Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOVEMBER 2019

DATA STRUCTURES AND ALGORITHMS [ELE 4018]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 21 November 2019** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Draw neat sketches wherever required.

1A. What is the basis for algorithm analysis? ***(02)***

1B. Highlight the importance of pseudocode in algorithm analysis. ***(03)***

1C. Solve the following recurrences using Master's theorem:

a. $T(n) = 3\,T(n/2) + n^2$ b. $T(n) = 16\,T(n/4) + n$ ***(02)***

1D. Write a recursive and an iterative algorithm to find nth Fibonacci number. Obtain the time complexity of the code. ***(03)***

2A. What are the basic operations that must be supported by a data structure? ***(02)***

2B. Write a pseudocode algorithm to sort a random selection of number using the concept of priority queue. Determine the time complexity of the code. ***(03)***

2C. Modify the PUSH() and POP() functions of STACK to implement a QUEUE. ***(02)***

2D. Evaluate the following expressions using STACK. Show the content of the STACK after each significant step.

(4+8)*(6-5)/((3-2)*(2+2)) ***(03)***

3A. Construct the binary search trees from the given traversals:

a. Preorder [15 10 8 12 20 16 25]

b. Postorder [10 30 20 150 300 200 100] ***(02)***

3B. Given an array implementation of a Binary search tree (BST), write a pseudocode algorithm to search for given item in it. Prove the time complexity of your code with respect to the structure of a BST. ***(03)***

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

3D. Write a pseudocode algorithm to reverse a given linked list in constant time. Prove the correctness of the code with a suitable example. ***(03)***

4A. With suitable examples explain complete and incomplete graphs. What is total number of edges in each case? ***(02)***

4B. Given a graph G and vertices x and y, write an algorithm to check if there exists a path from x to y. Determine the time complexity of the algorithm. ***(03)***

4C. Explain with examples collision resolution policies used in Hashing. ***(03)***

4D. Write a pseudocode algorithm to merge, two sorted arrays. ***(02)***

5A. Making use of the merging algorithm written in Q4D. Write a pseudocode algorithm to sort a given array using a QUEUE. Illustrate with a suitable example. ***(03)***

5B. Given the chain of 4 matrices : A1=[5,4], A2=[4,6], A3=[6,2], A4=[2,7].

Find the optimum sequence to multiply A1..A4 using the concept of dynamic programming. ***(03)***

5C. Explain the concept of graph colouring with suitable example. ***(02)***

5D. Explain P, NP-Complete type of problems. ***(02)***