ROLL NO. _____

Code: DC54/DC104 **Subject: DATA STRUCTURES**

DipIETE – CS (Current & New Scheme)

Time: 3 Hours **DECEMBER 2015** **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. Array as data structures is good for

(A) Sequential access of data **(B)** Direct access of the data
(C) Both **(A)** and **(B)** **(D)** None of these

b. A sorting search cannot have complexity less than

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

c. On a 32 bit computer, an integer is stored in

(A) 4 bytes **(B)** 2 bytes
(C) 8 bytes **(D)** 6 bytes

d. Adjacency matrix is used to represent

(A) Only undirected graph **(B)** Only directed graph
(C) Both **(A)** and **(B)** **(D)** A graph with loop only

e. Which of the following data structure is suitable for deletion of an item with minimum overhead?

(A) A simple linked list **(B)** An array
(C) A doubly linked list **(D)** Circularly linked list

f. How many pointer assignments will be required to merge two circular lists?

(A) 2 **(B)** 3
(C) 4 **(D)** 1

g. A tree contains one root and

(A) Any number of other nodes
(B) n internal nodes and m leaf nodes such that $n \geq m$
(C) n internal nodes and m leaf nodes such that $n \leq m$
(D) n internal nodes and m leaf nodes such that $n = m$

h. Which of the following statement is false?

(A) Stack concept can be implemented using array.
(B) Stack concept can be implemented using Linked list.
(C) Stack is equivalent to LIFO structure.
(D) Stack is equivalent to FIFO structure.

i. In order to maintain precedence of operations, parentheses are used in _____ Expression.

(A) In-order **(B)** Pre-order
(C) Post-order **(D)** All of these

j. A DAG has

(A) Exactly one cycle **(B)** Atleast one cycle
(C) No cycle **(D)** None of these

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

Q.2 a. What is register variable and how is it different from memory variable? Whether a memory is allocated for a register variable or not? Justify your answer. **(8)**

b. Write a recursive function to multiply two positive integers. **(8)**

Q.3 a. Using a suitable example, explain the method of passing a structure as parameter to a function. **(8)**

b. Can we define a structure having only one component (item) in it? Support your answer with a suitable reasoning. **(4)**

c. Differentiate between access mode "a" and "w+" in file management using C language. **(4)**

Q.4 a. Write an algorithm to determine transpose of a matrix. **(8)**

b. Write the quick sort algorithm to sort an unsorted array of n elements in ascending order. **(8)**

Q.5 a. Write a method to add, delete and search an item in queues. **(8)**

b. Write the two basic operations performed with a stack. Write the operation as a function in C language. **(8)**

Q.6 a. What happens when the last node in a linked list is not pointed to NULL pointer? What will happen to your program? **(6)**

b. How a polynomial of degree 'n' can be represented using linked list? Explain your answer with a suitable example. **(10)**

Q.7 a. Write two applications of doubly linked list and its advantage over singly linked list. **(8)**

b. Write a program to print a list in reverse order i.e. the last element should be printed first and first element should be printed last. **(8)**

Q.8 a. When a graph is called a connected graph? Write an algorithm to test connectivity in a graph. **(10)**

b. Write an algorithm to add a new element in a binary search tree. **(6)**

Q.9 Write short notes on: **(8+8)**

(i) Depth first traversal of a graph
(ii) Heap sort