Paper: Competitive Programming and Efficient Coding (ITPE212) **Time:50 min**

Maximum Marks: 20 **MidTerm-1, 22Feb 2025**

Instructions: All questions are compulsory and assume missing data, if any.

1. We are given an array arr[] of size n where elements first decrease and then increase. We need to count how many elements in the array are less than or equal to a given integer x. Sove this in O(log n), and write code modules for solution. 2+2+2
2. Given an array of heights representing the histogram's bar heights, find the area of the largest rectangle that can be formed in the histogram. Give algo for brute force solution and solution in O(n). 3+4
3. You are given an unsorted array of n distinct integers. Your task is to find the k-th smallest element in the array using an efficient algorithm (with complexity analysis)that runs in:
   a) O(n) time complexity in the **best or average case.** 3
   b) O(n) time complexity in the **worst case** as well. 4