CS613 Spring 2012 – Some practice problems for Exam 1

Here are some problems from last term's Exam 1. These are similar to some of the types of problems you will see on Exam 1. There will also be short answer definitions and short discussion questions from the material that we covered in Chapter 1, Appendix B, and the review of ISAs.

1. A program executes in 10 sec on a particular computer. The computer's branch-processing subsystem is upgraded so that branch instructions execute twice as fast as before. After the upgrade, the original program runs in 8 sec. What fraction of the program's instructions is branch instructions?

2. You are evaluating two 'C' compilers, A and B, for your computer. You compile the same test program using each compiler. The compiled code from compiler A has an instruction count of 1000_{10} instructions, and average CPI of 2. The compiled code from compiler B has an instruction count of 1200_{10} instructions. When you run the two programs, you find that the CPU time for the two versions is equal. What is the average CPI for the code compiled with compiler B?

3. A data word is stored by a MIPS processor at memory address 1000_{10}. What the memory address of the least-significant byte of the data word?

4. Write a MIPS code segment for the 'C' statement:

   A = 5 + B[C]

   Assume that A is in $s0, the base address of B is in $s7, and the address of the memory variable C is in $t3.

5. Encode the MIPS instruction:

   addi $s1, $s2, -17_{16}

   Show the contents of each field in binary.

6. Encode the MIPS instruction:

   lw $s3, 65_{10}($t0)

   Show the contents of each field in hexadecimal.

7. Encode the MIPS instruction:

   bne $s1, $s2, L1

   where the label L1 refers to memory address 1000_{10} and the bne instruction is located at memory address 500_{10}. Show the contents of each field in binary.

8. Encode the MIPS instruction:

   j L2

   where the Jump instruction is located at address 12345678_{16} and the label L2 refers to address 76543210_{16}. Show the contents of each field in hexadecimal.