System Programming 2021
Assignment 1

Instructions for Submission:

1. This is an individual assignment of 20 marks.
2. The submission should be a single zipped folder with the naming convention - *A1_Lastname_Firstname.zip, e.g., A1_Doe_Jane.zip*
3. The submission will consist of the following files -
    a. Code files wherever required. Naming convention to be followed is *Q1_A1.c, Q2_A1.c..and so on*
    b. One pdf document containing solutions of all questions. Naming convention to be followed is *A1_Report.pdf*
4. The files need to be well commented and explanations of each command with the options used need to be written

QUES1: Write a bash script which displays the Factorial of a number **N** on the monitor.
[4 marks]

QUES2: Given 2 arrays of integers, use C and pthread to write a parallel program to find the common elements. Assume the entire arrays are stored initially in one location and distributed to the different threads for parallel processing.
[4 marks]

QUES3: Write a program to find the count of entered numbers in parent process, sum of even numbers in child process 1 and sum of odd numbers in child process 2.
The order of execution should be :

a. **[2 marks]** Sum of even numbers
Count
Sum of odd numbers

b. **[2 marks]** Sum of odd numbers
Sum of even numbers
Count

QUES4: Enter the program listed below:

```
1] #include<iostream>
2] using namespace std;
3] int func(int);
```

```
4] const int X = 5;
5] int main(){
6] cout << "Program is starting.\n";
7] int result;
8] int X = 10;
9] cout << "In the middle of the program.\n";
10] result = func(X);
11] cout << "The result is " << result << ".\n";
12] }
13] int func(int y){
14] int answer;
15] cout << "In the function.\n";
16] answer = y;
17] answer += X;
18] int X = 20;
19] cout << "In the middle of the function.\n";
20] answer += X;
21] cout << "The function is exiting.\n";
22] return answer;
23] }
```

i) Hand simulate the program. Using the table given below, record the values of the variables X, result, answer, and y at the following lines in the program: 6,9,11,15,19,21. For some lines, some variables will not be defined, record that information instead of the variable's value.

Line Number	X	Result	Answer	Y
6				
9				
11				
15				
19				
21				

[3 marks]

ii) Using gdb and the break, step, and print variable commands record the values of the variables X, result, answer, and y at the following lines in the program: 6,9,11,15,19,21 in a different table. For some of these lines, you will get an error because the variable doesn't exist within the scope of that line. Do not go back and change the values in your first table. **[2 marks]**

iii) Answer the following questions:

1. On line 9, what is the value of the result and where did it come from? If you run the program several times, does the value of result at line 9 ever change?
2. What are the values printed for X on lines 9 and 15? Why are the printed values of X different?
3. Compare the values in Table your first and second tables? Were they different at any of the lines? If so, explain the mistake you made during the hand simulation.

[3 marks]