ADA-2024: Homework-1

Deadline: 28th January, Full Marks: 15

Problem: You are given three sorted arrays A, B, and C each having n numbers. You can assume that you can compare two elements from $A \cup B \cup C$ in $O(1)$-time. Let k be an integer. Design an algorithm that outputs the k-th smallest element of $A \cup B \cup C$. The running time of your algorithm must be faster than $O(n)$. Try to optimize the running time of your algorithm as much as possible.

N.B. If your algorithm runs in $O(n)$-time, then you will receive at most 10% credit.

Guidelines: Please state any assumption you make. No such assumption should contradict with what the assumptions in the question says. For instance, if you want the array index to start from 0 to $n-1$, please state it. But by default as per the question, the index is $1, \ldots, n$. Your answer must clearly explain the algorithm properly with a justification why the algorithm is correct. Additionally, your answer must give a clear explanation of your claimed running time. Missing explanations etc will deduct marks.