## COMP 122/L

Summer 2023

## Introduction to MIPS Assembly (Answers)

1.) What values (in decimal) will be in registers $\$ \mathrm{t0}, \$ \mathrm{t} 1$, and $\$ \mathrm{t} 2$ after this program executes?
li \$t0, 3
li \$t1, 4
addu $\$$ t2, $\$ \mathrm{t} 0, \$ \mathrm{t} 1$
\$t0: 3, \$t1: 4, \$t2: 7
2.) What values (in decimal) will be in registers $\$ \mathrm{t} 0$ and $\$ \mathrm{t} 1$ after this program executes?
li \$t0, 6
li \$t1, 4
subu \$t0, \$t0, \$t1
\$t0: 2, \$t1: 4
3.) What values (in decimal) will be in registers $\$ \mathrm{t0}, \mathrm{\$ t} 1$, and $\$ \mathrm{t} 2$ after this program executes?
li \$t0, 3
li \$t1, 4
move \$t2, \$t0
move \$t0, \$t1
move \$t1, \$t2
\$t0: 4, \$t1: 3, \$t2: 3
4.) What value (in signed decimal) will be in register $\$ \mathrm{t} 0$ after this program executes?
li \$t0, 7
nor \$t0, \$zero, \$t0
addiu \$t0, \$t0, 1
Note: this question originally just said "in decimal", which is ambiguous. The original answer posted also wasn't correct. Here is the follow through:
li \$t0, 7: \$t0 now holds 28 0s, followed by 0111 (7)
nor \$t0, \$zero, \$t0: effectively \$t0 = ~(\$zero I \$t0); (28 0s) 0000 I (28 0s) $0111=(280 \mathrm{~s}$ 0111), ~(28 0s) $0111=(281 \mathrm{~s}) 1000$

The following add yields (28 1s) 1001. This, in twos-complement, is -7 . Overall, the question does a binary negation of the number is $\$ t 0$, and then adds 1 , which is how integer negation is performed.
5.) What values (in decimal) will be in registers $\$ \mathrm{t0}, \$ \mathrm{t} 1$, and $\$ \mathrm{t} 2$ after this program executes?
li \$t0, 2
li \$t1, 7
multu \$t0, \$t1
mflo \$t2
\$t0: 2, \$t1: 7, \$t2: 14
6.) What values (in decimal) will be in registers $\$ \mathrm{t} 0, \$ \mathrm{t} 1$, and $\$ \mathrm{t} 2$ after this program executes?
li \$t0, 24
li \$t1, 3
divu \$t0, \$t1
mflo \$t2
\$t0: 24, \$t1: 3, \$t2: 8
7.) What will the following program print, if run with SPIM?
li \$a0, 12
li $\$ \mathrm{v} 0,1$
syscall
12
8.) What value (in decimal) will be in register $\$$ t0 after this program executes?
li \$t0, 7
ori \$t0, \$t0, 8
\$t0: $15(7=0111,8=1000$, OR yields $1111=15)$
9.) What value (in decimal) will be in register $\$ \mathrm{t} 0$ after this program executes?
li \$t0, 7
andi $\$ \mathrm{t} 0, \$ \mathrm{t} 0,8$
\$t0: $0(7=0111,8=1000$, AND yields $0000=0)$
10.) What value (in decimal) will be in register $\$ \mathrm{t} 0$ after this program executes?
li \$t0, 7
xori \$t0, \$t0, 9
\$t0: 14 (7 = 0111, $9=1001$, XOR yields $1110=14$ )
11.) What value (in decimal) will be in register $\$ t 0$ after this program executes?
li \$t0, 7
xori \$t0, \$t0, 15
\$t0: $8(7=0111,15=1111$, XOR yields $1000=8)$
12.) What does the following program print, if run with SPIM?
li \$a0, 3
li \$v0, 1
syscall
li \$a0, ' n '
li \$v0, 11
syscall
li \$a0, 7
li $\$ \mathrm{v} 0,1$
syscall

3
7
13.) What does the following program print, if run with SPIM?
li \$a0, 4
li $\$ v 0,1$
syscall
li \$a0, 8
li \$v0, 1
syscall
48
14.) What does the following program print, if run with SPIM?
.data
foo:
.asciiz "Some string\n"
bar:
.asciiz "Some other stringln"
main:
la \$a0, foo
li \$v0, 4
syscall
li \$v0, 10
syscall
Some string
15.) What does the following program print, if run with SPIM?
.data
foo:
.ascii "alpha"
bar:
.asciiz "beta"
main:
la \$a0, foo
li \$v0, 4
syscall
li \$v0, 10
syscall
alphabeta
16.) What does the following program print, if run with SPIM, and 13 is input by the user?
li \$v0, 5
syscall
addiu \$a0, \$v0, 7
li \$v0, 1
syscall
20

