
Important: Do not draw the circuits by hand; instead, you should use the Digital tool. Submit your circuits as instructed in the HW2 website.

Collaboration Policy: For this homework only! You may collaborate with other students in this class. As an **exception** to the usual collaboration policy, you do not need to tell us about casual interactions of the "I got X, what did you get?" variety. But **do** cite any close collaboration or major corrections; for example, if the answer to the above hypothetical was "I think X is wrong, here's why," and then you change your answer, add a note like "mst3k suggested this answer" next to your answer. However, we expect that everyone will work on the assignment to better understand circuits, so **you may not directly copy another student's answer.**

PROBLEM 1 *4-bit Shifter*

Design a circuit that accepts two inputs: a 4-bit number and a 2-bit shift amount. The circuit's purpose is to generate a 4-bit output that reflects the input number after a bitwise left shift. Importantly, this circuit should operate without relying on a clock signal.

PROBLEM 2 *4-bit Increment*

In class, we considered a counter circuit which counted from 0b000 to 0b111 and then back to 0b000. Design a counter circuit that "stops" at $x = 0b1111$. That is, if x is not all 1s, then increment by 1. If x is all 1s, then increment by 0, i.e., $z = 0b1111$. Feel free to use the counter component under Memory.

PROBLEM 3 *Register File*

Create a register file comprising four register banks, each capable of storing 4 bits. The register file should have four input signals: a Clock signal, a Write Enable line, 4-bit input data **A**, and a 2-bit wide register number Selector. Furthermore, the register file should feature a single 4-bit wide output **X**, representing the value currently stored in the selected register.