Printed Pages : 4 TCS302

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

PAPER ID : 1065 Roll No.

B.Tech

(SEM III) ODD SEMESTER THEORY EXAMINATION 2009-10

DATA STRUCTURE USING 'C'

Time : 3 Hours] *[Total Marks : 100*

Note : *(1) Attempt all questions.*

(2) All parts of a question should be attempted at same place.

1 Attempt any **four** parts of the following : **5×4=20**

(a) Define data structure. Write down the difference between 'logical' and 'physical' structure of data using a suitable example.

(b) Write a program in 'C', that counts total number of 'words' in a given input text.

(c) Suppose you have an array to numbers denoted by num [ ]. Write the iterative and recursive procedure to find the sum of 500 numbers. Compare the time and space-requirement of both algorithms.

(d) Write down algorithm for evaluation of postfix expression using stack.

(e) Each element of an array X [30] [50] requires 4 bytes of storage. Base address of X is 2500. Determine the location of X [10][10] when the array is stored as

(i) Row major

(ii) Column major

(f) Explain divide and conquer method and apply it on the merge sort using some example.

2 Attempt any **four** parts of the following : **5×4=20**

(a) You are given two polynomials. Represent the polynomials in a suitable data structure and write an algorithm to add the two polynomial functions.

(b) Suppose LIST is a circular list in memory. Write an algorithm which deletes the last node from LIST.

(c) Implement a queue as a linked list. Write algorithm for performing insertion and deletion in it.

(d) Show, how a priority queue can be implemented using linked list.

(e) Given a queue and an empty stack, write a function that uses the stack to reverse the order of all items in the queue.

(f) Write algorithm to add an item to each end of a dequeue.

Attempt any **two** parts of the following : **10×2=20**

(a) Write down the 'iterative' and 'recursive' algorithms for In order traversal of a binary tree. What is the run-time of the algorithms ?

(b) (i) Write a 'C' function that accepts a pointer to a binary tree and a pointer to a node of the tree and returns the level of the node in the tree.

(ii) Consider the following algebraic expression :

$$E = (2x + y)(5a - b)^3$$

Draw the tree T which corresponds to expression E.

(c) What is hashing ? Give the characteristics of hash function. What are different methods of handling overflow in hashing ?

Attempt any **two** parts of the following : **10×2=20**

(a) (i) Write an algorithm for sorting a set of numbers in descending order using selection sort. Analyse the algorithm.

(ii) Illustrate the operation of HEAP-SORT on the following array :

$$A = \langle 5, 13, 2, 25, 7, 17, 20, 8, 4 \rangle$$

(b) (i) Define B tree. Explain the insertion operation of B tree with example. What are the applications of B-tree ?

(ii) Insert the following keys, in the order shown, to build them into an AVL tree :

M, T, E, A, Z, G, P

(c) Suppose a graph G is input by means of an integer M, representing the nodes 1, 2 .... M and a list of N ordered pairs of integers, representing the edges of G.

Write a program in C language to find the adjacency matrix of graph G.

5 Write short notes on any **four** of the following : **5×4=20**

(i) Sparse Matrices and their applications

(ii) Kruskal's algorithm

(iii) Tower of Hanoi problem

(iv) Time-space trade-off with suitable examples

(v) Principles of recursion with example

(vi) Garbage collection and compaction.
