

## CSE 2304 Lab 2

2/15/2016

Due: 11:59PM, Sun 2/28/2016

In this lab you will learn several addressing modes in MIPS. You will learn how to read data from and write data to memory. Also you will learn basic control flow instructions (branches).

**Problem 1 – In class:** Here you will learn how to store data in memory, retrieve data from memory and use basic flow control instructions. The program below accepts 10 integer inputs, store them in consecutive memory. Then these numbers are read from memory and their sum is displayed in the screen. Note the use of “.space” directive that reserves a chunk of  $10 * 4 = 40$  bytes of memory space.

```
# Lab Assignment 2
.data # Data declaration section
strInMsg: .asciiz "Please Enter An Integer:"
strOut: .asciiz "The sum is: "

.align 2 #Make sure that our input data is well aligned
memAddr: .space 40 #Reserved storage of 40 bytes, to store 10 integers (4 bytes
each)

.text # Start of code section
main:
    la $t0, memAddr
    add $t3, $zero, $zero #Initialize $t0 to zero
    add $t1, $zero, 10 #Initialize $t1 to ten. This will be our counter

    #read Integers.
loop:    la $a0, strInMsg
        add $v0, $zero, 4
        syscall

        add $v0, $zero, 5
        syscall
        sw $v0, 0($t0)
        add $t0, $t0, 4

        sub $t1, $t1, 1
        bgtz $t1, loop

loopadd:
    sub $t0, $t0, 4
    lw $t2, 0($t0)
    add $t3, $t3, $t2

    add $t1, $t1, 1
    blt $t1, 10, loopadd

    la $a0, strOut
    li $v0, 4
    syscall

    li $v0, 1
    add $a0, $zero, $t3
    syscall

end:    li $v0, 10
        syscall
# END OF PROGRAM
```

**Problem 2 (30 pts):**

Write a MIPS program that converts from Fahrenheit to Centigrade, and vice-versa. Specifically, your program should prompt the user for a temperature (an integer), then print out that value converted from F to C, and from C to F.

What it looks like on screen, supposing I want to convert from 100:

```
Enter a number to convert: 100
```

```
Converting the number 100
```

```
C to F is 212
```

```
F to C is 37
```

**Problem 3 (30 pts):**

Modify your program from Problem 2 to do the same conversion, only you will read in a temperature that is identified as F or C, and the result will be in the appropriate scale. As before, the numbers should be integers

```
Enter a number to convert: 100
```

```
Enter the Temperature: C
```

```
100 C is the same as 212 F
```

**Problem 4 (40 pts):**

Write a MIPS program similar to the one above that reads 10 number inputs (integers only), store them in consecutive memory location, and display to the console their sum, mean, maximum, minimum, the number of zeros, positive, and negative numbers. For instance, if your input is: -2, -3, -4, -1, 0, 1, 2, 3, 4, 5; the output should be:

```
Sum of ten numbers: 5
```

```
Maximum: 5
```

```
Minimum: -4
```

```
Mean: 0.5
```

```
Number of Negative numbers: 4
```

```
Number of Zeros: 1
```

```
Number of Positive Numbers: 5
```

**Deliverables:** You are expected to complete Problem 2, 3, and 4 alone and submit both a softcopy of your MIPS source code and a one-page report discussing your design and implementation, any difficulties you have encountered to complete this lab, and what you think you have learned. In your MIPS code, write your name, class and section number in the first lines as comments. All of your source code files should be saved either as a .s file or .asm file. All files should be zipped into one. The zipped file should be named in the format: Firstname\_Lastname\_Lab#.zip.

**Note:** You should be ready to demo your program in lab. No late submission will be accepted.