Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH. END SEMESTER EXAMINATIONS,

APRIL/MAY 2017

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

REVISED CREDIT SYSTEM
(02/05/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Write a function to create a binary search tree. Given the set of values 50, 75, 25, 65, 70, 80, 78, 68 create a Binary Search Tree. **5**

1B. Prove or disprove the following: **3**

i. $2^{n+1} = O(2^n)$

ii. $2^{2n} = O(2^n)$

1C. If the depth of an almost complete binary tree is 7, what is the minimum and maximum number of nodes in the tree. **2**

2A. Write a recursive function to sort elements using quick sort. Also trace the function for the following set of elements. **5**

12, 23, 7, 5, 13, 51, 19, 65, 62, 18, 65, 2

2B. What is an expression tree? Write an expression tree for the following infix expression **3**

A+B*(C+D)+E-A/C

2C. Describe a method to represent a binary tree using an array clearly mentioning the ways to determine the position of parent and child nodes of a node with position 'i' in the tree. **2**

3A. Write functions for the following operations on a circular doubly linked list. **5**

i. Create the list
ii. Insert a node after a node pointed to by *ptr*
iii. Print the list in reverse order

3B. Evaluate the following expression using stack: 6*4-7/3+2 **3**

3C. Discuss the time complexity of linear and binary search algorithms **2**

4A. Write a function to delete an element from a binary search tree(BST). Delete the root from the BST shown in Figure Q.4A and show the output. **5**

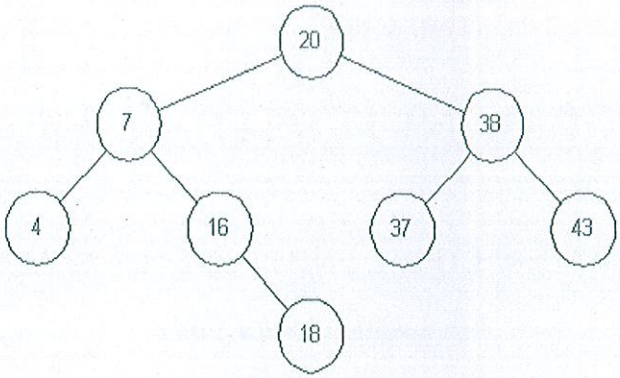

Figure Q.4A

4B. Represent the graph shown in Figure Q.4B using: 3
a. adjacency matrix
b. linked adjacency list

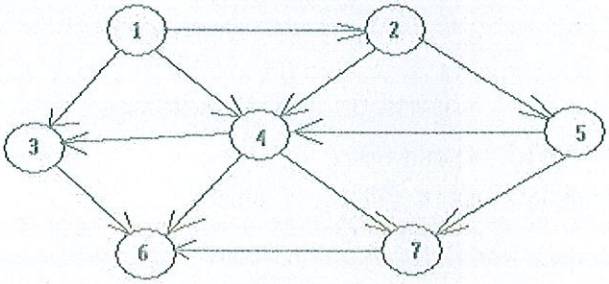

Figure Q.4B

4C. Write a recursive function to find the sum of all the elements of an array and compute the space complexity. 2

5A. What is a sparse matrix? Give an example. Discuss the practical implementation of creation of a sparse matrix with minimum space requirement. Write a function to find the transpose of a sparse matrix. 5

5B. Given the postorder and inorder traversal of a binary tree, construct the unique binary tree. 3

Postorder: G D B E H I F C A
Inorder: B G D A E C H F I

5C. Construct a threaded binary tree for the tree shown in Figure.Q.5C 2

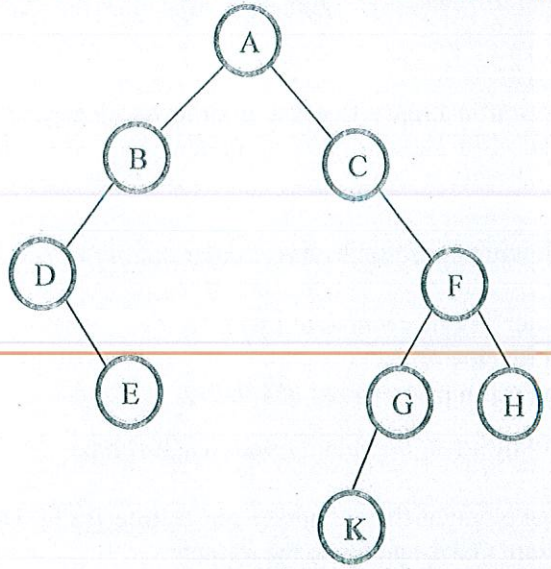

Figure.Q.5C