Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

FOURTH SEMESTER B.TECH. DEGREE END SEMESTER EXAMINATIONS, MAY – 2016

SUBJECT: OPEN ELECTIVE – I:FUNDAMENTALS OF DATA STRUCTURES AND ALGORITHMS (ICT 3283)

(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **17/05/2016** **MAX. MARKS: 50**

Instructions to candidates

- Answer all the questions.
- Missing data, if any, may be suitably assumed.

1A. Define different asymptotic notations used to measure the performance of an algorithm. Show that the following equalities are correct, using those definitions.

i. $n^2 - 5n = O(n^2)$

ii. $\sum_{i=0}^{n} i^2 = \theta(n^3)$

1B. Convert A+(((B-C)*(D-E)+F)/G)$(H-J) to postfix and prefix.

1C. List and explain different methods of measuring the performance of an algorithm. Which is the most accepted method and why?

[5+3+2]

2A. What is a circular queue? Write functions to add and delete operations on it. Write the state of the circular queue with maximum size 8 after performing each of the following operations: add(10), add(20), add(30), delete(), delete(), add(40), add(50), delete(), add(60), delete(), delete(), add(70)

2B. Write a function to exchange the smallest and largest elements in a singly linked list.

2C. What is a heap? Explain different types of heaps with an example for each. [5+3+2]

3A. Write a function to delete an element from a Binary Search Tree considering all the cases.

3B. Construct the binary tree given the following postorder, preorder and inorder traversals.
Postorder: EDBKGHFCA
Preorder: ABDECFGKH
Inorder: DEBACKGFH

3C. Let G = (V, E) be a directed graph. Let |V| = n; |E| = e. Prove the following:

i. $0 \leq e \leq n(n-1)$

ii. $\sum_{i=1}^{n} d_i^{in} = \sum_{i=1}^{n} d_i^{out} = e$. [5+3+2]

4A. List different representations of graphs? Give examples. Traverse the graph shown in Figure Q.4A using Depth First Search. Also write the function to perform the same.

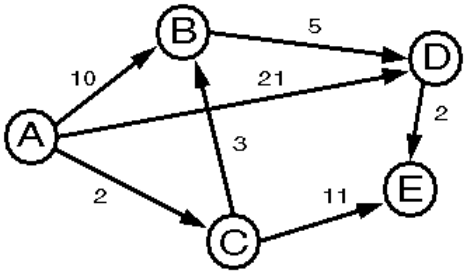

Figure Q.4A

4B. Write a function to search an element in an array using binary search technique.
4C. Construct the Binary Search Tree given the following elements:
10, 5, 15, 16, 90, 34, 67, 89, 17, 2, 24, 45, 23, 11

[5+3+2]

5A. Write the necessary functions to sort a set of numbers using quick sort. Trace your algorithm to sort the following numbers using the function.
12, 1, 34, 23, 67, 45, 34, 78, 14, 6, 33, 66
5B. Write a function to evaluate a postfix expression.
5C. Write a function to count the number of leaf nodes in a binary tree.

[5+3+2]