MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104
(Constituent College of Manipal University)

THIRD SEMESTER B.TECH. (IT/CCE) DEGREE END SEMESTER EXAMINATION, NOV/DEC -2015
SUBJECT: DATA STRUCTURES (ICT-205 / ICT-251) ICT−2103
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS　　　　　　　　　**01/12/2015**　　　　　　　　　**MAX. MARKS: 50**

Instructions to candidates
- Answer any **FIVE FULL** questions
- Missing data, if any, may be suitably assumed

1A. Answer the following:

    i. What is the maximum number of nodes in k^{th} level of a binary tree?

    ii. What is maximum number of nodes in a binary tree of depth k?

    iii. What is the total number of external nodes in a binary tree of nodes N?

    iv. Give the expression to find the number of edges E of a graph G with N vertices, if d_i is the degree of vertex i.

    v. What is the total number of passes required in bubble sort technique if the input array has P elements.

1B. Write a program to implement a queue data structure where the data is inserted at two ends and can be deleted from only rear end of the queue.

1C. Write an iterative function to perform the preorder traversal of a binary tree.

$$(5+3+2)$$

2A. Write a complete C++ program to implement multiple stacks where the number of stacks to be implemented is given as input by the user.

2B. Write a user defined function to perform breadth first search of a graph. For the given graph in Figure Q.2B, find the breadth first search sequence starting from all the vertices. Consider the increasing numerical order for traversal.

2C. Find the time complexity of the following using tabular method:
```
void add(int a[][3], int b[][3], int c[][3], int m, int n)
{
  for(int i=0;i<m;i++)
    for(int j=0;j<n;j++)
        c[i][j]=a[i][j]+b[i][j];
}
```

$$(5+3+2)$$

3A. Write a complete C++ program which performs the following operations using doubly linked list without the header node:

    i. Create two polynomials and display them.

    ii. Perform addition on two polynomials

    iii. Perform multiplication on two polynomials

3B. For the given inorder and postorder traversals construct the binary tree. Give the preorder traversal sequence and the array memory representation for the obtained tree:

Inorder: D G B A H E I C F

Postorder: G D B H I E F C A

3C. Write a user defined function to insert a node into an already sorted singly linked list with header. After insertion of the node, the list should be in sorted order.

(5+3+2)

4A. Write a function to create a binary search tree. The parameters to the function include the root of the tree and the item to be added. Given the set of values 50, 75, 25, 65, 70, 80, 78, 68 create a Binary Search Tree. With steps show individually the trees on deleting 75 and 50 one after the other.

4B. Write a user defined function to create a singly linked list with only odd data values (input to be given by the user and even values entered by the user to be discarded). After the singly linked list is created, create another list, which is a circular linked list that has the values from the even positions of the already created singly linked list. For example, if the singly linked list was created with values: 3, 5, 7, 9, 11, 13, 15, then the circular list should contain values: 5, 9, 13.

4C. Define an expression tree. For the expression given below construct the equivalent expression tree. Show each step in constructing the expression tree.

EXPRESSION:((5*y^2) - (3*y)) + 2

(5+3+2)

5A. Write a complete C++ program to implement merge sort algorithm. Illustrate the merge sort for the following set of array elements: 8, 3, 24, 6, 2, 45, 1

5B. Write a user defined function to evaluate a postfix expression. Evaluate the given postfix expression using tabular representation of stack. Show the contents of stack at each step.

Postfix expression: 9 2 3 * + 5 + 4 7 * -

5C. Write a recursive function to search for an element in an integer array using binary search method.

(5+3+2)

6A. Write the recursive functions to perform the inorder, preorder and post order traversal. Trace each traversal technique for the given tree in Figure Q.6A. Also write the level order traversal sequence for the same.

6B. What are the different collision resolution techniques in hashing? Explain with example.

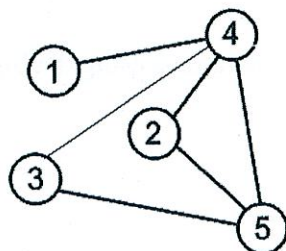6C. What is the limitation of linear queue? How to overcome the limitation of linear queue?
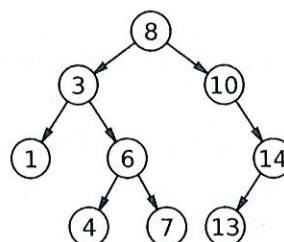
(5+3+2)

Figure Q.2B

Figure Q.6A