Data Structures and Algorithms Lab

Lab 08 **Marks 10**

Instructions

Work on this lab individually. You can use your books, notes, handouts etc. but you are not allowed to borrow anything from your peer student.

Marking Criteria

Show your work to the instructor before leaving the lab to get some or full credit.

What you must do

Program the following tasks in your C++ compiler and then compile and execute them.

Task 1

You are given two arrays, both containing ***n*** elements. Write functions to determine the **intersection** (i.e., common elements) of these two arrays, based on the **time complexity** requirements given below. You can assume that there are **no duplicates** in either of the two arrays.

Implement the function:

```
int intersection1 (int A[], int B[], int C[], int n)
```

which takes three integer arrays of size ***n*** as parameters. The intersection of arrays **A** and **B** will be stored in the array **C**. This function will **return the number of elements** that were stored in array **C**.

The **worst-case time complexity** of this function should be $O(n^2)$. You are not allowed to create any new array(s).

Now, you can assume that both the input arrays contain the numbers which are **sorted** in increasing order. Implement the function:

```
int intersection2 (int A[], int B[], int C[], int n)
```

The **worst-case time complexity** of this function should be $O(nlgn)$. You are not allowed to create any new array(s).

Task 2

Write a function to determine the ***k*th** smallest element of an array containing **n** elements. The prototype of your function should be:

```
int findKthSmallest (int A[], int n, int k)
```

In the above prototype, **A** is the array containing ***n*** integers out of which we want to find the ***k*th** smallest element. Also determine the time complexity of your function.

Task 3

A common problem in text processing is to find the **frequency** of a particular word in any given text file. Your task is to write a program that takes a filename and displays the **number of occurrences** of a particular word in **each line** of the text in the file.

The **input file** (**.txt**) will contain input and is in exactly the following format: First line of the input file will contain the word to be searched, on the next line is the beginning of the paragraph of any length in which the word to be searched.

Input files of different data sizes are given with this lab folder.

sample.txt

the
In the name of Allah, the Entirely Merciful, the Especially Merciful. All praise is to Allah, Lord of the worlds. The Entirely Merciful, the Especially Merciful, Sovereign of the Day of Recompense. It is YOU we worship, and YOU we ask for help. Guide us to the straight path. The path of those upon whom YOU have bestowed favor, not of those who have evoked anger or of those who are astray. **[Surah-e-Al-Fatiha]**

Output

The word "the" has following occurrences
Line 1: 3
Line 2: 3
Line 3: 0
Line 4: 0

☺ ☺ ☺ **BEST OF LUCK** ☺ ☺ ☺