Lab 4

Friday, December 4, 2020 1:42 PM

CDA 3201C Intro to Logic Design
Template for solving counters

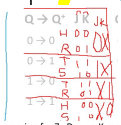
Problem: Construct a counter for the following sequence: 1, 2, 3, ...

Step 1: **State Diagram.** Draw State Diagram
How many states?
How many flip flops are needed?

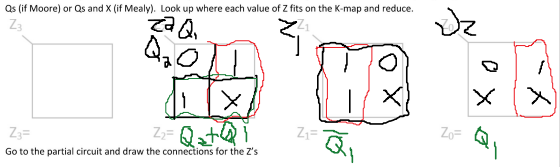
Step 2: **Partial Circuit.** Go to the end, draw the partial Flip Flops, connect Clock, label Inputs (if any), Outputs and Q's and # all, LSB FF = 0 to left

Step 3: **Table.** Draw Dr. Petrie's table, fill and number the bits for Qs, input (if any) and outputs, label the least significant Q_0
Write the possible values of Q_s and inputs (if any) and decide which state is assigned to each row. Then looking at the state diagram figure out the binary value for the **output** column.

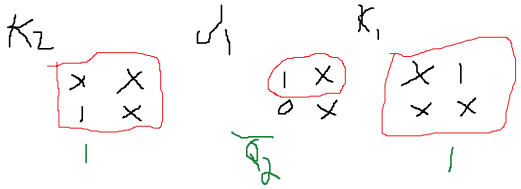
Present State (Q)		Input (X)	Output (Z)		Next State (Q+)		Flip Flop Transition Table			
State Name	Q_2 Q_1		Z_2	Z_1	State Name	Q_2^+	Q_1^+	J_2	K_2	J_1	K_1
A	0 0	N/A	0	1	B	0	1	0	X	1	X
B	0 1		1	0	C	1	0	1	X	X	1
C	1 0		1	1	A	0	0	X	1	0	X
X	1 1		X	X	X	X	X	X	X	X	X



Step 4: **Outputs.** Find Simplified Sum of Products expression for Z. Draw a K-map that fits values of Z (2x2, 2x4, 4x4). Label with Qs (if Moore) or Qs and X (if Mealy). Look up where each value of Z fits on the K-map and reduce.

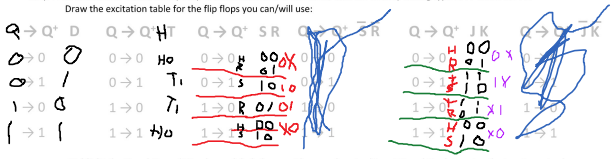


Go to the partial circuit and draw the connections for the Z's



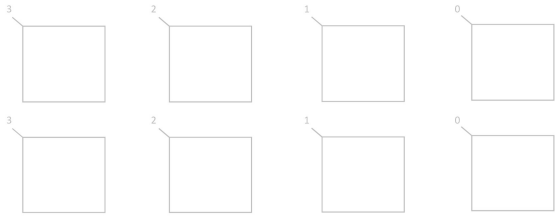
Step 6: **Next State.** Look at the state diagram and input (if any) and fill in the column for the next state with the name and its corresponding row number.

Step 7: **FF Transition.** Fill in the Flip Flop Transition header of the table, with the corresponding type of FF and # the FF.
Draw the excitation table for the flip flops you can/will use:



Highlight the Q and Q+ and FF columns labeled zero with one color. Looking at Q and Q+ determine the input required for the FF until done with that color. Highlight the next Q and Q+ and FF labeled one with a different color, and continue process until the table is complete.

Step 8: **FF Inputs.** Find Simplified Sum of Products expression for each FF Transition column using K-Maps. Draw a K-map that fits values of (2x2, 2x4, 4x4). Label with Qs and input (if any). Look up where each value fits on the K-map and reduce.



Go to the partial circuit and draw the connections for the inputs of each FF.