

Name:

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**ICS 233, Term 141**

**Computer Architecture & Assembly Language**

**Quiz# 2**

Date: Sunday, Oct. 26, 2014

**Q1.** Fill in the blank in each of the following questions:

(1) Assuming variable Array is defined as shown below:

Array: .byte 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

The content of register \$t0 after executing the following sequence of instructions is \_\_\_\_\_.

```
la $t0, Array
lw $t0, 4($t0)
```

(2) Assume that the instruction `j NEXT` is at address `0x00400030` in the text segment, and the label `NEXT` is at address `0x004000a8`. Then, the address stored in the assembled instruction for the label `NEXT` is \_\_\_\_\_.

(3) Assume that the instruction `bne $t0, $t1, NEXT` is at address `0x00400030` in the text segment, and the label `NEXT` is at address `0x004000a8`. Then, the address stored in the assembled instruction for the label `NEXT` is \_\_\_\_\_.

(4) Assuming that `$a0` contains an Alphabetic character, the instruction \_\_\_\_\_ will guarantee that the character in `$a0` is always an upper case character. Note that the ASCII code of character 'A' is `0x41` while that of character 'a' is `0x61`.

**Q2.** Using only basic MIPS instructions, write the shortest sequence of instructions to implement each of the following pseudo instructions:

1. `xori $t0, 0x12345678` # \$t0 is xored with the 32-bit value 0x12345678
2. `ble $t0, $t1, Next` # branch to Next if \$t0 is less than or equal to \$t1
3. `bgt $t0, 100, Next` # branch to Next if \$t0 is greater than 100
4. `neg $t0, $t1` # \$t0 is loaded with the negative value of \$t1
5. `rol $t0, $t0, 12` # \$t0 is rotated to the left by 12 bits and stored in \$t0

**Q3. Answer the following questions. Show how you obtained your answer:**

- i. Determine the content of register **\$s1** after executing the following code:

```
ori $s1, $zero, 12
sll $t0, $s1, 3
sub $t0, $t0, $s1
sra $t1, $s1, 2
add $s1, $t0, $t1
```

- ii. Determine the content of register **\$t2** after executing the following code:

```
li $s1, 0x5A
and $t2, $zero, $t2
```

Next:

```
andi $t1, $s1, 1
add $t2, $t2, $t1
srl $s1, $s1, 1
bne $s1, $0, Next
```

- iii. Given that **TABLE** is defined as: **TABLE: .word 7, 10, -4, 5, 20, 13**

Determine the content of registers **\$t2** after executing the following code:

```
la    $t0, TABLE
li    $t1, 6
lw    $t2, ($t0)
loop: addi $t0, $t0, 4
      lw    $t3, ($t0)
      bge  $t3, $t2, skip
      move $t2, $t3
skip: addi $t1, $t1, -1
      bne  $t1, $0, loop
```