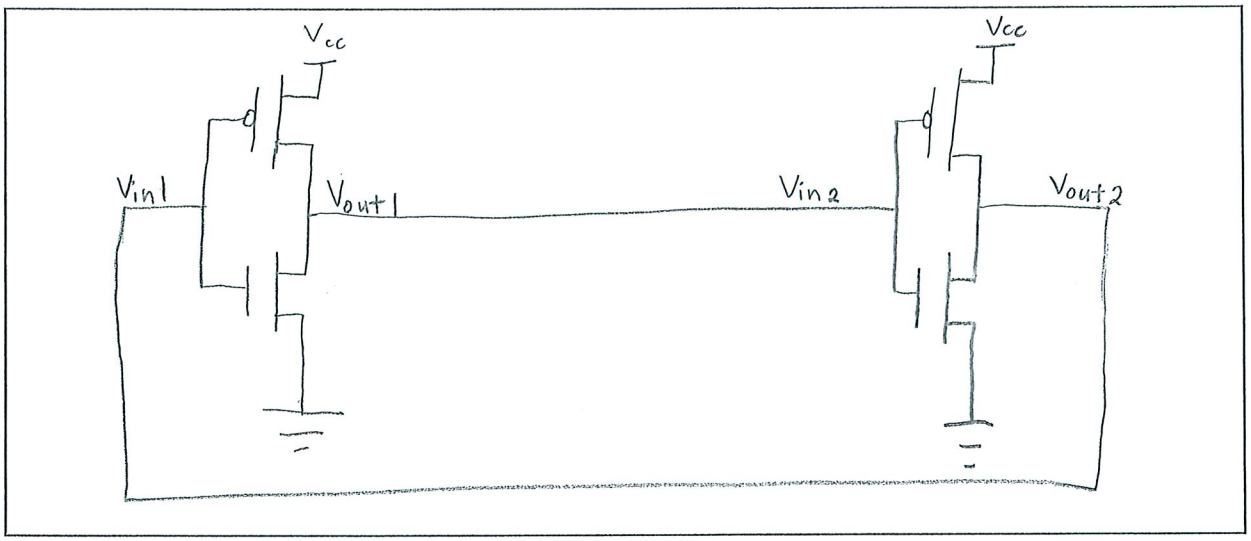
Revisited Concept Exercise for Module 3 – No. 1
Monday, March 10, 2014

1. Draw the circuit for a bi-stable using N- and P-Channel MOSFETs (HINT – consists of two inverters):

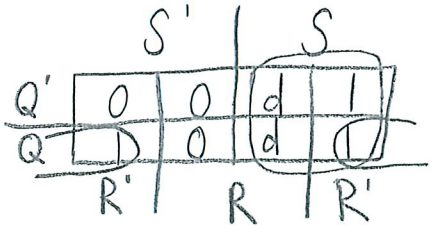


2. Define metastability:

The operation of a circuit when it is halfway between a logic '1' voltage and a logic '0' voltage.

3. Fill in the ***present state – next state*** table for an S-R latch (Q* is the **next state**):

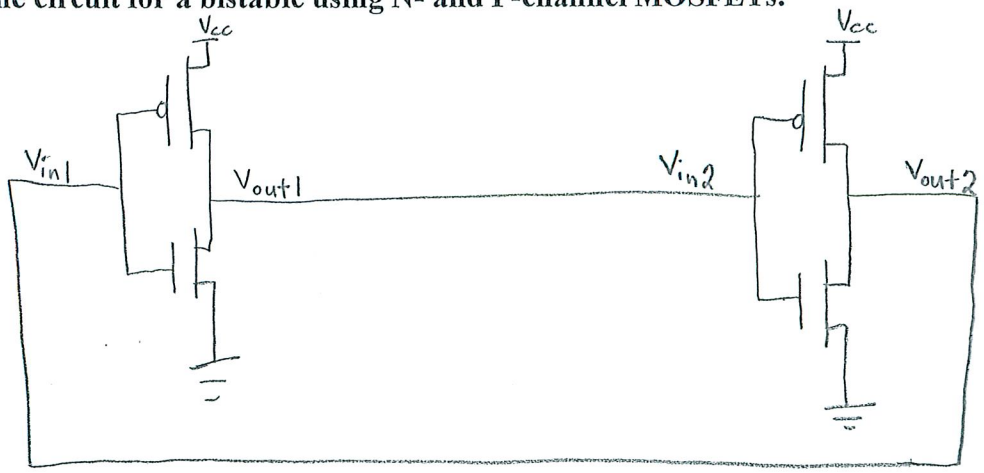
S	R	Q	Q*
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	d
1	1	1	d



Q* = $S + R' \cdot Q$

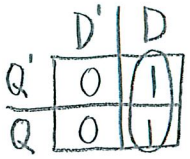
Revisited Concept Exercise for Module 3 – No. 2
Wednesday, March 12, 2014

1. Draw the circuit for a bistable using N- and P-channel MOSFETs.



2. Fill in the PS-NS table for a "D" flip-flop and derive its next state equation.

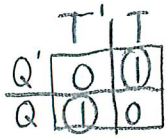
D	Q	Q*
0	0	0
0	1	0
1	0	1
1	1	1



Q* = D

3. Fill in the PS-NS table for a "T" flip-flop and derive its next state equation.

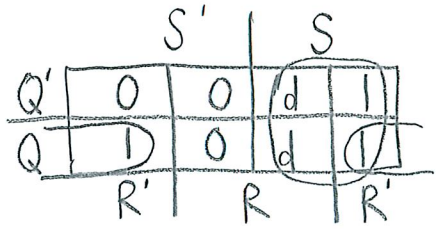
T	Q	Q*
0	0	0
0	1	1
1	0	1
1	1	0



Q* = $T \cdot Q' + T' \cdot Q = T \oplus Q$

4. Fill in the PS-NS table for an "S-R" flip-flop and derive its next state equation.

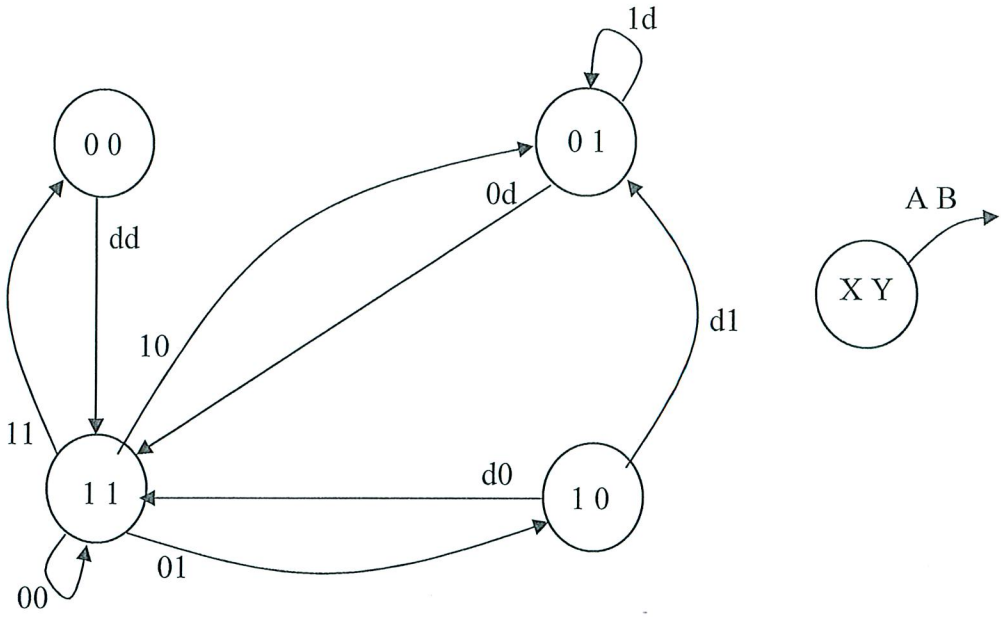
S	R	Q	Q*
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	d
1	1	1	d

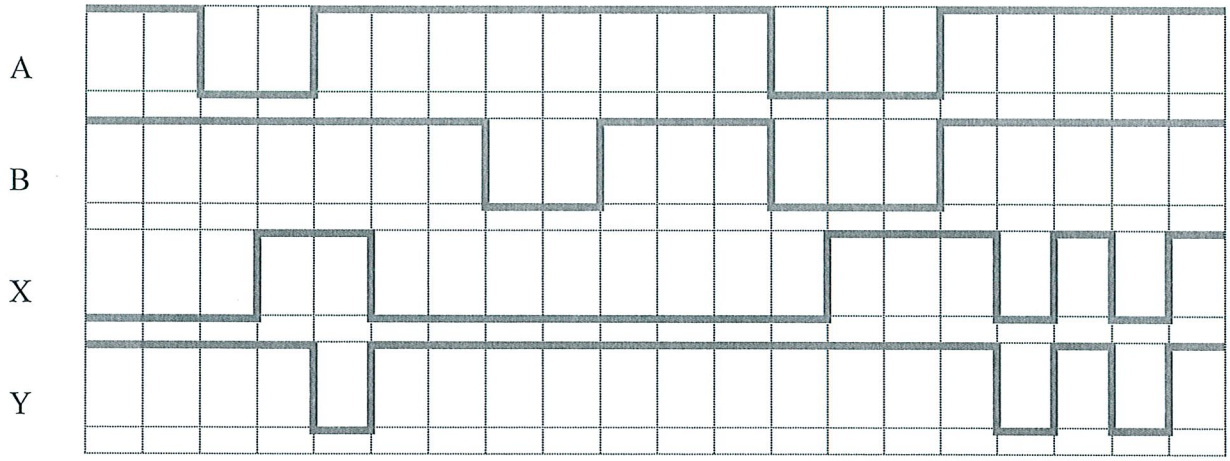


Q* = $S + R' \cdot Q$

Revisited Concept Exercise for Module 3 – No. 3
Monday, March 24, 2014

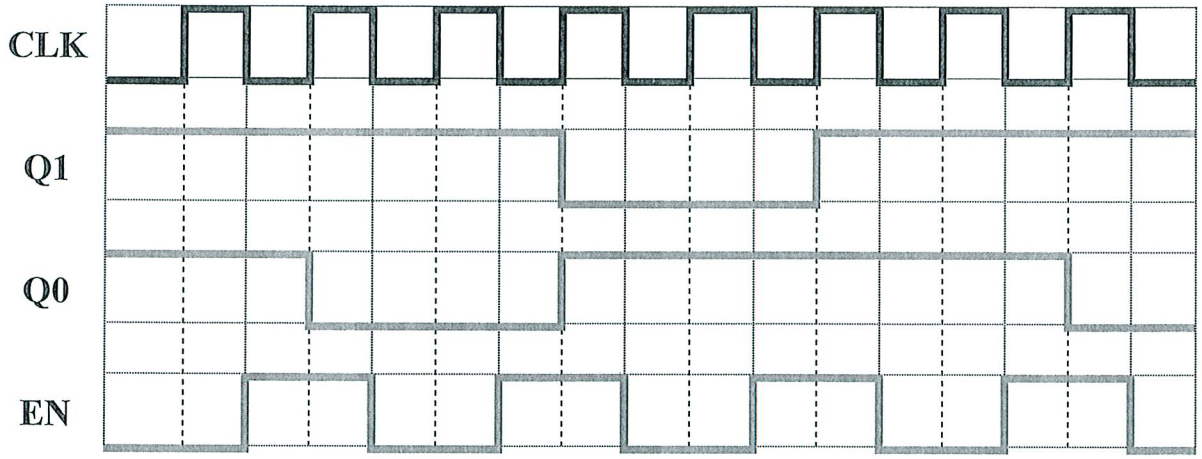
Given the following state transition diagram, complete the timing chart below.

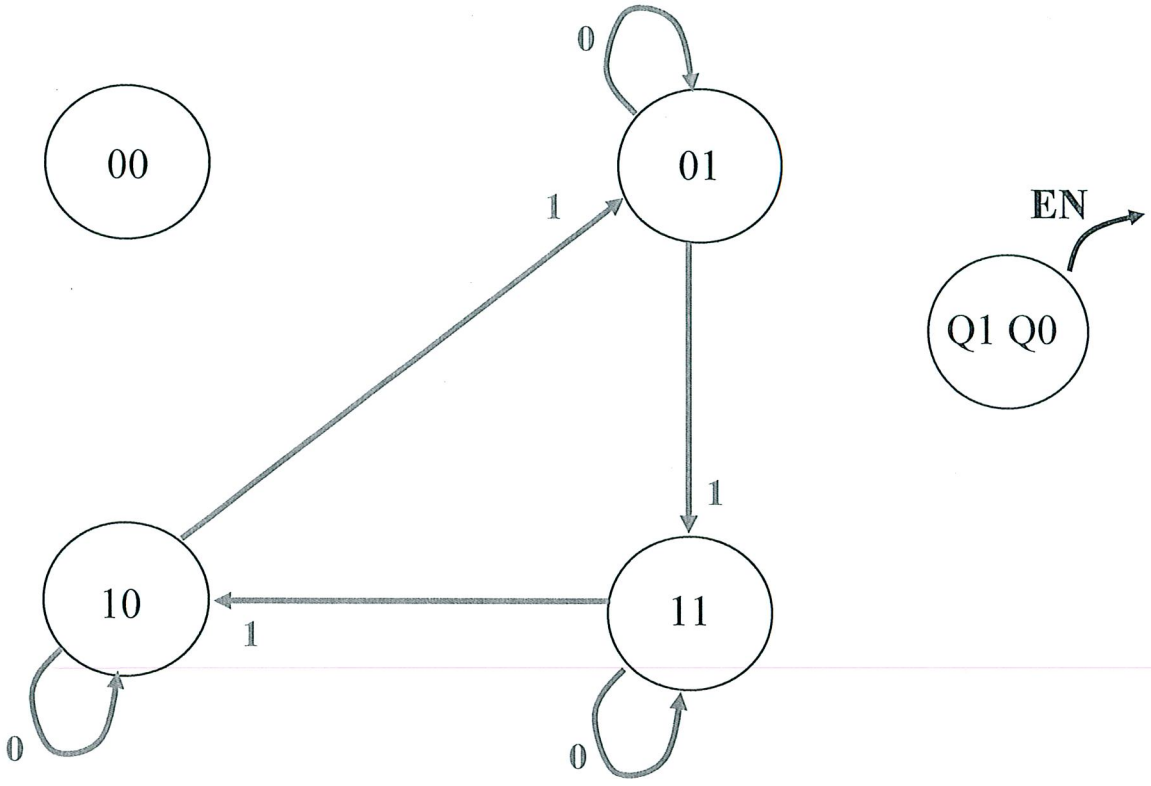




Revisited Concept Exercise for Module 3 – No. 4
Wednesday, March 26, 2014

Given the timing diagram, below, for a state machine that has one input (EN) and two state variables (Q1 and Q0), derive a state transition diagram (note that there is *one unused state*).





Revisited Concept Exercise for Module 3 – No. 5
Monday, March 31, 2014

Using a 7-segment display, design a "direction run indicator" (similar to that used on VCRs) that sequences the perimeter segments in a *clockwise* fashion if mode control input M=1 (A→B→C→D→E→F→A→B…), or in a *counter-clockwise* fashion if mode control input M=0. Input S should control whether the display is running (S=0) or stopped (S=1); if stopped, the middle segment (G) should be on and the rest should be off. Draw a *Moore* model state transition diagram.