Rose-Hulman Institute of Technology
Computer Science and Software Engineering
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Homework 2
Instruction Formats and Addressing Modes
Max Points: 45 points

Directions

This assignment is due Tuesday, September 27 for all three sections. Submit your solutions on a separate sheet of paper. You may use SPIM and a calculator as required.

Learning Objectives

In the process of completing this homework assignment, students will develop their abilities to

- Explain the binary representation of various forms of data, including opcodes, registers, immediate values, and branch and jump target addresses.

Problems

1. [25 pts] Consider the MIPS code fragment on the following page (which doesn't do anything of any obvious practical value). Parts of several machine language instructions have been replaced by question marks. For each of those instructions except the first (and only those instructions), provide the following information:

   a. Address (assume that the address of the first instruction is 0x0040ffd8)
   b. Instruction format
   c. Name of each field and its value in either decimal or hexadecimal representation
   d. Addressing mode of each operand
   e. Complete machine language instruction in hexadecimal representation

   For example, for the first instruction

   a. The address is 0x0040ffd8.
   b. The format is I-type.
   c. The fields are opcode = 15, rs = 0, rt = 1, and immediate = 0x0fff.
   d. The addressing modes of $0, $1, and 0x0fff are register, register, and immediate, respectively.
   e. The complete machine language instruction is 0x3c010fff.

Line	Assembly Language Instruction	Machine Language Instruction(s)
1	li $t6, 0x0fffffec	0x3c01????
		0x342e????
2	move $t0, $a0	0x00044021
3	move $t1, $a1	0x00054821
4	li $t4, 0	0x340c0000
5	add $t4, $t4, 1	0x218c????
6	lw $t3, 0($t0)	0x8d0b0000
7	slt $t5, $t3, $zero	0x0160682a
8	LblTwo: beq $t3, $zero, LblOne	0x1160????
9	add $11, $11, $12	0x????????
10	sw $t3, -4($t1)	0xad2b????
11	add $t1, $t1, 4	0x21290004
12	j LblTwo	0x????????
13	LblOne:	

2. [20 pts] Exercise 2.52 (on the companion CD, follow the “In More Depth” link)