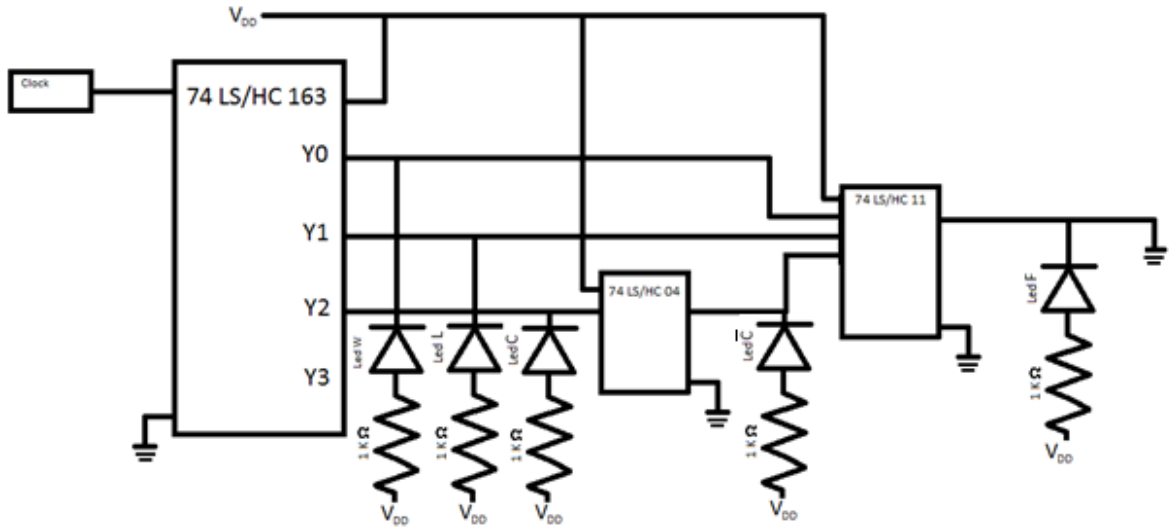
Lab3 Combinational circuit Design
Lab Report
Section 1
Batu Arda Düzgün
21/10/2019

The Design Methodology:

Like I told in preliminary work in this lab we implineted a logic circuit desing on a breadboard with 74 HC type components. My logic equation is $WL\bar{C}$ = F . to impliment this I used a LS/HC 04 which is a hex inverter. First used a 74HC163 4-bit counter. This counter has 4 outputs based on the given in put signal. I used 3 of this signals Y0, Y1, Y2. Y0 reprisents W, Y1 reprisents L and Y2 reprisents C. Then I connected Y2 to this inverter to invert its signal. Then I used a LS/HC 11 which is a triple 3-input AND gate and conceted my inverted Y2 signal and Y1, Y0 signals to it.then its output is my final output. I connected parallel leds to the 3 output of 74HC163 and to the final output of the system which is the output of LS/HC 11. Then difrent from my preliminary work I connected one more parallel led to the inverted Y2 signal. This are connected parallel to prevent leds from burning.



This is a representation of the circuit I build. Some parts have more complex connections than what I showed.

Y0	Y1	Y2	W	L	C	$\bar{C}$	F	Led_W	LED_L	Led_C	Led_C'	Led_F
0	0	0	0	0	0	1	0	1	1	1	0	1
1	0	0	1	0	0	1	0	0	1	1	0	1
0	1	0	0	1	0	1	0	1	0	1	0	1
1	1	0	1	1	0	1	1	0	0	1	0	0
0	0	1	0	0	1	0	0	1	1	0	1	1
1	0	1	1	0	1	0	0	0	1	0	1	1
0	1	1	0	1	1	0	0	1	0	0	1	1
1	1	1	1	1	1	0	0	0	0	0	1	1

This is the truth table of the circuit.

As expected it is correct for $WL\bar{C}$ = F

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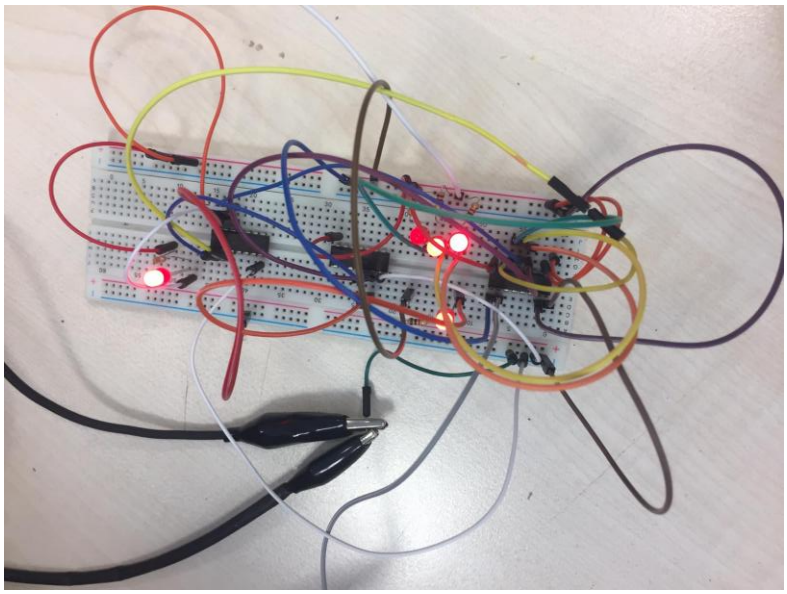
Results:



This is the picture of my circuit. Like I said 74HC163 4-bit counter has a realy complicated connection to the 5V. It has 5 different connections to it.

This is the signal of the C signal. To measure its frequency I gave the 74HC163 1K hz signal so in my experiment its frequency is 0.125Hz (this is also the graph for C' led)

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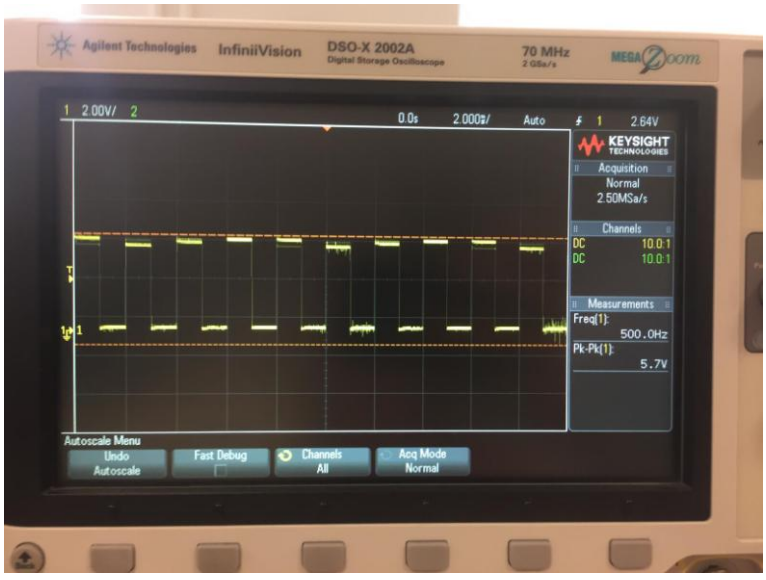
This is the signal of the L signal. To measure its frequency I gave the 74HC163 1K hz signal so in my experiment its frequency is 0.250Hz



This is the signal of the W signal. To measure its frequency I gave the 74HC163 1K hz signal so in my experiment its frequency is 0.500Hz

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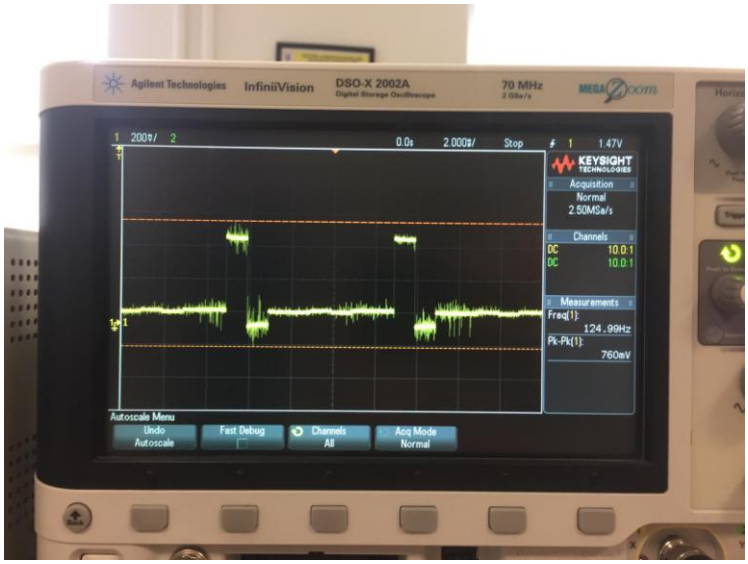

This is the signal of the F signal. To measure its frequency I gave the 74HC163 1K hz signal so in my experiment its frequency is 0.125Hz

The results are exactly like what I expected. the clock is giving a proper output of 3 different signals who have half of each other frequencies.

Conclusion:

In this lab I learned how to set up logic circuits on a breadboard using 74 HC type components. These are old components which were used in 70s by using them we get to relive a bit of history of electronics. This is good for us because it is good to see the basics before doing more complicated circuits in the course. The results are exactly like what I expected so there were no complications.