MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

## SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION APRIL/MAY 2019

## SUBJECT: DATA STRUCTURE AND ALGORITHMS (ECE - 4020)

## TIME: 3 HOURS

MAX. MARKS: 50

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

1A. Create a class called COMPLEX which has two private data members of type int to store real and imaginary part and four public member functions such as COMPLEX Add(float, COMPLEX)----- adds integer to a complex number COMPLEX Add(COMPLEX, COMPLEX) ----- adds two complex numbers void Read() ----- Reads real and imaginary part void Display() ----- Displays complex number in this format: x + i y or x - i y Write a complete C++ program to implement above functions.

1B. Write an algorithm to implement the binary search operation.

(5+5)

(5+5)

- 2A. What are the advantages of using Circular queue? Write a C++ program to implement circular queue using array data structure.
- 2B. Write an algorithms and a complete C++ program to implement insertion and deletion of elements from an array.

3A.	class	SLIST{
		~~-~ (

struct node { int data; node \*link; }\*HEAD;
public:
linklist(); //constructor to initialize the pointer
void merge( SLIST A, SLIST B ); //merges two linked list
void display(); //displays the elements of the list

};

Let A and B be two single linked list of type SLIST. Create a new single linked list C of type SLIST that contains elements alternatively from A and B beginning with the first element of A, if you run out of elements in one of the lists, then append the remaining elements of the other list to C. Write a C++ program to perform the above operations with main program.

3B. What is meant by the "stack overflow" conditions? Is it applicable to the linked list method of implementation of the stack? Give reasons. Describe the stack operations with example.

(5+5)

- 4A. What is the difference between a heap and a binary search tree? Show the result of inserting 45, 56, 78, 23, 11, 54, 88, 43, 55, 21 into an empty binary search tree. Also show the result of deleting root node.
- 4B. A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:

Character	А	В	С	D	Е	F
Frequency	5	25	7	15	4	12

Note that each character in input message takes 1 byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message? Find the efficiency of the Huffman coding. Show all the steps clearly and also write the codewords for all the characters.

(5+5)

- 5A. Explain the working of merge sort on the following data: 10, 15, 0, 17, 20, 25, 30, 16, 70, 6. Show all intermediate steps.
- 5B. For the digraph given in **Figure 5B** obtain:
  - a. The indegree and outdegree of each vertex
  - b. Its adjacency matrix representation
  - c. Its adjacency list representation

(5+5)



Figure 5B