CSC 256 - Machine Structures
Project 3

Total Points: 60 Points

Description

For project three, your objective is to convert the given C++ code into MIPS assembly. Please do not modify the C++ code itself. You are only allowed to make modifications to the assembly file. Start writing your code below the main: label and above the exit: label. For this project stay BETWEEN these labels.

When doing a C++ to MIPS conversion, it can be done in the following steps:

1 Assign variables to registers. When inspecting code, any constant values in if-statements or expressions may need to be assigned to temporary registers.

2 Initialize variables to registers. (actually put the values into the registers.)

3 Then move onto the rest of the code.

Before you begin, please make sure you click the link on ilearn to create your GitHub repo. After created please clone this repo with the *git clone repo_url* command.

Expected Output:

```
Value of a: 25
Value of b: 31
Value of c: 18
Value of d: 49
```

Submission

When you have completed the assignment please commit all work done to your private repository. This can be done with the following commands:

```
git add .
git commit -m "some message"
git push
```

Base MIPS Code

```
    .data
        endl:    .asciiz  "\n"   # used for cout << endl;
        albl:    .asciiz  "Value of a: " # label for a
        blbl:    .asciiz  "Value of b: " # label for b
        clbl:    .asciiz  "Value of c: " # label for c
        dlbl:    .asciiz  "Value of d: " # label for d
    .text

# a --> $s0
# b --> $s1
# c --> $s2
# d --> $s3
main:


exit:
    la   $a0, albl      # puts albl into arg0 (a0 register) for cout
    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a string
    syscall             # make a syscall to system

    move $a0, $s0       # puts a into arg0 (a0 register) for cout
    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
    syscall             # make a syscall to system

    la   $a0, endl      # puts the address of the string endl into a0
    addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
    syscall

    la   $a0, blbl      # puts blbl into arg0 (a0 register) for cout
    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing an string
    syscall             # make a syscall to system

    move $a0, $s1       # puts b into arg0 (a0 register) for cout
    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
    syscall             # make a syscall to system

    la   $a0, endl      # puts the address of the string endl into a0
    addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
    syscall

    la   $a0, clbl      # puts clbl into arg0 (a0 register) for cout
    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a string
    syscall             # make a syscall to system

    move $a0, $s2       # puts c into arg0 (a0 register) for cout
    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
    syscall             # make a syscall to system

    la   $a0, endl      # puts the address of the string endl into a0
```

```
50      addi $v0, $0, 4      # puts 4 into v0 saying we are printing a string
51      syscall
52
53      la   $a0, dlbl       # puts dlbl into arg0 (a0 register) for cout
54      addi $v0, $0, 4      # puts 4 in v0 which denotes we are printing a string
55      syscall              # make a syscall to system
56
57      move $a0, $s3        # puts d into arg0 (a0 register) for cout
58      addi $v0, $0, 1      # puts 1 in v0 to denote we are printing an int
59      syscall              # make a syscall to system
60
61      la   $a0, endl       # puts the address of the string endl into a0
62      addi $v0, $0, 4      # puts 4 into v0 saying we are printing a string
63      syscall
64
65      addi $v0,$0, 10
66      syscall
```

p3codeBase.s

C++ Equivalent

```cpp
#include <iostream>

using namespace std;



int main(void)
{

    int a = 5;
    int b = 6;
    int c = 7;
    int d;

    d = -1;

    if ( a < 10){
        a++;
    }else{
        a--;
    }

    d = a + c;
    c = a + d;

    if( b < 10 ) {
        b++;
        c--;
    }else{
        b--;
        c++;
    }

    a = c + b;
    b = c + d;

    if(b < c && b > a){
        d = a + b;
    }else if (b > c || c < a){
        d = b + c;
    }

    cout << "Value of a: " << a << endl;
    cout << "Value of b: " << b << endl;
    cout << "Value of c: " << c << endl;
    cout << "Value of d: " << d << endl;
    return 0;
}
```

p3code.cpp