COMP 230: Computer Architecture and Organization

Homework 6

Assigned: November 03, 2017 *Due: November 17, 2017*

Complete this assignment on a separate sheet of paper.

1. Exercise 4.1 from the text.

2. Exercise 4.3. The cost/performance ratio is just the cost divided by the performance. In this case we measure performance relative to the original datapath. In other words, the cost/performance ratio of the original datapath is just its cost divided by 1, and the cost/performance ratio of the new datapath is its cost divided by its speedup.

3. Consider the non-pipelined datapath show in figure 4.11 in the text. Assume the logic blocks have the following latencies, in `ps`:

I-Mem	Add	Mux	ALU	Regs	D-Mem	Sign-Extend	Shift-Left-2
200	70	20	90	90	250	15	10

   Let's focus on the Shift-left-2 datapath element.

   (a) Which instructions require this element?

   (b) If you improve this element to take 5ps, which instructions will have reduced latencies, and by how much?

   (c) If this resource gets degraded to a latency of 130ps, how much must the clock cycle time change (if at all).

4. Exercise 4.8, parts 1-3.

5. Exercise 4.18 (all parts)

6. The following three exercises contain 6 parts each. Each exercise deals with a topic that is a slight extension from what we covered in class. In other words, these exercises will required you to (1) read the textbook, and (2) use your independent-thinking skills.

   Complete any 6 "parts" (subquestions) of your choosing, but the 6 parts must come from at least two different exercises.

   - Exercise 4.12
   - Exercise 4.15
   - Exercise 4.19