0907335 Computer Organization (Fall 2014)

Quiz 1

الاسم: رقم التسجيل: الرقم التسلسلي:

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Instructions: Time **20** minutes. Open book and notes exam. No electronics. Please answer all problems in the space provided and limit your answer to the space provided. **No questions are allowed**.

<Good Luck>

Q1. At what clock rate a processor runs if it executes a program consisting of 10^9 instructions in 4.0 seconds? Assume that this processor takes an average two cycles to execute each instruction.

<2 points>

Clock Rate = Instruction Count × CPI / CPU Time

= 10^9 × 2 / 4.0

= 0.5 GHz

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 the starting addresses of Arrays `A` and `B` to Registers `$s0` and `$s1`, respectively.

<3 points>

```
A[0] = B[3] + 7;
```

```
lw   $t0, 12($s1)
addi $t1, $t0, 7
sw   $t1, 0($s0)
```

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. Note that the opcode of `beq` instruction is 4.

<2 points>

```
beq $s0, $s1, -5
```

beq :	rs:	rt :	const

4 : 16: 17: -5

$(000100 : 10000 : 10001 : 1111\ 1111\ 1111\ 1011)_2$

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

<3 points>

```
int Max(int x, int y) {
     if (x >= y)
          return x;
     else
          return y;
}
```

```
Max:  slt  $t0, $a0, $a1
      bne  $t0, $zero, else
      add  $v0, $a0, $zero
      jr   $ra
else: add  $v0, $a1, $zero
      jr   $ra
```