Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
JUNE 2019
SUBJECT: DATA STRUCTURES AND ALGORITHMS (ECE - 4020)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

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

1A. Write C++ functions to do PUSH, POP and PEEK operations on a stack created using linked list. Write the function definition with the prototypes as given below:

```
void push ( int );
int pop ( );
int peek ( );
```

1B. Write C++ functions to create a binary tree and insert nodes into the tree. Write a recursive function in C++ for performing preorder traversal of a binary tree. Write your function definition with the prototypes as given below:

```
struct node *createNode (int );
void preorder (struct node * );
struct node* insertNode(struct node*, int );
```

1C. Construct a tree for the given traversals. Preorder : 1, 2, 4, 5, 3, 6, 8, 9, 7. Postorder : 4, 5, 2, 8, 9, 6, 7, 3, 1.

(4+3+3)

2A. Write a C++ function to insert elements in a MAX-heap and maintain heap property after every insert. Consider the elements of the heap are integers and also assume that array length is MAX_LEN.

2B. Analyse the following algorithm and give the time complexity in terms of Big-O notation.

```
Algorithm Add ( A, B, n)
{
      for (i=0; i<n; i++)
     {   for (j=0; j<n; j++)
          c[i,j] = A[i,j]+B[i,j];
      }
}
```

2C. What is a Threaded binary tree? How is it useful and what are its disadvantages?

(4+3+3)

3A. Define and illustrate the following terms with reference to graphs:
(i) Directed graph (ii) Undirected graph (iii) Degree of vertex (iv) Adjacency matrix

3B. Write an algorithm to perform quick sort on an array of integers.

3C. What is an algorithm? What are the criteria for selecting an algorithm?

(4+3+3)

4A. Write a C++ function which will perform binary searching in an array of integers. Write the function definition with the prototype as given below.
int Bsearch (int [] , int); // given array and key to be found, returns the location if found, else will return -1.

4B. With neat diagrams, explain linear and circular queue. What are its applications?

4C. Explain the basic rotations in AVL trees with simple three node example diagrams.

(4+3+3)

5A. In double linked list, to simplify insertion and deletion by avoiding special cases of deletion and insertion at front and rear, a dummy head node is added at the head of the list. The last node also points to the dummy head node as its successor. Write C++ code for the following function calls which uses Double LL having dummy head node.
Define a structure called Node for a Double LL.
CreateHead (Node* Head); // to create head for double LL
DeleteNode (Node* Head, int item); // to delete a node from double LL, Head which contains the given item.
Node* SearchNode (Node* Head, int item); // search and return the link which contains the given item.

5B. What is an array? Explain representation of an array with a diagram. Is array an abstract data-type? Write a function in C++ to insert an element into the array. The prototype of the function is given as below:
Delete_Element (int array[], int size_of_array, int value_to_delete);

(5+5)