CSC 256 - Machine Structures
Project 4

Assigned : March 13th, 2017
Due : March 21st, 2017 @ midnight
Total Points: 90 Points

Description For project four, 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 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.

Expected Output:

```
Sum: 5050
Reversed Number: 98654
is Palindrome: 1
```

Submission
When you have completed the assignment please upload your .s file to ilearn. PLEASE DO NOT UPLOAD ANY OTHER TYPE OF FILE.

Base MIPS Code

```
.data
    endl:     .asciiz  "\n"   # used for cout << endl;
    sumlbl:     .asciiz  "Sum: " # label for sum
    revlbl:     .asciiz  "Reversed Number: " # label for rev
    pallbl:     .asciiz  "Is Palindrome: " # label for isPalindrome
    arr:        .word 1
                .word 2
                .word 3
                .word 4
                .word 5
                .word 4
                .word 3
                .word 2
                .word 1
.text

# sum             --> $s0
# rev             --> $s1
# num             --> $s2
# isPalindrome    --> $s3
# address of arr  --> $s4
# i               --> $s5
# beg             --> $s6
# end             --> $s7
# d               --> $t0
# 10              --> $t1
# 100             --> $t3
main:

exit:
  la   $a0, sumlbl    # puts sumlbl 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 sum 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, revlbl    # puts revlbl 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 rev into arg0 (a0 register) for cout
  addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
```

```
49    syscall             # make a syscall to system
50
51    la    $a0, endl     # puts the address of the string endl into a0
52    addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
53    syscall
54
55    la    $a0, pallbl   # puts pallbl into arg0 (a0 register) for cout
56    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a
          string
57    syscall             # make a syscall to system
58
59    move $a0, $s3       # puts isPalindrome into arg0 (a0 register) for
          cout
60    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
61    syscall             # make a syscall to system
62
63    la    $a0, endl     # puts the address of the string endl into a0
64    addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
65    syscall
66
67
68    addi $v0,$0, 10
69    syscall
```

p4codeBase.s

C++ Equivalent

```cpp
#include <iostream>

using namespace std;



int main(void)
{

    int sum = 0;
    for(int i = 1; i <= 100; i++){
        sum = sum + i;
    }

    int num = 45689;
    int rev = 0;
    int d = -1;
    while( num > 0){
        d = num % 10;
        rev = rev*10 + d;
        num = num / 10;
    }

    int arr[] = {1,2,3,4,5,4,3,2,1};
    int beg = 0;
    int end = 8;
    int isPalindrome = 1;
    while(beg < end){
        if (arr[beg] != arr[end]){
            isPalindrome = -1;
            break;
        }
        beg++;
        end--;

    }


    cout << "Sum: " << sum << endl;
    cout << "Reversed Number: " << rev << endl;
    cout << "Is Palindrome: " << isPalindrome << endl;
    return 0;
}
```

p4code.cpp