Final Assignment

CSE 115L, Section: 30

Total Marks: 40

Deadline: 04 – 06 –2020

Instructions:

Read the following instructions very carefully. Failure to comply any of them will result in mark deduction and in severe case may lead to rejection of your submission.

i. You must make sure that your code file is named after the problem you are solving. For example: if you are solving problem number 5, name your code file as such "problem_5.c". If problem number 5 has a bonus question and you are solving that, you may use "problem_5_bonus.c".

ii. Before solving bonus problem, you must solve the original problem that the bonus problem is part of. For example: if problem 5 has a bonus part, you must solve problem 5 before solving its bonus part. If you do not, you will get marks for none of them.

iii. After you have solved all the problems and you must create a folder and rename it to your ID. For example: if your NSU ID is: 171 2980 042, your folder name should be the same, "1712980042". Move all your code files inside that folder and then zip it. Your zipped file should be named as "1712980042.zip".

iv. Now that you are done with this, go to google classroom and submit the zip file.

v. You may unsubmit and resubmit it as many times as you want before the deadline. After the deadline is over, if you unsubmit, your assignment will not be graded.

vi. You may take help from any and all internet resource available to you. But if any part of your code is found to be plagiarized, your whole submission will be rejected. So **DO NOT PLAGIARIZE.**

1. Write a program that can determine the frequency of each element in an array. (1d array) (5)
For example: if the array is: **int arr[] = {3,7,7,1,7,3,1,5,7}**, your program should print the following.

Frequency of 3: 2
Frequency of 7: 4
Frequency of 1: 2
Frequency of 5: 1

Note: You are not allowed to use any 2-d array. However, you are allowed to use as many 1d array as you need.

For a bonus of 2 marks: Can you solve this with 2-d array as well?

2. Write a program that takes an integer **n** as input and creates a reversed pyramid pattern using asterisks. Your program should store this pattern in a two-dimensional array and finally print the array to display the pattern. (2d array) (5)

For example, if **n = 5**, resulting two-dimensional array should look like this:

*	*	*	*	*	*	*	*	*
	*	*	*	*	*	*	*	
		*	*	*	*	*		
			*	*	*			
				*				

3. Write a program to find the nth term of the following sequence recursively where n is an input from the user. (4)

$$\frac{7}{16}, \frac{3}{8}, \frac{5}{16}, \frac{1}{4}, \ldots..$$

4. Calculate and print the result of summation series of the same sequence up to nth term where n is an input from the user. (4)

5. Consider a kindergarten school where in the nursery class, 10 students are enrolled. All of them must take 3 subjects; English, Bengali and Math. The student with the highest total mark in the exam is considered the best student. Write a program that allows their teacher to input 10 students' information which include their name, roll number and their marks in the individual subjects and determines the best student. (6)

As for the output, it should display the name, roll number and total mark of the best student.

6. Write a function that takes a number as a string and returns it as an integer. (4)

For example:

```
char input[] = "1234";

int output = convert(input);        // lets assume that you named your function convert

printf("%d", output);      // this should display 1234
```

7. a) Declare a datatype called "Point" using structure that can be used to represent points (by their x and y coordinates) in a cartesian coordinate system. (2)

b) Write a program that reads in a list of points (given by their x and y coordinates) and determines the pair that is the farthest apart and prints coordinate of the points of the pair. (3)

8. Bangladesh Army is looking for a secure way to encrypt secret messages and their mathematician has come up with a nice solution. Instead of sending the message in simple text, he reversed the whole string and converted the characters to their ascii value. To make it even harder, he put a white space between every two numbers. (7)

Your job is to write a program that can do the encryption. Your program should take a string as input, encrypt the string and print the output.

Sample input:
HELLO
Output:
79 76 76 69 72

Notes:
You may assume that the actual message has no white space in it. It may contain only capital letters.

You may use any library function from <string.h>.

For a bonus of 5 marks: Can you write a program to decrypt the message as well?