Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institute of Manipal University

THIRD SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING)

MAKEUP EXAMINATIONS, DEC 2017/JAN 2018

SUBJECT: DATA STRUCTURES [ICT-2103]

(REVISED CREDIT SYSTEM)
(26/12/2017)

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates:

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

1A. Write a user defined function to evaluate a postfix expression. Show the stack content at each step for the evaluation of postfix expression: a b * c d / + e - , where a = 2, b = 3, c = 12, d = 4 and e = 5. **(05)**

1B. Explain the following with suitable examples:
i. Heap and its types.
ii. Threaded binary tree. **(03)**

1C. 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];
}
```

(02)

2A. Explain Breadth First Search (BFS) algorithm with respect to the graph shown in the Figure Q.2A. Also write the function for the same. **(05)**

2B. Explain different types of constructor with suitable example. **(03)**

2C. Convert the tree given in Figure Q.2C into a binary tree using the left child right child representation and write the memory representation of the resultant binary tree using arrays. **(02)**

3A. Explain merge sort with steps for the array 123, 67, 9, 23, 875, 30, 561, 222, 177, 18. Also write the function for the same. **(05)**

3B. Implement a queue of integers by using an array int q[QUEUESIZE], where q[0] is used to indicate the front of the queue, q[1] is used to indicate its rear and where q[2] through q[QUEUESIZE -1] contain elements in the queue. Show how to initialize such an array and write functions to insert an element and to check whether the queue is empty or not. **(03)**

3C. Write the answer for the following with justification:

i. What is the final linked list available on completion of the following program execution. The linked list given as input is 1→2→3→4→5.

```
class Node{
 public:
   int data;
   Node *link;
};
Node *head = NULL;
void function1(Node *head)
{
 Node *t1, *temp;
 t1 = head;
 if(t1 == NULL) {
   cout<<"\n\r List is Empty";
 }
 else if(t1->link == NULL){
   cout<<"\n\r 1st node is last node ";
 }
 else
 {
  while(t1->link->link)
       t1=t1->link;
  temp=t1->link;
  t1->link=NULL;
  temp->link=head;
  head=temp;
 }
}
```

ii. What is the output of the following code? Justify

```
#include <iostream>
using namespace std;
int main()
{
    char arr[20];
    int i;
    for(i = 0; i < 10; i++)
        *(arr + i) = 65 + i;
    *(arr + i) = '\0';
    cout <<arr;
    return(0);
}
```

(02)

4A. Write a C++ program to do the following:

i. Create a circular singly linked list with each node storing an integer value

ii. Delete all those nodes of the created circular singly linked list which contain prime number (05)

4B. Convert the following infix expression into prefix and postfix expressions. Show the stack content at each step of conversion.

A + B - C * D / E + F + G * H (03)

4C. Construct max and min heap for the input: 35, 33, 42, 10, 14, 19. Show each step of the construction. (02)

5A. Write a complete class definition to implement a Binary Search Tree with member functions to do the following operations. Write the main method also.

(i) Create a binary search tree.

(ii) Find the minimum element in a binary search tree.

(iii) Find the parent of any given node. (05)

5B. Write the recursive function for inorder, preorder and postorder traversal of a binary tree. Also, write the traversal sequence for each of the method for the tree given in Figure Q.5B. (03)

5C. Write a program to check whether a given m x n matrix is sparse or not. (02)

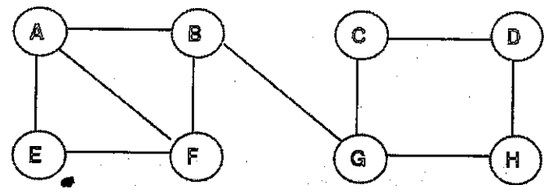

Figure: Q.2A

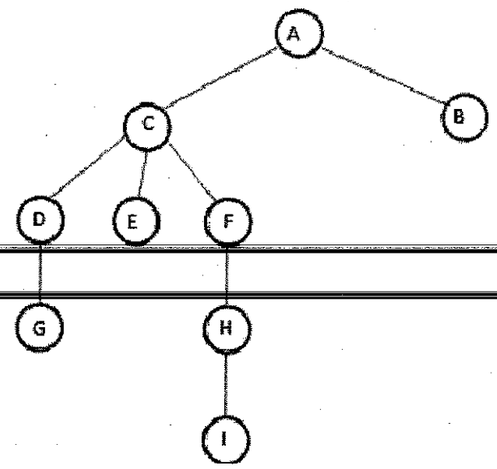

Figure: Q.2C

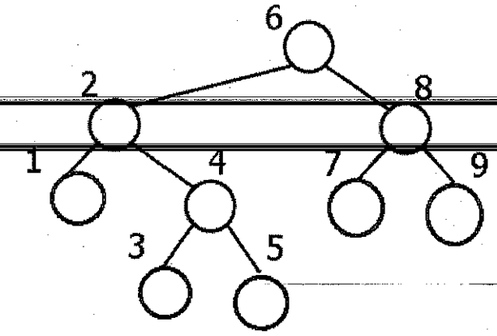

Figure: Q.5B