LabWork 7
FSM Design
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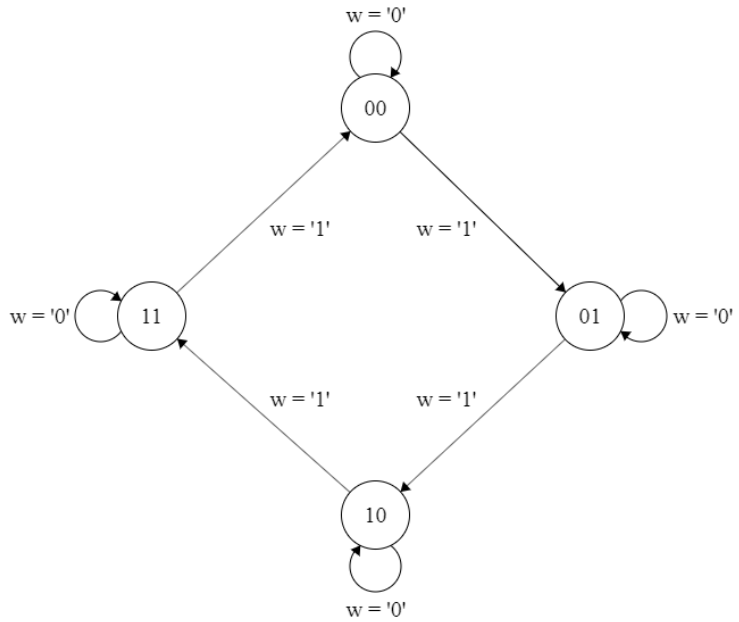
09.12.2019

The Design Methodology:

I made a FSM which counted binary on demand. I wanted it to count form 0 to 3 to do that it needs to have 4 states. For that it needs a 2 bit binary number. Each D flip flop can store 1 bit so I needed to use 2 D flip flops. If the input was ‘0’ then its state does not change so its output doesn’t change. If its input is ‘1’ then it counts 1 up every clock rising edge. It reverts back to 00 after 11. I was planning to take my inputs from a digital sound censor but the circuit gave random errors so I disconnected the censor end connected my input ‘w’ directly to Vdd and ground by hand. Then display the state of the FSM I connected the D flip flops outputs to LEDs. This made the output easy to see and made it clear if the FSM is working.

To design the FSM I first drew a FSM diagram.



Then I made its truth table.

S1	S0	w	NS1	NS0
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	1	0
1	0	1	1	1
1	1	0	1	1
1	1	1	0	0

Then from the truth table I made K maps of NS1 and NS0

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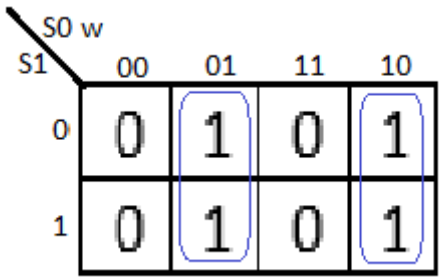
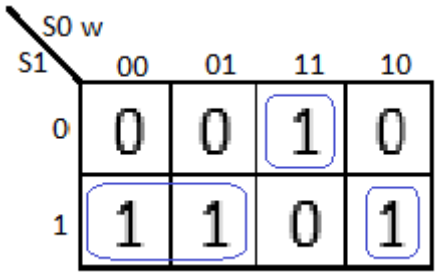


NS0 = (S0 xor w)

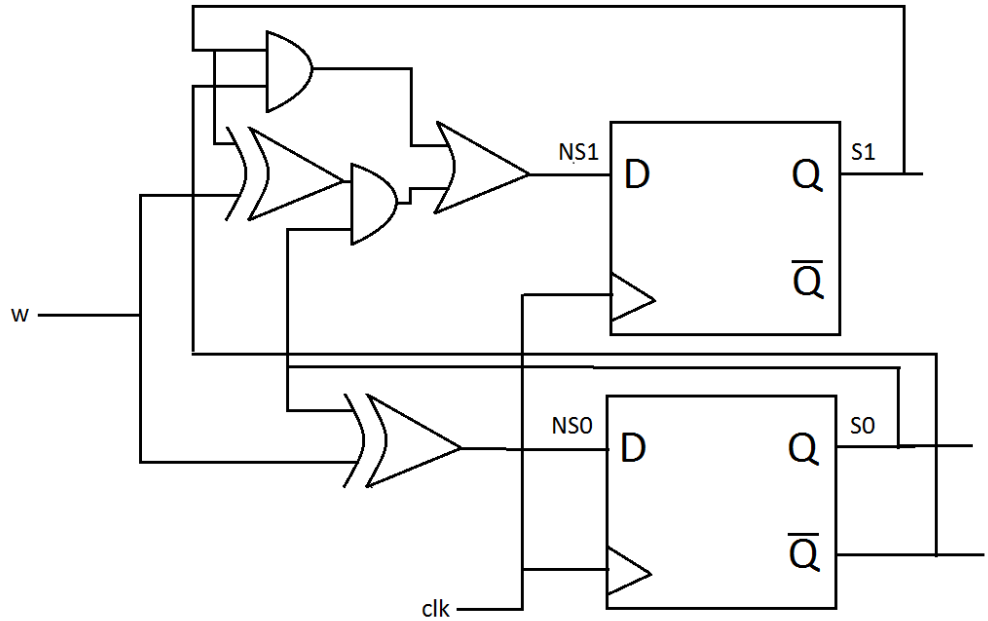


NS1 = (S1 and S0') or ((S1 xor w) and S0)

Then from the K maps I got my logic equations

Results

First I drew a simple diagram of my circuit.



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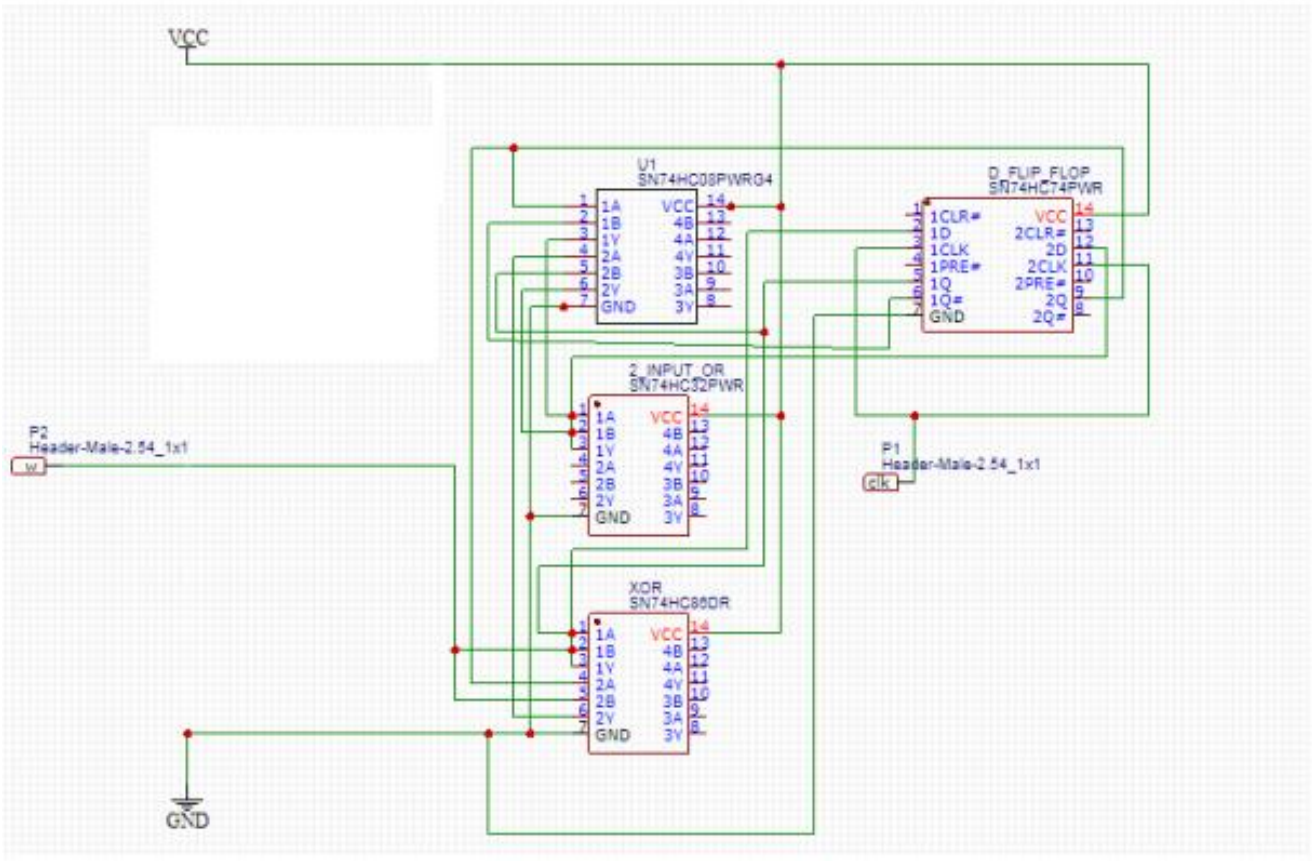
Then I draw I schematic of my circuit using the IC components I will use.



Then I implemented that schematic on my bread board using jumper cables. Then I gave the Vdd signal from a power source and gave the clock signal from a signal generator to the circuit. I saw it was working as I intended it.

Results:

In this lab work we designed and implement a FSM on a breadboard. We have already implemented circuits on the bread board but this one by far was the most challenging still not something completely new to us. But FSM are new to use and this lab made me have a greater understanding of them. This is really important because FSM are everywhere in our daily lives sand I will be using multiple of them in my term project too. I also started to appreciate BASYS 3 even more because of the random errors the breadboard circuit gave because of the connection errors.