MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VI SEMESTER B. TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL / MAY 2019
SUBJECT: DATA STRUCTURES AND ALGORITHMS [ELE 4018]
REVISED CREDIT SYSTEM

Time: 3 Hours	Date: 30, April 2019	Max. Marks: 50

Instructions to Candidates:
- ❖ Answer **ALL** the questions.
- ❖ Missing data may be suitably assumed.
- ❖ Write algorithms in pseudocode only.

1A. What is an algorithmic problem? How an algorithm is analyzed? *(02)*

1B. Solve the following recurrences:

1. T(n) = 3T(n-1), if n>0 otherwise 1
2. T(n) = 2T(n-1)-1, if n>0 otherwise 1 *(02)*

1C. How are data structures classified? Give examples. *(02)*

1D. Write iterative and recursive algorithms to convert a given decimal number to its equivalent binary number. Trace the algorithm for a N=10. *(04)*

2A. Write functions to insert and delete items from a Queue? Modify the functions to implement a circular queue. *(03)*

2B. Using the details provided in Table 1, obtain the Huffman code for "DEAD" and "DEAF".

Table 1: Huffman coding

Character	A	B	C	D	E	F
Frequency	5	9	12	13	16	45

(03)

2C. Using the concept of stacks illustrate how a given infix string is converted to postfix. The given infix string for illustration purpose is:

A+ (B*C-(D/E^F)*G)*H *(02)*

2D. Write a pseudo-code algorithm to evaluate a given postfix string array? Assume only + and – operators. *(02)*

3A. Construct a binary search tree for the following data:

A = [32, 16, 23, 9, 10, 3, 47, 39, 81, 35];

Obtain the Inorder, Preorder and Postorder traversals for the binary search tree constructed. *(03)*

3B. Considering array implementation of a Binary search tree, write a recursive algorithm to search for item in it. *(03)*

3C. Compare linked lists and arrays for implementing data structures like STACKS and QUEUES. *(02)*

3D. Write a pseudocode algorithm to insert a new node at the end of a singly linked list. *(02)*

4A. With examples compare directed and undirected graphs. *(02)*

4B. How graphs are represented? What is the criteria for choosing a representation? *(02)*

4C. Write an algorithm to search a graph breadthwise. What is the time complexity of the algorithm? *(03)*

4D. What is the purpose of Hashing? What are the collision resolution policies?

Draw the 11 entry hashtable for hashing the keys 12, 44, 13, 88, 23, 94, 11, 39, 20 using the function $(2i+5) \bmod 11$, closed hashing, linear probing. *(03)*

5A. Write a divide-and-conquer algorithm to multiply two N-digit numbers with time complexity less than $O(n^2)$. Trace the algorithm for 12 x 34. *(03)*

5B. Given the chain of 4 matrices – A1=[4,3], A2=[3,2], A3=[2,2], A4=[2,4].

Find the optimum sequence to multiply 1 x 4. *(02)*

5C. Write algorithm to implement Dijkstra's Shortest Path algorithm. *(02)*

5D. Explain P, NP, NP-Complete, NP-Hard type of problems. *(03)*