Code: DC104   **Subject: DATA STRUCTURES**

DiplETE – CS {𝒩ℰ𝒲 𝒮𝒞ℋℰℳℰ}

Time: 3 Hours   **JUNE 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. A linear collection of data elements where the linear node is given by means of pointer is called

   (A) linked list   **(B)** node list
   (C) primitive list   **(D)** stack

b. Representation of data structure in memory is known as:

   (A) recursive   **(B)** abstract data type
   (C) storage structure   **(D)** file structure

c. If the address of A[1][1] and A[2][1] are 1000 and 1010 respectively and each element occupies 2 bytes then the array has been stored in _____ order.

   (A) row major   **(B)** column major
   (C) matrix major   **(D)** address major

d. An adjacency matrix representation of a graph cannot contain information of :

   (A) nodes   **(B)** edges
   (C) direction of edges   **(D)** parallel edges

e. The best average behaviour is shown by

   (A) Quick Sort   **(B)** Merge Sort
   (C) Insertion Sort   **(D)** Heap Sort

f. A queue is a,

   (A) FIFO (First In First Out) list.   **(B)** LIFO (Last In First Out) list.
   (C) Ordered array   **(D)** Linear tree

g. Consider that n elements are to be sorted. What is the worst case time complexity of Bubble sort?

(A) O(1)   (B) O(log2n)
(C) O(n)   (D) $O(n^2)$

h. Which data structure is needed to convert infix notation to postfix notation?

(A) Branch   (B) Queue
(C) Tree   (D) Stack

i. The largest element of an array index is called its

(A) lower bound   (B) range
(C) upper bound   (D) set

j. What is the result of the following operation?
Top (Push (S, X))

(A) X   (B) null
(C) S   (D) XS

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

Q.2 a. If you are using C language to implement the heterogeneous linked list, what pointer type will you use?   **(4)**

b. What is the data structures used to perform recursion?   **(6)**

c. Write a recursive function to find factorial of a given number.   **(6)**

Q.3 a. What is difference between structure and union? Write a program that will read and print the data for 10 students using the following structure:
struct student {
        char name [30];
         float mark;
}   **(3+5)**

b. Define file. Explain the major operations performed on sequential file.   **(2+6)**

Q.4 a. Write an algorithm in C to implement bubble sort technique.   **(8)**

b. Explain the procedure for Binary Search technique with the help of an example.
                                                                                  (8)

Q.5 a. Write the difference between a stack and a queue. Write a program in C to implement queue using linked list.   **(4+6)**

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b. Translate the following infix expression into its equivalent postfix expression using stack:
A*(B+D)/E-F*(G+H/K)　　　　　　　　　　　　　　　**(6)**

Q.6　a. Write a procedure to reverse a singly linked list.　　**(8)**

　　b. Write a function which inserts a newly created node after a specified node. **(8)**

Q.7　a. Define Circular Linked List. Write a program for creating and printing the elements of a Circular Linked List.　　　　　　　**(8)**

　　b. What are the disadvantages of single linked list? How these problems are solved by doubly linked list?　　　　　　　　**(4+4)**

Q.8　a. Define Binary tree. How binary trees are represented in memory?　**(8)**

　　b. Write the Preorder, Inorder and Postorder traversal for the following tree:　**(8)**
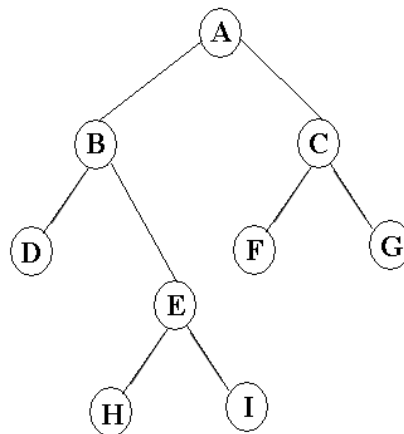
Q.9　a. Define the following with the help of example:
　　　(i)　Adjacency Matrix of a graph
　　　(ii)　Adjacency List of a graph
　　　(iii) In-degree and out-degree of a graph
　　　(iv) Directed Acyclic Graph (DAG)　　　　　　　**(2×4)**

　　b. Write a program that implements depth first search algorithm.　**(8)**