questions from this section.

(10×5= 50)

(a) Explain asymptotic notations. Discuss Big(O) notation.

(b) Explain how polynomial can be expressed using linked list. Write a C program to add two polynomials using linked list.

(c) Write a C program to implement stack using linked list and perform PUSH and POP operations onto the stack.

(d) Explain the concept of circular queue. Discuss the base cases to be verified for carrying our insertion and deletion operations in a circular queue.

(e) Find out degree of each node for a graph given below. Apply BFS algorighm and obtain the graph node traversal sequence, considering startind node of the BFS traversal as Node 1.
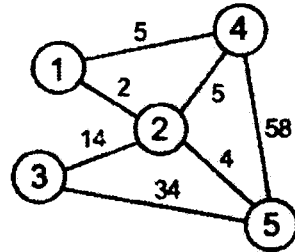


(f) What is tail recursion? Write a C program using recursive function that solves tower of Hanoi problem.

(g) Draw Huffman tree and generate Huffman code for the following symbols whose frequency of occurance in a message is stated along with symbols given below : Also estimate the total number of memory bits saved using the Huffman coding scheme.

A:15  B:16  C:17  D:12  E:25  F:4  G:6  H:1  I:15

(h) (a) Write a C program to search an element in array using binary search technique.

(b) Perform two way merge sort operation on the array given-

| 24 | 7 | 46 | 41 | 85 | 4 | 94 | 14 |
|----|---|----|----|----|---|----|----|

### Section-C

**Note: Attempt any two questions from this section.**

(15×2=30)

Q3. (a) What is the importance of Garbage Collection?

(b) Write an algorithm to delete and insert elements in DEQUE.

(c) Write an algorithm to delete last element from a doubly linked list.

Q4. (a) Sort 20, 35, 40, 100, 3, 10, 15 using selection sort.

(b) Explain with an example to find minimum cost spanning tree using Kruskal algorighm.

Q5. (a) Generate a binary tree for the following traversal sequences given -

IN-ORDER :    B F G H P R S T W Y Z

PRE-ORDER :   P F B H G S R Y T W Z

(b) Write an algorithm to convert an infix expression into postfix form.