Chapter Exam

Chapter 2-instructions:language of the computer

2012/04/24

1. The following problem deal with translating from C to MIPS. Assume that the variables f, g, h, i, and j are assigned to registers $s0, $s1, $s2, $s3, and $s4, respectively. Assume that the base address of the arrays A and B are in registers $s6 and $s7, respectively

a.	f = g + B[4];
b.	f = g − A[B[4]];

For the C statements above, what is the corresponding MIPS assembly code? (You can use $t0~$t7 registers for temporal data.) (20%)

2. In the following problems, the data table contains bits that represent the opcode of an instruction. You will be asked to translate the entries the entries into assembly code and determine what format of MIPS instruction the bits represent.
[opcode: 000000 (R-formate), 001000(addi), 100011(lw), 101011(sw), 000010(jump); register: 01000~01111($t0~$t7), 10000~10111($s0~$s7)]

a.	1010 1110 0000 1011 0000 0000 0000 0100
b.	1000 1101 0000 1000 0000 0000 0100 0000

(1) For the binary entries above, what instruction do they represent? (16%)

(2) What type (R-type, I-type, J-type) instruction do the binary entries above represent? (4%)

3. Assume that both a. and b. are signed number.

a.	0x00001000
b.	0x20001400

(1) Suppose that register $t0 contains a value from above. What is the value of $t2 after the following instructions? (10%)

```
        slt    $t2, $t0, $t0
        bne    $t2, $zero, ELSE
        j      DONE
ELSE:   addi   $t2, $t2, 2
DONE:
```

(2) Suppose that register $t0 contains a value from above. What is the value of $t2 after the following instructions? (10%)

```
        sll  $t0, $t0, 2
        slt  $t2, $t0, $zero
```

4. The MIPS memory allocation has stack, dynamic data, static data and text segment, please explain that (20%)

5. Suppose we have a 32-bit computer with an instruction set that supports immediate instructions as shown below:

operand	Source Register	Destination Register	Immediate
6 bits	5 bits	5 bits	16 bits

(1) How many registers and operations at most does this computer have? (10%)

(2) What is the range of the number in the Immediate field in 2'complement format? (10%)