ROLL NO. _____

Code: DC54 Subject: DATA STRUCTURES

DipIETE – CS (NEW SCHEME)

Time: 3 Hours **JUNE 2012** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: **(2×10)**

a. Scope of a variable is

(A) The region over which the variable declaration has effect
(B) The region where function has effect
(C) The return type of a variable
(D) None of the above

b. Two programs are given to final factorial of a number, one with recursion and one without recursion. Which program will not run for a very big number as input because of stack overflow?

(A) First one only **(B)** Second one only
(C) Both **(D)** None of the above

c. A direct access file is

(A) A file in which records are arranged in a way they are inserted
(B) A file in which records are arranged in particular order
(C) Files which are stored on a direct access storage medium
(D) None of the above

d. The complexity of merge sort algorithm is

(A) O(n) **(B)** O(log n)
(C) $O(n^2)$ **(D)** O(n log n)

e. A stack is defined formally as a list in which all insertion and deletion are made at _____

(A) same time **(B)** same end
(C) different end **(D)** both **(A)** and **(B)**

f. Which of the following sorting algorithm is of divide-and-conquer type?

(A) Bubble sort **(B)** Insertion sort
(C) Quick sort **(D)** All of above

g. In a linked list, the pointer of last node contains a special value called the _____ pointer.

(A) NULL **(B)** Zero
(C) Link **(D)** Nextpointer

h. The node in a _____ linked list has a pointer to both its successor and predecessor.

(A) Circularly **(B)** Doubly
(C) Linear **(D)** Sequential

i. The inorder traversal yields a sorted listing of elements in_____

(A) Binary trees **(B)** Binary search trees
(C) Heaps **(D)** None of above

j. In a graph if e=[u, v], then u and v are called

(A) endpoints of e **(B)** adjacent nodes
(C) neighbours **(D)** all of above

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. What is scope and storage allocation of static, local and register variables? Explain with an example. **(6)**

b. What is static and dynamic memory allocation? Explain dynamic memory allocation functions with examples. **(10)**

Q.3 a. Define a structure to represent complex numbers. Write a program to multiply two complex numbers using your representation. **(8)**

b. Differentiate between Structures and Unions with example. **(4)**

c. List out the important file handling functions available in 'C' and write their prototype. **(4)**

Q.4 a. Write a complete program in C to find the transpose of a matrix. **(8)**

b. Write an algorithm to sort a list of numbers using Merge sort. **(8)**

Q.5 a. Describe the various operations on stack. List its applications. **(8)**

b. What is the advantage of circular queue over linear queue? Write C routines for inserting and deleting an element from the circular queue. **(8)**

Q.6 a. What is a singly linked list? Mention any two advantages of singly linked list. **(4)**

b. Show how a polynomial can be represented using linked list. Write an algorithm to add two polynomials. **(12)**

Q.7 a. Write a C program to perform the following operations on doubly linked list
(i) Insert a node
(ii) Delete a node **(10)**

b. Write C functions for the following tree traversals:
(i) Inorder
(ii) Preorder
(iii) Postorder **(6)**

Q.8 a. Write a "C" function to compute the in-degree and out-degree of a vertex of a directed graph when the graph is represented by an adjacency list. **(10)**

b. What is Minimum Cost Spanning Tree? Explain with example. **(6)**

Q.9 Write short notes on:

(i) Circular lists
(ii) Binary tree representations **(8+8)**