

Lab 3 Preliminary Report

Labwork 3
Combinational Circuit Design
11.10.2018
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21601793 EE 102 -2

• The Design Methodology

- Like I stated in my preliminary lab report I used 3 gates and a LED and additionally I used 4 resistances and 3 more LEDs to visualize inputs. I started to prepare my setup with connecting **74HC163 4-bit counter** as it is shown in the datasheet of it. After doing that I connected my gates with counter outputs in the order of my circuit diagram and additionally I connected a resistance for each counter output and connected those resistance to red LEDs. I connect the grounds to the blue line and all Vcc to the red line at the edges of the breadboard. Finally, I connected a resistance to the output of the circuit and a green LED to that resistance to visualize the output. My truth table, Karnaugh map, algebraic simplifications, circuit diagram and gates I used are shown below, respectively.

Truth Table

S	C	R	H(S,C,R)	LED ₀	Minterms
0	0	0	0	1	m_0
0	0	1	0	1	m_1
0	1	0	0	1	m_2
0	1	1	0	1	m_3
1	0	0	1	0	m_4
1	0	1	0	1	m_5
1	1	0	1	0	m_6
1	1	1	1	0	m_7

Karnaugh Map

		CR			
		00	01	11	10
S	0	0	0	0	1
	1	0	0	1	1

Lab 3 Preliminary Report

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21601793 EE 102 -2

Sum of products(minterms) = $\sum m(4,6,7) = m_4 + m_6 + m_7 = H(S, C, R)$

$$H(S, C, R) = S \cdot \bar{C} \cdot \bar{R} + S \cdot C \cdot \bar{R} + S \cdot C \cdot R$$

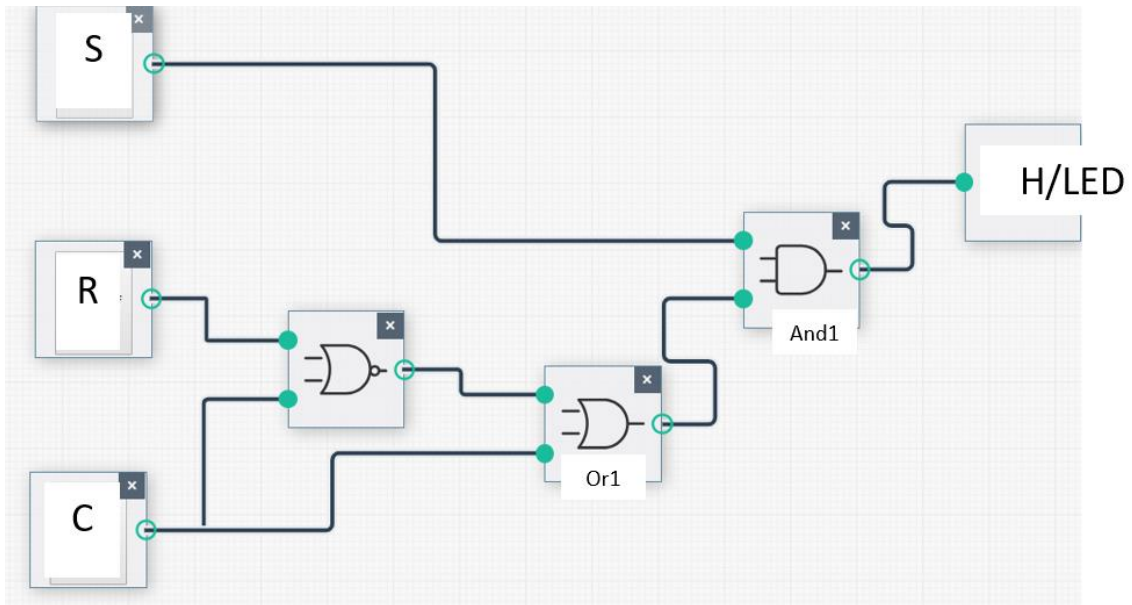
$$= S \cdot \bar{C} \cdot \bar{R} + S \cdot C \cdot (\bar{R} + R)$$

$$= S \cdot \bar{C} \cdot \bar{R} + S \cdot C$$

$$= S \cdot (\bar{C} \cdot \bar{R} + C)$$

$$H(S, C, R) = S \cdot (\bar{C} \cdot \bar{R} + C)$$

Logic Schematic Diagram



Lab 3 Preliminary Report

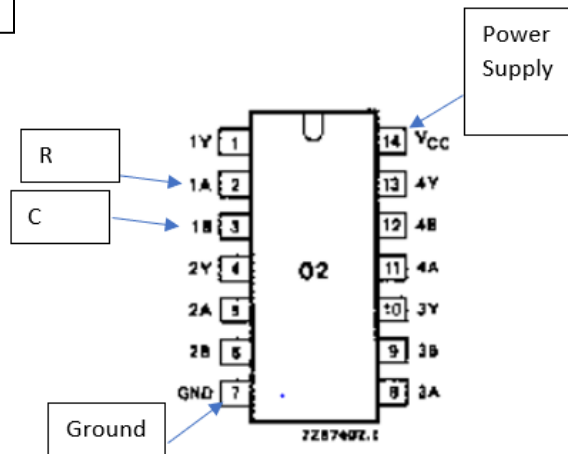
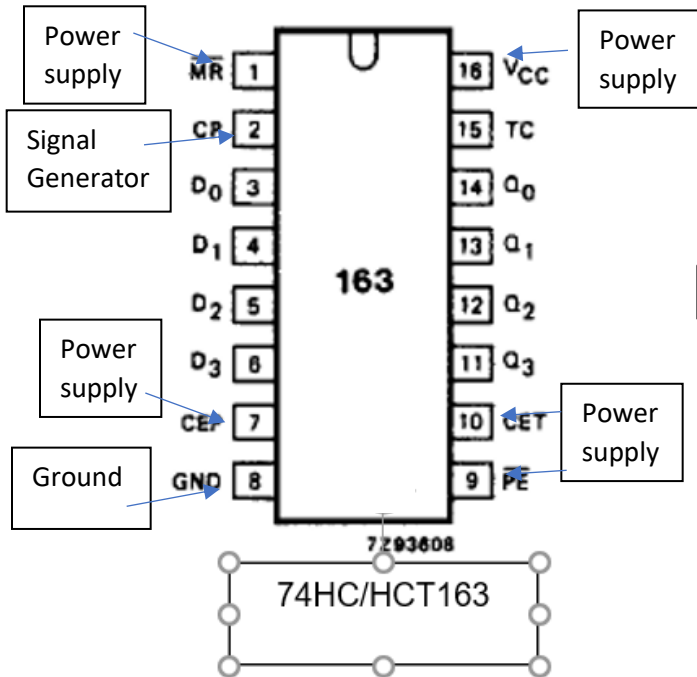
Labwork 3 Combinational Circuit Design

11.10.2018

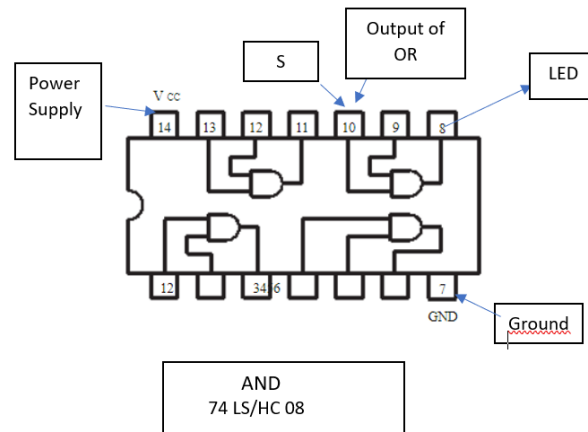
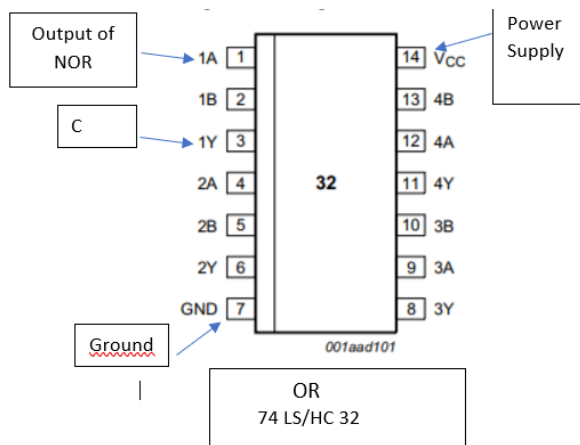
Şevki Gavrem Kulkuloğlu

21601793 EE 102 -2

- Like I mentioned in my prelab report I connected the pins as I the diagrams below



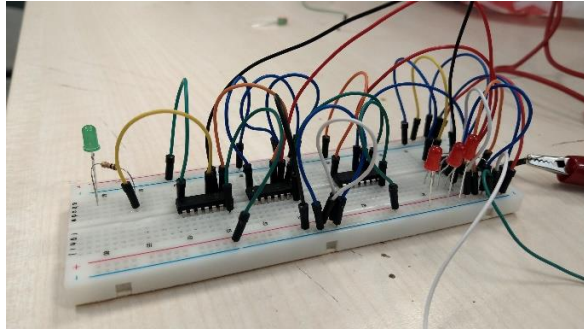
NOR
74 LS/HCT 02



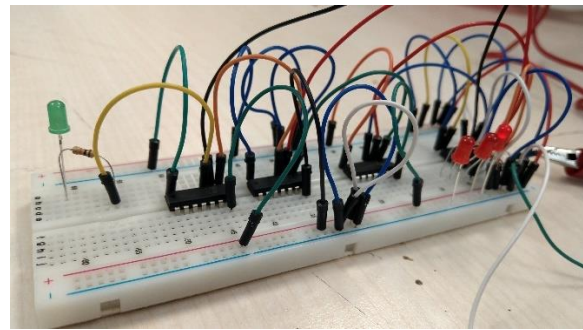
Lab 3 Preliminary Report

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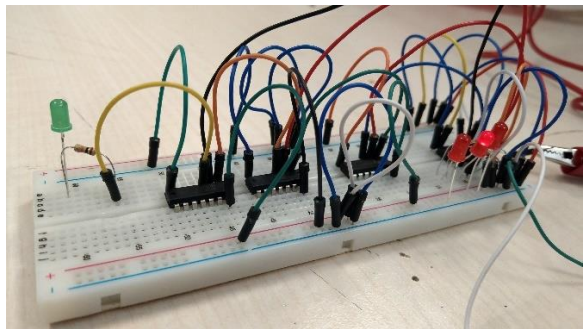
• Results



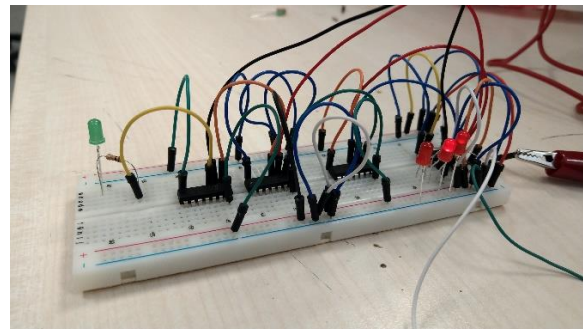
S:0 C:0 R:0 H:0



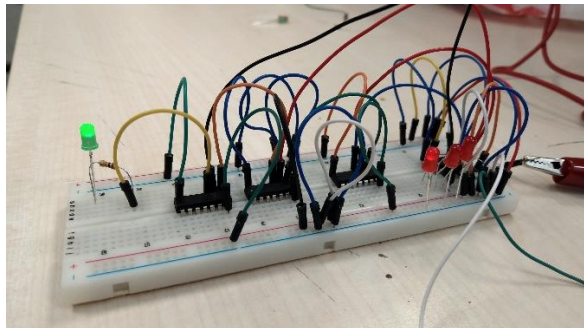
S:0 C:0 R:1 H:0



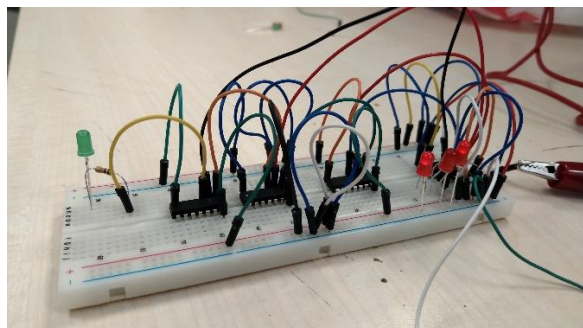
S:0 C:1 R:0 H:0



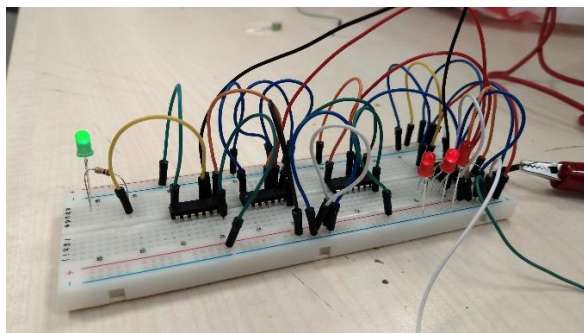
S:0 C:1 R:1 H:0



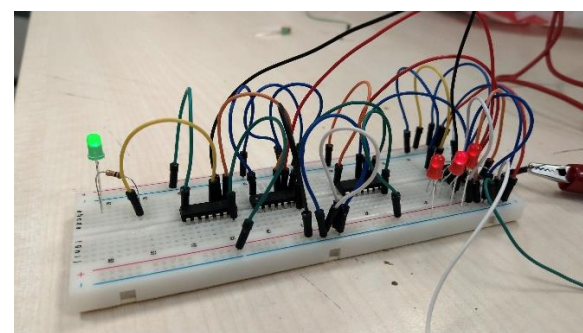
S:1 C:0 R:0 H:1



S:1 C:0 R:1 H:0



S:1 C:1 R:0 H:1



S:1 C:1 R:1 H:1

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- Because of using the signal generator and 4-bit converter we obtain the current behaves in a way like 0 and 1 s so LEDs are on and off according to these combinations like we thought while preparing the preliminary lab report.

- **Conclusion**

- I learnt how to use 4-bit converter which I thought very hard when I read the datasheet but in the it seems much easier than what I expected. I learnt how to use LEDs in circuit and it is possible to burn them so because of that I used resistors not to burn other LEDS. Most import thing I learnt is how to read the datasheets and according to that how to use the components. Thanks to this week's class and lab I learn how to write and read Karnaugh Map which makes my circuit easier.