CSCI 2321 (Computer Design), Spring 2018

Homework 4

Credit: 20 points.

1 Reading

Be sure you have read, or at least skimmed, the assigned readings from Chapter 3.

2 Honor Code Statement

Please include with each part of the assignment the Honor Code pledge or just the word "pledged", plus one or more of the following about collaboration and help (as many as apply).[1] Text *in italics* is explanatory or something for you to fill in. For written assignments, it should go right after your name and the assignment number; for programming assignments, it should go in comments at the start of your program(s).

- This assignment is entirely my own work. *(Here, "entirely my own work" means that it's your own work except for anything you got from the assignment itself — some programming assignments include "starter code", for example — or from the course Web site. In particular, for programming assignments you can copy freely from anything on the "sample programs page".)*
- I worked with *names of other students* on this assignment.
- I got help with this assignment from *source of help — ACM tutoring, another student in the course, the instructor, etc. (Here, "help" means significant help, beyond a little assistance with tools or compiler errors.)*
- I got help from *outside source — a book other than the textbook (give title and author), a Web site (give its URL), etc.. (Here too, you only need to mention significant help — you don't need to tell me that you looked up an error message on the Web, but if you found an algorithm or a code sketch, tell me about that.)*
- I provided help to *names of students* on this assignment. *(And here too, you only need to tell me about significant help.)*

3 Problems

Answer the following questions. You may write out your answers by hand or using a word processor or other program, but please submit hard copy, either in class or in one of my mailboxes (outside my office or in the ASO).

[1] Credit where credit is due: I based the wording of this list on a posting to a SIGCSE mailing list. SIGCSE is the ACM's Special Interest Group on CS Education.

1. (5 points) Use the algorithm shown in Figures 3.3 and 3.4, adapted to work on 6-bit quantities rather than 32-bit quantities, to multiply 50 (`0x32`) by 10 (`0x0a`). Convert the result back to base-10 so you can check that it's right. (This is very much like the example in Figure 3.6, but using 6 and 12 bits rather than 4 and 8.)

2. (5 points) Use the algorithm shown in Figures 3.8 and 3.9, adapted to work on 6-bit quantities rather than 32-bit quantities, to divide 60 (`0x3c`) by 17 (`0x11`). Convert the result (quotient and remainder) back to base-10 so you can check that it's right. (This is very much like the example in Figure 3.10, but using 6 and 12 bits rather than 4 and 8.)

3. (5 points) A 32-bit value doesn't have any particular intrinsic meaning; instead its meaning depends on how it's interpreted. For the 32-bit value represented by `0x0c000000`, what does it mean if interpreted in each of the following ways?

   - As a MIPS machine-language instruction (give the instruction name, e.g., `add`, and the operands).
   - As an integer in two's complement form (i.e., a signed number, with the high-order bit determining the sign).
   - As a floating-point number in IEEE 754 single-precision format.

4. (5 points) Show the bit representation for the base-10 value 63.25 in IEEE 754 single- and double-precision formats (so you will be writing down a 32-bit value and a 64-bit value). (To make your answer slightly less unreadable, you might put spaces between groups of 4 or 8 bits.) To get full credit you must show your work; I want you to actually do this problem more or less by hand rather than using a program that will just show you what's in memory for a `double` or `float`.