Homework #3

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- Solve exercise 3.13 3.18 3.27 4.7 in our textbook
- Due date: Oct. 18th (Tue.)
- Late submission due date: Oct. 19th (Wed.)
- For late submissions, there will be a 50% penalty on your total score.
- You cannot submit after the late submission due date.

3.13 [20] <§3.3> Using a table similar to that shown in Figure 3.6, calculate the product of the hexadecimal unsigned 8-bit integers 62 and 12 using the hardware described in Figure 3.5. You should show the contents of each register on each step.

3.18 [20] <§3.4> Using a table similar to that shown in Figure 3.10, calculate 74 divided by 21 using the hardware described in Figure 3.8. You should show the contents of each register on each step. Assume both inputs are unsigned 6-bit integers.

3.27 [20] <§3.5> IEEE 754-2008 contains a half precision that is only 16 bits wide. The leftmost bit is still the sign bit, the exponent is 5 bits wide and has a bias of 15, and the mantissa is 10 bits long. A hidden 1 is assumed. Write down the bit pattern to represent -1.5625×10^{-1} assuming a version of this format, which uses an excess-16 format to store the exponent. Comment on how the range and accuracy of this 16-bit floating point format compares to the single precision IEEE 754 standard.

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4.7 In this exercise we examine in detail how an instruction is executed in a single-cycle datapath. Problems in this exercise refer to a clock cycle in which the processor fetches the following instruction word:

10101100011000100000000000010100.

Assume that data memory is all zeros and that the processor's registers have the following values at the beginning of the cycle in which the above instruction word is fetched:

r0	r1	r2	r3	r4	r5	r6	r8	r12	r31
0	–1	2	–3	–4	10	6	8	2	–16

4.7.1 [5] <§4.4> What are the outputs of the sign-extend and the jump "Shift left 2" unit (near the top of Figure 4.24) for this instruction word?

4.7.2 [10] <§4.4> What are the values of the ALU control unit's inputs for this instruction?

4.7.3 [10] <§4.4> What is the new PC address after this instruction is executed? Highlight the path through which this value is determined.

4.7.4 [10] <§4.4> For each Mux, show the values of its data output during the execution of this instruction and these register values.

4.7.5 [10] <§4.4> For the ALU and the two add units, what are their data input values?

4.7.6 [10] <§4.4> What are the values of all inputs for the "Registers" unit?