Data Structures and Algorithms — Lab 1

# Objective

The basic purpose of this lab is to revise some preliminary concepts of C++ that have been covered in the courses Introduction to Computing and Programming Fundamentals and Object Oriented Programming.

## **Task 1**

Create a C++ generic abstract class named **List**, with the following:

**Attributes:**

Type \* arr;

int maxSize;

int currentSize;

**Functions:**

* 1. virtual void addElementAtFirstIndex(Type) = 0;

// Should add the element at the first position of the **List**

* 1. virtual void addElementAtLastIndex(Type) = 0;

// Should add the element at the last position of the **List**

* 1. virtual Type removeElementFromEnd() = 0;

// Should remove the element from the last position of the **List**

* 1. virtual void removeElementFromStart() = 0;

//Should remove the element from the first position of the **List**

* Write parameterized constructor with default arguments for the above class.
* Write Copy constructor for the above class.
* Write Destructor for the above class.

## **Task 2**

Create a menu based program for the following functions, using the class made in task 1; make a class named as **MyList**, having the following additional functionalities:

* **bool empty()**: Returns whether the MyList is empty or not
* **bool full():** Returns whether the MyList is full or not  
  **int size():** Returns the current size of the MyList
* **bool insertAt(int index, T value):** Adds a value at the index passed to the function, returns true if the index is present and value is added else returns false.   
  **Type last():** Returns the last element of the MyList
* **bool search(Type):** Returns true if the searched value is present in the list else returns false
* Write parameterized constructor with default arguments for the above class.
* Write Copy constructor for the above class.
* Write Destructor for the above class.

## **Task 3**

Create a menu-based program for the following functions, using the class made in task 2, make a class named as **CustomList**, having the following additional functionalities:

**Type sum\_ofPrime()**: It finds prime numbers in the list and calculates and returns the sum of all prime numbers present in list.

**Type secondMaxEven()**: It finds and returns the **second maximum even number** present in list.

**Type secondMinOdd()**: It finds and returns the **second minimum odd number** present in list.

**void printDuplicates():** It finds and displays all the numbers which occur more than once.

**void rotateClockwaise( int r)**: It divides the list into two parts (halves the list), and rotate both parts “**r**” times in clockwise direction

**void rotateanitclockwaise( int rt)** : It divides the list into two parts (halves the list), and rotate both parts “**rt**” times in the anti-clockwise direction

* Write parameterized constructor with default arguments for the above class.
* Write Copy constructor for the above class.
* Write Destructor for the above class.