0907335 Computer Organization (Fall 2012)
Quiz 1

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Instructions: Time **20** minutes. Open books and notes. No calculators or mobile phones. **No questions are allowed**. Show your work clearly.

Q1. A processor executes a program consisting of 10^9 instructions in 2.0 seconds. What is the average clock per instruction of this program if the processor runs on a 2.0-GHz clock?

<2 points>

CPI = (CPU Time * Clock Rate) / Instruction Count

$= 2.0 * 2.0*10^9 / 10^9$

= 4.0 cycles per instruction

Q2. For the following C statement, what is the corresponding MIPS assembly code? Assume that all variables are one-word signed integers. Also assume that the compiler maps Variable A to Register $s0 and maps the starting addresses of Arrays B and C to Registers $s1 and $s2, respectively.

<3 points>

```
C[4] = A + B[5];
```

```
lw  $t0, 20($s1)
add $t1, $s0, $t0
sw  $t1, 16($s2)
```

Q3. Translate the following MIPS instruction to machine code. First, specify the fields of the instruction word then convert the word to a 32-bit binary number.

<2 points>

```
        addi $t0, $s0, -2
```

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addi : rs: rt : const
</div>

8 : 16: 8: -2
(001000 : 10000 : 01000 :1111111111111110)$_2$

Q4. Convert the following C function to MIPS assembly code.

<3 points>

```
    int Zero(int x) {
        if (x == 0)
            return 1;
        else
            return 0;
    }
```

Zero: bne $s0, $zero, else
**   addi $v0, $zero, 1**
**   jr $ra**
else: addi $v0, $zero, 0
**   jr $ra**

<Good Luck>