Code: AC06/AT06 **Subject: DATA STRUCTURES & ALGORITHM DE**
Time: 3 Hours **Max. Marks: 1**

DECEMBER 2010

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 half an hour 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 queue is one in which addition and deletion can be done at both ends is

(A) Delque **(B)** Endqueue
(C) Dequeue **(D)** Hqueue

b. Extra memory of O(n) is needed in

(A) Bubble sort **(B)** Merge sort
(C) Insertion sort **(D)** Quick sort

c. Graphs are represented using

(A) Adjacency tree **(B)** Adjacency graph
(C) Adjacency queue **(D)** Adjacency linked list

d. How many distinct binary search trees can be formed which contain the integers 1,2,3

(A) 6 **(B)** 4
(C) 5 **(D)** 3

e. The number of comparisons required to sort 5 numbers in ascending order using bubble sort is

(A) 7 **(B)** 6
(C) 5 **(D)** 10

f. The spanning tree of connected graph with 10 vertices contains

(A) 9 edges **(B)** 10 edges
(C) 11 edges **(D)** 9 vertices

g. In _____, it is possible to traverse a tree without using stacks is

(A) Threaded binary tree **(B)** B^+ tree
(C) Heap **(D)** AVL tree

h. The prefix form of infix expression A+B-C*D is

(A) +AB-*CD **(B)** -+AB*CD
(C) -+ABC*D **(D)** None of the above

i. The data structure required to execute breadth First Traversal on a graph is

(A) Stack **(B)** Array
(C) Queue **(D)** Tree

j. The number of different directed trees with 3 nodes are

(A) 2 **(B)** 4
(C) 3 **(D)** 5

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

Q.2 a. Explain how an array can be used to represent polynomials. Represent the polynomial $3x^3 + 2x^2 + 1$ in three different ways. **(6)**

b. Write recursive method that prints odd numbers between 1 to n, for a positive integer n. **(4)**

c. Explain algorithm analysis using frequency count. Define Big-O notation. **(6)**

Q.3 a. Write a code in C to delete an i^{th} node from a linked list. **(6)**

b. What do you understand by sparse matrix? How it is represented using a linked list? Write an algorithm to find its transpose? **(10)**

Q.4 a. Define binary tree. Write a function to count the number of nodes in a binary tree. **(8)**

b. Write modules to perform the following operation on Binary tree
(i) count number of leaf nodes
(ii) find height of tree **(8)**

Q.5 a. Construct a tree for the expression

$$\frac{-b+\sqrt{b^2-4ac}}{2a}$$

State all the steps and write pre-order, in-order and post-order traversal of the above tree so formed. **(8)**

b. What do you understand by Height Balanced binary tree? Show the result of inserting 2, 1, 4, 5, 9, 3, 6, 7 into an initial empty Height Balanced Binary Search Tree. **(8)**

Q.6 a. Show and draw all B-trees of minimum degree 2 that represent the {1, 2, 3, 4, 5}.

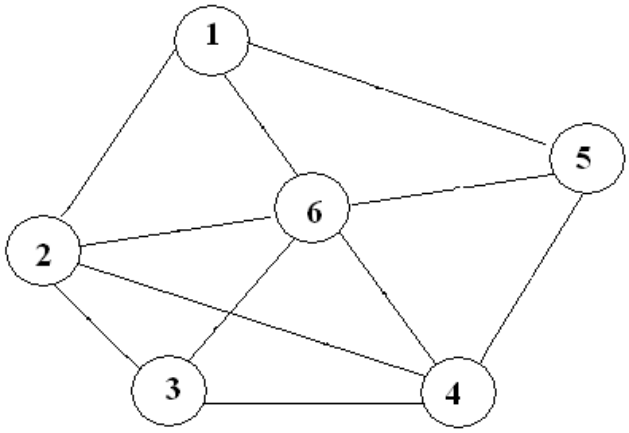
b. Write an algorithm for bubble sort. What is the asymptotic time complexity of bubble sort in worst case? **(10)**

Q.7 a. Construct the heap showing the insertion of each of the following elements in separate figures:-
48, 34, 54, 26, 64, 54 **(8)**

b. What is hash function? Describe any two hash functions. Explain collision handling using linear and quadratic probing. **(8)**

Q.8 a. Write Dijkstra algorithm for finding the shortest path in a given graph? Give the analysis of algorithm. **(8)**

b. Consider the following undirected graph given below. Find
(i) Its adjacency matrix.
(ii) Its adjacency list representation.
(iii) A depth-first spanning tree starting at node 1.
(iv) A breadth-first spanning tree starting at node 1. **(8)**



Q.9 a. How stacks & queues can be represented using a linked list? Explain giving suitable examples. **(10)**

b. Define threaded binary tree. Explain inorder threading using a suitable example. **(6)**