CS 351
COMPUTER ARCHITECTURE
Fall 2019

ASSIGNMENT 1

Due Date: *Wednesday, November 13th, 2019, 23:59*

Assignment Submission: *Turn in your assignment by the due date through LMS.* ***No late submissions will be accepted.*** *For each question, you should create a file and name the file as answer<queston number>.asm. Put all files under a folder (name the folder as <your first name>_<your last name>_ assignment1). Zip this folder and upload the zip file to LMS. Name the zip file as <your first name>_<your last name>_ assignment1.*

All work in the questions must be your own; you must neither copy from nor provide assistance to anybody else. If you need guidance for any question, talk to the instructor or teaching assistant.

In this assignment, you will write and simulate MIPS assembly code to solve various problems. You are going to use MARS MIPS simulator. Please download and install MARS version 4.5 from the following link:

http://courses.missouristate.edu/KenVollmar/MARS/

In order to run your code, you should first assemble it via clicking Run→Assemble (or press F3) then you can run by clicking this symbol  in the toolbar.

Note: In this assignment, you CANNOT use any MIPS instructions that we didn't cover in the lectures. Also, DO NOT use pseudo-instructions such as blt

QUESTION 1 (30 points)

You are given the following Python code. Please write the corresponding MIPS assembly code. In your MIPS code, hold the value of the variable ***x*** in register ***$t0***, the value of the variable ***y*** in register ***$t1*** and the value of the variable ***sum*** *in at* ***$s0***.

```
sum = 0
for x in range(1, 10, 2):
        y=0
        while y <= x:
                sum += y
                y += 1
```

QUESTION 2 (30 points)

Assume that a list ***A*** (array ***A***) of integer numbers (each integer is 4-bytes) have been stored in memory (in consecutive memory locations). MIPS register ***$s0*** holds the base address of this list and register ***$s1*** stores the size of the array. Please write a MIPS assembly code that finds the difference of farthest pair (difference between maximum and minimum elements in the list) of the list.

In your MIPS code, hold the value of the difference of farthest pair (max-min) in register $s2. Hold the values of maximum and minimum elements of the list in register $t0 and $t1, respectively.

Note: For this question, start with the code (***answer2.asm***) that has been provided to you with the assignment. This code defines a list, stores the base address of the list to the register ***$s0*** and the size of the list to the register ***$s1***. The values of list A in this code are given as examples. Your code should work for any list of integers. If the size of the list is changed, the value of ***$s1*** needs to be updated manually.

QUESTION 3 (40 points)

Assume that a list ***A*** (array ***A***) of integer numbers (each integer is 4-bytes) have been stored in memory (in consecutive memory locations). MIPS register ***$s0*** holds the base address of this list and register ***$s1*** stores the size of the array. Please write a MIPS assembly code that **reverses** the list.

For Example:

If the original list is [1, 2, 3, 4, 5, 6, 7, 8],

It should be converted to [8, 7, 6, 5, 4, 3, 2, 1]

Note: For this question, start with the code (***answer3.asm***) that has been provided to you with the assignment. This code defines a list, stores the base address of the list to the register ***$s0*** and the size of the list to the register ***$s1***. The values of list A in this code are given as examples. Your code should work for any list of integers. If the size of the list is changed, the value of ***$s1*** needs to be updated manually.