COMP 230: Computer Architecture and Organization September 15, 2017

Homework 3

Instructor: Robert Utterback *Due: September 25, 2017*

Complete this assignment on a separate sheet of paper.

1. Exercise B.36 from the text.
2. Exercise 2.7.
3. Convert each of the following MIPS assembly instructions to both machine code binary and hexadecimal.
   (a) `sw $t0 8($s0)`
   (b) `sub $s4,$s1,$t2`
   (c) `addi $t5,$t8,100`
4. Convert each instruction from hexadecimal to machine code binary and to MIPS assembly.
   (a) $\texttt{000b 8180}_{16}$
   (b) $\texttt{2319 ff9c}_{16}$
5. Convert each of the following C statements to MIPS assembly statements. Assume each lowercase variable `f, g, h, i,` and `j` are 32-bit integers as declared in a C or C++ program and are stored in registers `$s0` through `$s4`, respectively. Arrays are denoted with uppercase letters, with the base address of `A` in register `$s5`, the base adress of `B` in `$s6`, etc. You are not allowed to use any `mul` or `div` instructions.
   (a) `f = g + (h - 5);`
   (b) `B[8] = A[i - j] + B[i];`
   (c) `i = (f + j) / 8;`
   (d) `g = C[0] << 4; //` (In C, `x << y` shifts the bits of `x` to the left by `y` positions)
6. Exercise 2.18.
7. Exercise 2.26, parts 1 (2.26.1) and 2 (2.26.2) only. Note that part 2 refers to "each of the loops above," but there is actually just one loop.
8. Implement the C code from exercise 2.31 in MIPS assembly.
9. Write an iterative (instead of recursive) version of the C code in exercise 2.31 and write the MIPS assembly for it.
10. (Optional) Complete exercise 2.32 and note how it relates to the iterative version you wrote.