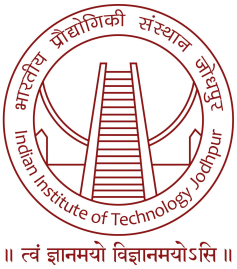
# INDIAN INSTITUTE OF TECHNOLOGY JODHPUR




## Data Structures and Algorithmic Techniques - CSL7561

### Assignment - 2

ASSIGNMENT DEADLINE - 23th January, 11:59 PM

**NOTE:**

- **You are allowed to use C programming language/ C++ to solve the problems. No other programming language is allowed.**
- **Use of API/ Libraries is strictly forbidden, you all need to write the code from scratch (except for input/ output header files).**
- **You need to submit the assignment before the deadline else your assignment will not be evaluated. No extension requests will be entertained.**
- **A strict plagiarism check using tools will be done on the code. If plagiarism is found in your code, you will be directly awarded zero for that question.**
- **The assignment needs to be submitted individually.**
- **You need to submit your programs (.c/ .cpp files) in a ZIP file. You have the liberty to choose your own input/ output format, hence include a separate pdf file that contains your input/ output format for each question.**

## Common Instructions for all Searching & Sorting Questions

- **Use integer values as elements of your array to perform searching/ sorting.**
- **Make sure that the size of your input is at least 10 elements.**

# Section - A (2 * 10 = 20 marks)

Implement the following search algorithms from scratch:

1) Linear Search Algorithm
2) Binary Search Algorithm

**Input Format:**
The first line contains the size of the input array (Integer)

The second line contains the input array (All Integers)

The third line contains the element which needs to be searched (Integer)

**Output Format:**
Program output should return the index of the element present in the array. Return -1 if the element is not present in the array.

**Sample Input 1:**
10
78 14 33 37 10 6 14 11 2 1
6

**Sample Output 1:**
5

**Sample Input 2:**
15
15 14 13 12 11 1 2 3 4 5 10 9 8 7 6
20

**Sample Output 2:**
-1

# Section - B (4 * 10 = 40 marks)

Implement the following sorting algorithms from scratch:

1) Quick Sort Algorithm
2) Insertion Sort Algorithm
3) Selection Sort Algorithm
4) Radix Sort Algorithm

**Input Format:**

The first line contains the size of the input array (Integer)

The second line contains the input array (All Integers)

**Output Format:**

Program output should display the input array after sorting the input array using the specified algorithm.

**Sample Input 1:**

12

100 160 -23 448 129 -1 10 17 22 99 -5 0

**Sample Output 1:**

-23 -5 -1 0 10 17 22 99 100 129 160 448

# Section - C (2 * 20 = 40 marks)

1) There are n rectangular bars with some lengths. The task is to modify the lengths such that each rectangular bar has the same length. You can lengthen or shorten each rectangular bar. Both operations cost z where z is the difference between the new and original length. Find the minimum total cost?

   **Input Format:**
   The First line contains the number of bars (Integer)

   The second Line Contains the size of each bar (All Integers)

   **Output Format:**
   Program output should be the minimum cost value (Integer)

   **Sample Input:**
   10
   9 7 8 15 12 6 11 14 2 1

   **Sample Output:**
   37

2) Given an integer array containing n elements with possibly duplicate elements, the task is to find indexes of the first and last occurrences of an element x in the given array.

   **Input Format:**
   The first line contains the size of the input array (Integer)

   The second line contains the input array (All Integers)

   The third line contains the element whose occurrence needs to be found (Int)

**Output Format:**

Program output should be the indices of first and last occurrences of element x separated by a space.

**Sample Input:**

15
19 22 78 12 22 16 34 22 68 10 1 15 12 68 19
22

**Sample Output:**

1 7