

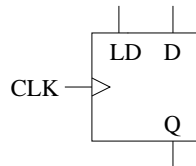
ECE 265

Homework #1

Problems:

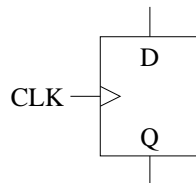
1. Port E of the M68HC11 is an 8-bit input port and may be used as general-purpose input lines for digital logic levels and/or for analog voltage signals.
 - a) The HC11 uses address \$100A to read the value of 8-bit digital data. What is this address in decimal?
 - b) In one application, the HC11 uses address \$1031 to read an analog signal value for temperature, and compares it to a preset level. What is this address in decimal?
 - c) If the preset level of Part b) is 200 (decimal), what is this level in binary? hexadecimal?
 - d) If the 8-bit temperature value read in Part b) is \$0F, how much is this temperature below the preset level of 200? Use 2's complement arithmetic and give the result in hexadecimal.

2. The following is a basic element for a register in a microcontroller:



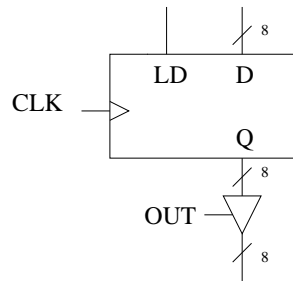
On a rising clock edge, the data on the D line is clocked into the flip-flop if $LD = 1$; otherwise, the state (Q) of the flip-flop does not change.

Use a basic D flip-flop

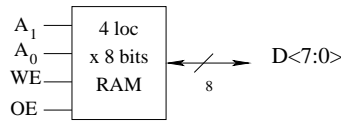


along with NAND gates and INVERTERS to design the element. Do not put any gating on the clock line. Show the resulting logic circuit diagram.

3. Show the connections to use 8 of the basic register elements and 8 tri-state buffers, to build the following 8-bit register:

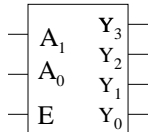


4. The following 4x8 RAM is to be built:



The RAM has 4 locations that can store 1 byte each. A_1A_0 is used to address the 4 locations. If $OE = 1$ (Output Enable), then the byte addressed appears on the $D<7:0>$ lines. On the rising edge of the clock when $WE = 1$ (Write Enable), the data on $D<7:0>$ is written into the location addressed. Note that OE and WE will never be asserted at the same time.

Problem: use 2-to-4 decoders:



E	A_1	A_0	Y_3	Y_2	Y_1	Y_0
0	-	-	0	0	0	0
1	0	0	0	0	0	1
1	0	1	0	0	1	0
1	1	0	0	1	0	0
1	1	1	1	0	0	0

along with four of the 8-bit registers of Problem 3, and a minimum number of NAND gates and INVERTERS, to design the RAM. Show the resulting logic circuit diagram. You can use the symbol for the 8-bit register, given in Problem 3, in the logic circuit diagram.