CS430 Problem Set #6

Date assigned: Monday, November 5, 2012
Date due: Monday, November 12, 2012
Points: 50

1) (4 pts) Explain what PC-relative addressing is and then work problem 13.4 part d on page 480.

2) (4 pts) Give an example of PC-relative addressing in the x86 world and in the MIPS world. Explain why your examples use PC-relative addressing.

3) (6 pts) Work problem 14.5 on p. 528. In answering parts a) and b) compute the speedup and give your answer as a % faster.

4) (8 pts) Work problem 14.9 on p. 528.

5) (8 pts) Work problem 14.10 on p. 528

6) (20 pts) Consider the following assembly language program for a winMIPS64 processor.

```
        .data
n:      .word 5
vals:   .word 0,1

        .text
main:   ld r1,vals(r0)
        ld r2,n(r0)
        ld r4,vals+8(r0)
        ld r5,vals(r0)
l1:     dadd r1,r1,r2
        dsub r2,r2,r4
        slti r3,r2,0
        beqz r3,l1
        halt
```

a) Give a general English description of what this program does. Do not describe each statement one at a time for your English description. That is, in general, what is the program doing?

b) Run this program through the winMIPS64 simulator and report on: a) the number of cycles this program takes to run and b) the CPI for this program

c) What is the machine language for the statement beqz r3,l1?

d) There are three different pieces of information for the machine language statement in c). Describe each of these pieces of information.

e) The MIPS branch instruction behaves differently than the x86 branch instruction. Using the machine language for the statement beqz r3,l1, explain how this instruction works. Further, how far forward and backward can this instruction branch? One possible resource is http://www.cs.ucr.edu/~junyang/teach/F04_203A/MIPS64manual.pdf

Note1: Please make sure your problem sets are typed, answered in order, and stapled together.

Note2: A hard copy of your Problem Set Solution is due on the instructor's desk by 11:45am on the day the assignment is due. Also, place a copy of this solution 06PUNetID.doc (or .pdf) in the CS430 Drop Box by 11:45am on the day in which the assignment is due.

Note3: I don't mind you talking about particular problems at a very high level (not a specific solution level) and even lending resources of where more information can be found. Further, all of your solutions are to be original and in your own words. If you have any questions, let me know.