Spring Term 2023

OOP (A and B section) BSE

Assignment 1

Total marks 300
CLO 3

Note: Do not copy code from internet or any other source even across the sections. I will check the plagiarism of the assignment and it will capture the cheated code from internet or copied from class fellows. Those who will try they will get some marks for their effort even you do not get perfect solution. Copied & Shared work will score in negative grading. Assignment should be in jupyter. After submission, no excuse will be entertained. No assignment will be accepted after due date**. Submit .cpp and .h Files by zipping them. Use of header files is a must.**
You must follow the criteria of submission by renaming your zip file as your RollNo_A1.zip i.e 20L-1234_A1.zip. If you find it difficult, you can zip your entire project as well.

//Write constructors and destructors if required.

Q1) You are given a 2D list of integers, where each element may be positive, negative, or zero. Your task is to write a program that prints a new 2D list containing only the positive elements of the original list, and also calculates the sum of all positive elements in the new list. The number of rows and columns in the original list is determined by the user. Assume that rows and columns of the input array are defined by the user. **20**

2	3	-1	0	0	0
0	0	0	1	1	0
-3	0	2	0	0	0
11	-12	1	2	0	2
-55	0	0	0	-10	0

Output Array:

2	3		
1	1		
2			
11	1	2	2

Sum=25

Q2) You are given a file named **input.txt** with values Yes and No. Read the file and insert the strings in a 2D array of **strings**, where the elements are either "Yes" or "No". Do not use extra space. You have to calculate number of rows and columns after reading the file. Now, your task is to compress the input array by counting the number of "Yes" values and creating a new array, which will contain the count of "Yes" values in the first column and the string "No" in the second column. Then, you need to use the compressed array to transform it back to the original input array. You can use another 2D array as an intermediate representation. Additionally, you need to calculate the number of "Yes" values in the

original array and print the result. Make an input function to make Input 2D array from user and fill it up **40**

Yes	Yes	Yes	No	No	No
Yes	No	No	No	Yes	No
Yes	No	No	No	No	No
Yes	Yes	Yes	No	No	Yes
Yes	No	No	No	Yes	No

3	3
2	4
1	5
4	2
2	4

Yes	Yes	Yes	No	No	No
Yes	No	No	No	Yes	No
Yes	No	No	No	No	No
Yes	Yes	Yes	No	No	Yes
Yes	No	No	No	Yes	No

Use intermediate 2D array for the location of "Yes" (or "No"). In this 2D array the first row will contain the location of "Yes"es. For example, the first row will look like this 1, 2, 3. Which represents that "Yes" in first row are at location 1, 2 and 3 and rests of the elements are "No". **Use string not cstring.**

Q3) Write a program in C++ to implement dynamic memory allocation for a 2D maze game. The game should allow a player to move from one cell to another in the maze and reach the end. The player should be able to move in any of the four directions (up, down, left, right) as long as there is no wall in that direction. The maze should be randomly generated at the start of each game, using dynamic memory allocation. The game should keep track of the player's position and the number of moves taken to reach the end of the maze. The game should also check if the player has reached the end of the maze and display a message to the player indicating whether they won or lost the game. **20**

Q4) A **.PGM** image format can be represented using a 2D Integer Matrix, each index representing a colour pixel which ranges from **(0 - 255),** where 0 is the darkest and 255 is the brightest. Below is a sample pgm image file, and another can be found by clicking here Sample-2: **60**

```
P2
4 4
255
0   33    0   170
0  143    0    0
0    0   63    0
170   0    0  255
```

Here the first row represents a magic number "P2" which provides encoded information about the image. **This row can be hard coded**. The next row contains information about the **total number of columns and rows** of the image respectively. The third row contains information about the **maximum grey scale value** of the image. You can read more about Portable Grey Map Images on the following page: PGM Images Info

Your task is to implement an image editor program in C++ containing a class "Image" that will have the following functions:

1. Read a PGM image file into a 2D Integer Matrix
2. Save the edited PGM image into a file
3. Change the image's brightness by a value which ranges from -255 to 255
4. Flip the image horizontally or vertically
5. Combine Two Images Side to Side
6. Find the negative of an Image
7. Apply the median filter on an image to reduce noise
8. Implement the additional feature of applying filter which will count towards bonus marks in the assignment

Use the following skeleton code as a starting point in order to understand the question more briefly.
Code URL: Github

Q5) Write a program in C++ that implements a simple e-library management system. The program should provide a menu which allows the user to do the following: **30**

a. Add A New Book
b. Edit Details of an Available Book
c. Delete A Book
d. Display All Books in the Library

The book class contains the following attributes:

- Publication ID (This is unique, you must use this variable for searching purposes)
- Book Title
- Author(s)
- List of Patron Subscribers

The program should prevent addition of duplicate books entries using the unique publication id. The program should be implemented using character arrays only, **(Using string is prohibited)**. Additionally, you should consider using OOP concepts such as classes or structs, default or parameterized and copy constructors in your program.

Q6) Write a program in C++ to implement a class named "MyString" which will use char arrays as its private member. The class should have the following functions: **30**

a. Find the length of the string
b. Concatenate two strings
c. Make a sub-string
d. Search a word in a string
e. Reverse the string

Q7) Write a program in C++ that takes a sentence as input from the user and calculates the number of occurrences of each word in the sentence, ignoring punctuation and case sensitivity. The program should use a char array to store the sentence and should handle cases **where the sentence may contain multiple spaces or punctuation marks between words.** **30**

For example,

Input

Hello, world. How are you today. Its a beautiful world

Input - 1

Enter word to find its frequency: world

Output - 1

world = 2

Input - 2

Enter another word to find its frequency: How

Output - 2

How = 1

Additionally, add a print function to display the frequency of every word in the sentence. For instance, hello = 1 world = 2 how = 1 are: 1 you = 1 today = 1 Its = 1 a = 1 beautiful = 1

Q8) Implement a class ComboLock that works like the combination lock in a gym locker, as shown here. The lock is constructed with a combination—of three numbers between 0 and 39. The reset method resets the dial so that it points to 0. The turnLeft and turnRight methods turn the dial by a given number of ticks to the left or right. The open method attempts to open the lock. The lock opens if the user first turns it right to the first number in the combination, then left to the second, and then right to the third. **30**

```
class ComboLock :
 ComboLock( int secret1, int secret2, int, secret3)
void reset() ;
void  turnLeft(ticks) ;
 . . .
void turnRight( ticks) ;
 . . .
 bool open() ;
```