

Bring this homework to class on Monday Feb. 19 for discussion. Turn it in on Friday Feb. 23.

1. Combinatorial Logic - Name the building block that will do the following.

a. A 4-bit number (0-15) input selects one of 16 other inputs to appear at the single output.

Multiplexer (Mux)

b. A 4-bit number (0-15) input causes only one of 16 outputs to be true or "1"

Decoder

c. A 4-bit number (0-15) input causes only one of 16 outputs to be equal to another input.

Demultiplexer (Demux)

d. Sixteen inputs are labeled 0 to 15. The two-bit output is the binary number of the lowest-numbered input that is true (two words).

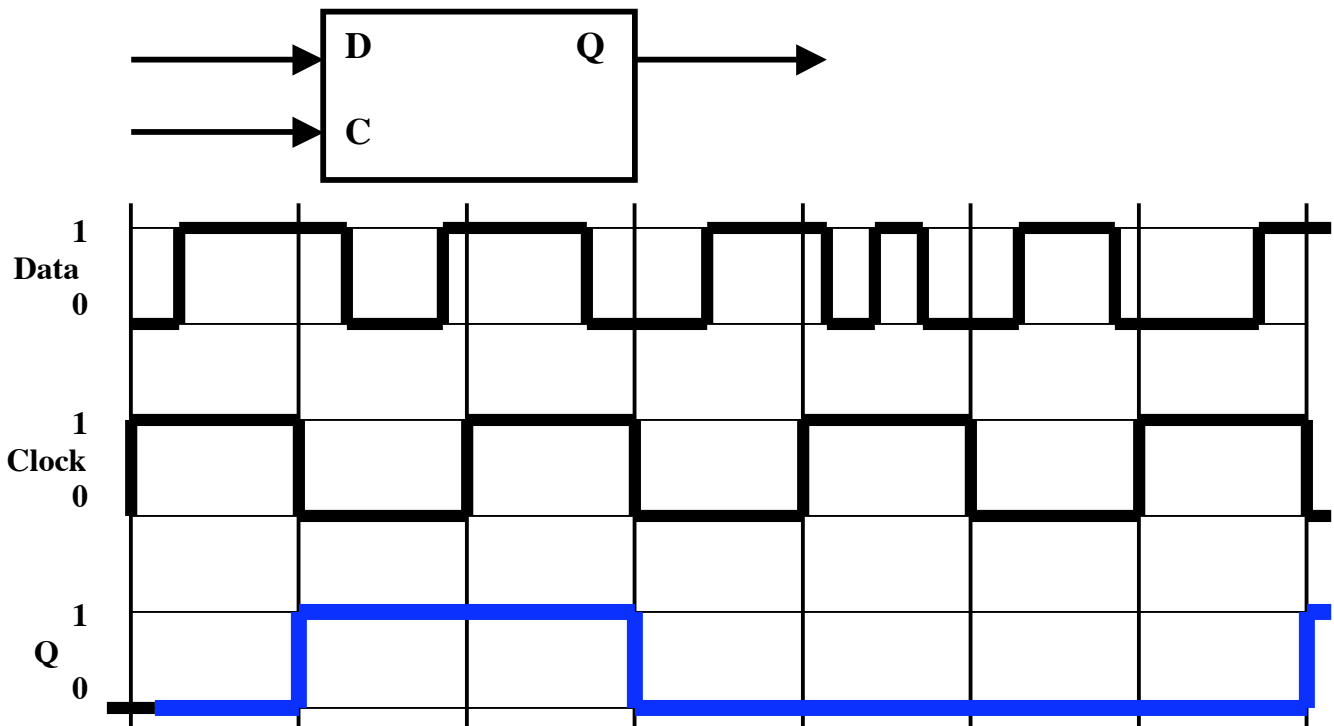
Encoder

e. The input data bits to a 4-bit shifter are 1011. The control inputs are "E" Enable (0 -> straight through, 1 -> shift), "D" Direction (0 -> left, 1 -> right), "R" Rotate (1 -> be a Rotator). Fill in the following table. Q3 - Q0 are the four output bits.

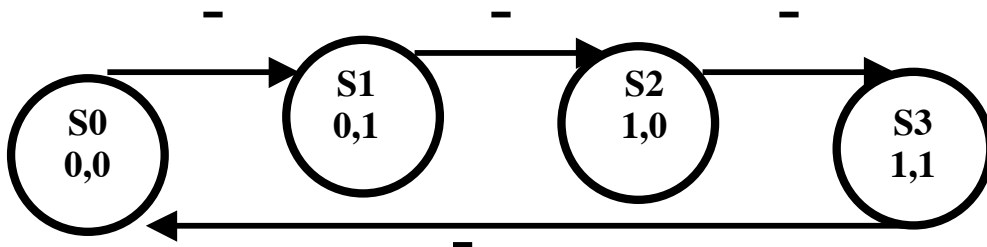
Enable	Direction	Rotate	Q3	Q2	Q1	Q0
0	1	0	1	0	1	1
1	1	0	0	1	0	1
1	0	1	0	1	1	1
1	1	1	0	1	1	1

2. Sequential Logic

The following is an negative edge triggered latch. Shown are the Input "D" and Clock "C" signals as functions of time "t". Draw in the output Q(t) signal.



3. State Machine Draw a state diagram for a circuit that counts from 0 to 3 in binary and then repeats (input always "-", output Q0 Q1: 00, 01, 10, 11, 00, 01, 10, 11, 00, ...)



Fill in the truth table for the logic that is needed:

Present State Values [$P_0(t), P_1(t)$] Next State Values $N_i(t)$

Time	P0	P1	N0	N1
0	0	0	0	1
1	0	1	1	0
2	1	0	1	1
3	1	1	0	0

For additional practice, see the problems on the ECE2030 Web Site,

<http://www.ece.gatech.edu/academic/courses/ece2030/>