CSCE 212: Quiz 3 **Spring 2009**

Name (please print):_____ **Total points: ___/40**

Instructions
This is a CLOSED BOOK and CLOSED NOTES quiz. However, you may use calculators, scratch paper, and the green MIPS reference card from your textbook. Ask the instructor if you have any questions. Good luck!

1. (10 points) Suppose one machine, A, executes a program with an average CPI of 2.1. Suppose another machine, B (with the same instruction set and an enhanced compiler), executes the same program with 25% less instructions and with a CPI of 1.8 at 800MHz. In order for the two machines to have the same performance, what does the clock rate of the first machine (machine A) need to be?

   $instructions_A * CPI_A * (1/clockrate_A) = instructions_B * CPI_B * (1/clockrate_B)$

   $instructions_A * 2.1 * (1/clockrate_A) = .75*instructions_A * 1.8 * (1/800x10^6)$

   $2.1 * (1/clockrate_A) = .75*1.8 * (1/800x10^6)$ ➔ *solve for* $clockrate_A$

2. (10 points) Use Amdahl's Law to compute the new execution time for an architecture that previously required 25 seconds to execute a program, where 15% of the instructions executed were load/stores, if the time required for a load/store operation is reduced by 40% (amount of improvement for load/stores = 1/.60 = 1.67).

   new time = (.15)*25/1.67 + (.85)*25

3. (10 points) Suppose a program has the following instruction classes, CPIs, and mixtures:

Instruction type	CPI	ratio
A	1.4	55%
B	2.4	15%
C	2	30%

   Your engineers give you the following options:

   Option A: Reduce the CPI of instruction type A to 1.1
   (.55)*1.1 + (.15)*2.4 + (.30)*2 = 1.565

   Option B: Reduce the CPI of instruction type B to 1.2
   (.55)*1.4 + (.15)*1.2 + (.30)*2 = 1.55

   Which option would you choose and why?
   B, yields lower overall CPI