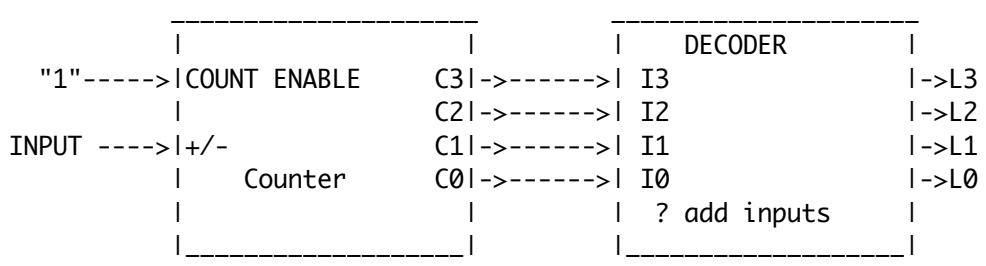
ECE2030b - HW-6 ANSWERS Due Monday 11/4 during class.

Problem 1. Design a synchronous circuit using a modular counter with an increment/ decrement control input and one of the following modules: encoder, decoder, multiplexor, or demultiplexer (identify the second module, and add additional inputs).

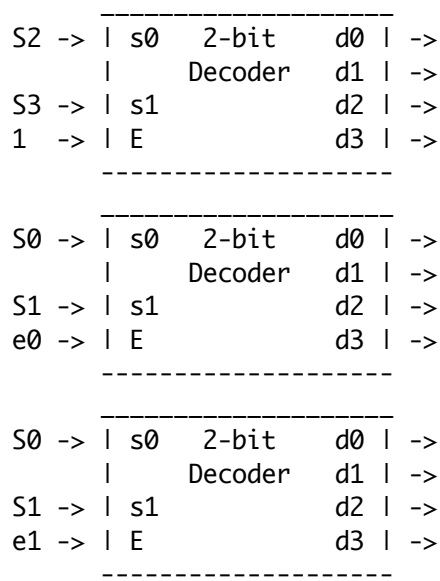
The complete circuit has one input that can be 0 or 1. It has four outputs, L0, L1, L2, and L3, one and only one of which is "1", the rest are "0". When the input is "1", the output that is "1" moves higher (from L0 to L1, or from L1 to L2, or from L2 to L3, or from L3 to L0). When the Input is "0", the output "1" moves lower.

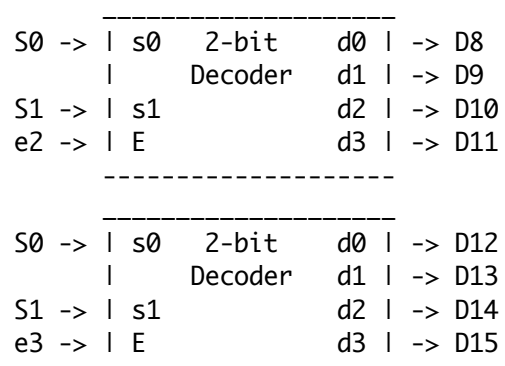
(use a non-proportional font, like Courier) to see the diagrams below)



Problem 2. Use five 2-bit decoders to make a 4-bit decoder. Use the enable (E) inputs appropriately (connect to logic "1" when not used).

The circuit inputs are S0, S1, S2, S3 which form the four-bit binary number that sets one of 16 output lines D0, D1, ..., D15 true ('1"). Each 2-bit decoder has inputs s0, s1, E (enable) and outputs d0, d1, d2, d3.





Problem 3. A keypad has 16 buttons that place a logic "1" signal on one of 16 output lines. Show how to use a single logic building block circuit that we discussed in class to generate a unique 4-bit binary number that indicates which key was pressed. Identify the type of building block circuit that is used.