The LNM Institute of Information Technology
Department: Computer Science and Engineering
Advanced Data Structures and Algorithms (CSE XYZ)
Mid Term Examination

Time: 90 mins **Date: 29/02/2020** **Max. Marks: 90**

Instruction: *1. Make and State Appropriate Assumptions if and when required.*

Q.1. State the worst-case time complexity of the following operations in BIG-O notation. All answers should be in your answer book (NOT on question paper).

Sr No	Data Structure	Insert	Delete	Search
1	Unsorted array			
2	Sorted array			
3	Binary Search Tree			
4	AVL Tree			
5	Red-Black Tree			
6	B Tree			

[Marks = 6 * 3 * ½ = 9]

Q.2.

(a) State the characteristics of a Red-Black Tree. [Marks = 6]

(b) Insert the following key-values in that sequence into an empty Red-Black Tree 155, 105, 55, 175, 25, 75 and 65. Show the resulting Red-Black-Tree after every insert operation. [Marks = 20].

Q.3.

(a) State the characteristics of B-Tree of order 'm' [Marks = 6].

(b) Insert the following key-values in that sequence into an empty B-Tree of Order 4 (assume **right-bias**): 6, 4, 22, 10, 2, 14, 3, 8, 11, 13, 5 and 9. Show the resulting B-Tree after every insert operation. [Marks = 14].

Q.4.

(a) Show examples of Binomial-Trees of degree 0, 1, 2, 3[Marks 4].

(b) Construct a Min Heap of Binomial Trees by sequentially inserting the following Priority-values into this Heap: 37, 13, 7, 46, 21, 72, 64, 9, 60, and 55 [Marks 16]

(c) Pop the Min value of 7 and reconstruct the Min Binomial Heap [Marks 5]

(d) What are the time complexities (in BIG-O notation) of (i) creating a binomial heap of 'n' elements, (ii) pop and (iii) push operations. [Marks 6].

Q.5. What are the time complexities (in BIG-O notation) of finding whether a given sub-string exists or not in a given string, using (i) Naïve-Exact-Match and (ii) KMP algorithm. [Marks 4].

[Total marks = 90]