Name: Id#

COE 301/ICS 233, Term 172

Computer Architecture & Assembly Language

Quiz# 4 Solution

Date: Sunday, March 11, 2018

# Implement the following two procedures using MIPS assembly language. Use MIPS programing convention in saving registers.

## A procedure, RSum, that computes the sum of a given row. Assume that the procedure receives as parameters the address of the array in register $a0, the number of columns in register $a1, and the index of the row to be summed in register $a2. The procedure should return the sum of the row in register $v0.

RSum:

xor $v0, $v0, $v0 # sum=0

xor $t0, $t0, $t0 # i=0

# Computing starting address of row

mul $t1, $a1, $a2

sll $t1, $t1, 2

add $t1, $t1, $a0 #t2 = starting address of row $a2

Loop:

lw $t2, ($t1)

add $v0, $v0, $t2 # adding column elements

addi $t1, $t1,4 # incrementing to next column element

addi $t0, $t0, 1 # i = i + 1

bne $t0, $a1, Loop

jr $ra

## A procedure, ArrayRowSum, that displays the sums of all rows in the array based on using RSum procedure. Assume that the procedure receives as parameters the address of the array in register $a0, the number of rows in register $a1, and the number of columns in register $a2. Each row sum should be printed in a new line. To print an integer in register $a0, use syscall with $v0=1. To print a character in $a0, use syscall with $v0=11.

ArrayRowSum:

addi $sp, $sp, -20 # allocate memory on stack

sw $ra, ($sp) # save $ra

sw $s0, 4($sp) # saving needed registers

sw $s1, 8($sp)

sw $s2, 12($sp)

sw $s3, 16($sp)

move $s0, $a0 # Array address

move $s1, $a1 # Number of rows

move $s2, $a2 # Number of colums

xor $s3, $s3, $s3 # i = 0

Loop2:

move $a0, $s0

move $a1, $s2

move $a2, $s3

jal RSum

move $a0, $v0

li $v0, 1 # print row sum

syscall

li $a0, '\n' # print new line

li $v0, 11

syscall

addi $s3, $s3, 1

bne $s3 $s1, Loop2

lw $ra, ($sp) # restore $ra

lw $s0, 4($sp) # restore saved registers

lw $s1, 8($sp)

lw $s2, 12($sp)

lw $s3, 16($sp)

addi $sp, $sp, 20 #free memory from stack

jr $ra