Name: Id#

COE 301/ICS 233, Term 171

Computer Architecture & Assembly Language

Quiz# 2 Solution

Date: Tuesday, Oct. 31, 2017

## **Q1.** Determine the output produced by the following program given that the program inputs are 7 and 4. Needed syscall services are given below.

|  |  |  |
| --- | --- | --- |
| Service | $v0 | Arguments / Result |
| Print Integer | 1 | $a0 = integer value to print |
| Read Integer | 5 | $v0 = integer read |
| Exit Program | 10 |  |

.text

.globl main

main:

li $v0, 5

syscall

move $t0, $v0

li $v0, 5

syscall

move $a1, 5

move $a0, 7

jal Proc1

move $a0, $v0

li $v0, 1

syscall

li $v0, 10

syscall

Proc1:

bne $a0, $a1, Skip

move $v0, $a0

jr $ra

Skip:

addi $sp, $sp, -8

sw $a0, ($sp)

sw $ra, 4($sp)

addi $a0, $a0, -1

jal Proc1

lw $t0, ($sp)

lw $ra, 4($sp)

addi $sp, $sp, 8

add $v0, $v0, $t0

jr $ra

# The program computes 7+6+5+4=22 and then displays it.

# **Q2.** Assuming that functions F and G receive two integer arguments in $a0 and $a1 and return their results in $v0, implement the function F given below saving needed registers on the stack. Save changed registers according to the assumed programming convention:

int F(int a, int b) {

return G(2a,b)+G(a,2b);

}

F: addiu $sp, $sp, -16 # frame = 16 bytes

sw $ra, 0($sp) # save $ra

sw $a0, 4($sp) # save argument a

sw $a1, 8($sp) # save argument b

sll $a0, $a0, 1 # $a0 = 2\*$a0

jal G # call G(2a,b)

sw $v0, 12($sp) # save result of call G(2a,b)

lw $a0, 4($sp) # $a0 = a

lw $a1, 8($sp) # $a0 = b

sll $a1, $a1, 1 #$a1 = 2\*$a1

jal G # call G(a,2b)

lw $v1, 12($sp) # restore result of call G(2a,b)

addu $v0, $v0, $v1 # $v0 = G(2a,b)+G(a,2b)

lw $ra, 0($sp) # restore $ra

addiu $sp, $sp, 16 # free stack frame

jr $ra