Department of Electrical & Software Engineering
University of Calgary
ENSF 614
Lab 4, Fall 2023

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Notes:

- This is a group assignment, and you can work with a partner.

Due Date: Wed Oct 18, before 11:59 PM

This is a very shorter lab assignment compared to the other labs, and we have a shorter due date.

Marking scheme

- Exercise A 4 marks
- Exercise B 4 marks

Exercise A: Using C++ library classes, `vector` and `string`

The objective of this exercise is to gain some experience in understanding the C++ library classes, `vector`, and `string`.

What to Do:

Download the files `lab4ExA.cpp` from D2L. In this file there is a declaration of `vector <string>`. If you compile and run this program it creates the following output:

```
ABCD
EFGH
IJKL
MNOP
QRST
```

Let's visualize this output as a matrix of letters (5 rows and 4 columns):

A	B	C	D
E	F	G	H
I	J	K	L
M	N	O	P
Q	R	S	T

Your job is to complete the definition of the function called `transpose` that creates a new object of `vector<string>` where its strings are the transpose of the original vector:

A	E	I	M	Q
B	F	J	N	R
C	G	K	O	S
D	H	L	P	T

To test your program, you can change the values of the constants `ROWS` and `COLS`, in the `main` function to make sure your function works with other sizes of the `String_Vector`.

What to Submit:

Submit the definition of your function transpose and the program's output.

Exercise B: C++ File I/O

The objective of this exercise is to help you understanding the basics of file I/O in C++.

What to Do:

Download the files `lab4ExB.cpp` from D2L. If you read this file carefully you will realize that this simple C++ program creates a binary file (for example: `cities.bin`), that contain several records of type `struct City`. Each record has two double types represent x and y coordinates of a city on Cartesian Plan, followed by the name of the city, which is stored as a C-string in an array of characters with 30 elements. The program has several functions, the implementation of one of them, called `print_from_binary`, is missing. Your task will be to write the definition of the missing function. This function is supposed to read the content of the binary file created by the program, and display the its content (records both on the screen and into a text file, using in the following format: `Name: Calgary, x coordinate: 100, y coordinate: 50`

Here is the functions prototype and interface comment:

```
void print_from_binary(char* filename);
/* PROMISES: uses ifstream library object to open the binary file named
 * "filename", reads the content of the file which are objects of struct City
 * (one record at a time), and displays them on the screen. It also saves the records
 * into a text-file that its name must be filename argument, but with the extension of .txt
 */
```

What to Submit:

Submit the definition of your function `print_from_binary` and the content of the generated text file, as part of your lab report in PDF format.