ROLL NO. _____

Code: DC104 **Subject: DATA STRUCTURES**

DipIETE– CS *{NEW SCHEME}*

Time: 3 Hours **DECEMBER 2014** **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. _____ is the logical or mathematical model of a particular organization of data.

(A) Structure **(B)** Variable
(C) Function **(D)** Data Structures

b. The data structure that is known as a non-linear data structure?

(A) Array **(B)** Stack
(C) Linked List **(D)** Graph

c. _____ operation accesses each record exactly once so that certain items may be processed.

(A) Inserting **(B)** Deleting
(C) Traversing **(D)** Searching

d. _____ function of C is used to allocate a block of memory.

(A) malloc() **(B)** calloc()
(C) free() **(D)** realloc()

e. Which of the following linked list below have last node of the list pointing to the first node?

(A) Circular Doubly Linked List **(B)** Doubly Linked List
(C) Circular Linked List **(D)** Circular Singly Linked List

f. Which of the following approach is used by Merge Sort?

(A) Divide and conquer **(B)** Backtracking
(C) Heuristic search **(D)** Greedy approach

g. A Binary tree is said to be a BST (Binary Search tree) if every node N in a tree is such that

(A) Left Subtree < N < Right Subtree **(B)** N < Left Subtree < Right Subtree
(C) Left Subtree < Right Subtree < N **(D)** Right Subtree < Left Subtree < N

h. Which of the following way follows in Inorder traversal?

(A) Root →Left subtree→Right subtree
(B) Root→Right subtree→Left subtree
(C) Left subtree→Root→Right sub tree
(D) Left sub tree→Right subtree→Root

i. The worst case and average case complexity of Bubble Sort algorithm is given by

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

j. A complete graph with N nodes will have _____ edges.

(A) [n(n-1)/2] **(B)** [(n-1)(n+1)/2]
(C) [n(n+1)/2] **(D)** [(n-1)/2]

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

Q.2 a. Discuss the procedure of writing a Recursive function. Also write C programs for the following with the explanation in support of your answer: **(4+4)**

(i) To find the sum of n numbers by recursion.
(ii) To reverse a given number.

b. Explain the memory Allocation in C and distinguish between compile time (static) and run time (dynamic) memory allocation. **(8)**

Q.3 a. How a pointer can be used to access the members of a structure? Explain by C programs as examples. **(8)**

b. Describe Major File operations with examples as C programs. **(8)**

Q.4 a. Describe linear and binary search with their algorithms. **(8)**

b. Write a C Program code for binary search using recursion. **(8)**

Q.5 a. Discuss the concept of Stack and Queues and write the C programs that demonstrate the following: **(2+3+3)**

(i) Push and Pop operations in a stack
(ii) Insert and Delete operations in a Queue.

b. Briefly describe the Circular Queue. Show the procedure of adding and deleting an element from a circular queue by a C programming function. **(8)**

Q.6 a. Define a singly Linked List. Write a C Program for appending a new node in the end as well as deleting the beginning or first node of the created linked list. **(8)**

b. Give a C program module that shows the Insert, find, delete and print operations in a Singly Linked list. **(8)**

Q.7 a. Write short notes on the following: **(4+4)**

(i) Circular linked lists
(ii) Doubly linked lists

b. Write a C program which demonstrates the merging of two circular lists. **(8)**

Q.8 a. Express the non recursive algorithms for the Inorder and Preorder traversal of a binary tree. **(8)**

b. Write the following algorithms: **(8)**

(i) Write the algorithm for testing that a given binary tree is BST (Binary Search tree) or not.
(ii) Express the algorithm of inserting a node k in a BST (binary search tree) with a brief analysis.

Q.9 a. Distinguish between the Breadth first search (BFS) and Depth first search (DFS) traversal techniques of a graph in detail. **(8)**

b. Discuss the Kruskal's Algorithm with its analysis and apply it to find the minimum cost spanning tree for the following undirected graph: **(4+4)**