MC48 Intra-term Exam 1

Serial #:

This exam is an open-book, open-notes, individual-work exam. Please write your name only on this page. Do not turn the page until instructed, in order that everyone may have the same time. Then, be sure to look at all problems before deciding which one to do first. Some problems are easier than others, so plan your time accordingly. You have 50 minutes to work.

Write the answer to each problem on the page on which that problem appears. You may use the back of that same sheet if you need additional space. You may also request additional paper, which should be labeled with your test number and the problem number.

Name: ______________________________

Problem	Page	Possible	Score
1	2	12	
2	3	12	
3	4	12	
4	5	12	
Total		48	

1. [**12 Points**]

   A computer's design is modified to increase the clock rate by a factor of 1.1. However, the design change also involves increasing the multiplication instruction to 10 cycles from 5. (All other instructions take the same number of cycles as before.)

   A sample program is run on both the old computer and the new one. By amazing coincidence, it runs at exactly the same speed on the two designs. What fraction of the program's time on the new machine is spent multiplying?

2. [**12 Points**]

Write a procedure in MIPS assembly language, called `maxc`, that expects two arguments (in `$a0` and `$a1`), namely two memory addresses. The procedure should return (in `$v0`) the larger of the two words stored at those two memory addresses. For example, if memory location 10 contains 54 and memory location 24 contains 2, then when passed 10 and 24 as arguments, the procedure would return 54.

3. [**12 Points**]

The following six numbers should be interpreted as signed integers in 16-bit-wide twos-complement format. Write the letters in the blanks so as to make the inequality true.

$$\begin{aligned} a &= 1100\ 0000\ 0000\ 0001 \\ b &= 0010\ 0000\ 1001\ 0000 \\ c &= 1100\ 0000\ 1001\ 0001 \\ d &= 0000\ 0000\ 0000\ 0000 \\ e &= 0010\ 0000\ 0000\ 0001 \\ f &= 0100\ 0000\ 0000\ 0001 \end{aligned}$$

$$\underline{\quad\quad} < \underline{\quad\quad} < \underline{\quad\quad} < \underline{\quad\quad} < \underline{\quad\quad} < \underline{\quad\quad}$$

4. [**12 Points**]

Write the 32 bits for the floating point number that results from multiplying by two the floating point number 0000 0110 0010 0111 0000 0000 0000 0000

(Note that this is divided into chunks of four bits just to help you count positions more accurately. The chunks do not correspond to the logically significant portions of the representation.)