

EEE 102

LAB 3

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Class code and section: EE-102-01

Purpose of Lab:

This lab's goal is to use a counter to create a combinational logic circuit on a breadboard. Additionally, become familiar utilizing signal generation for controlling the counter.

Design Specification:

The circuit in this lab will be created to handle the issue covered in the previous lab. When four coins are tossed, the game is won if at least two of them land on their heads consecutively. This is represented by a red led.

$$f(\text{Led } 0, \text{Led } 1, \text{Led } 2, \text{Led } 3) = (\text{Led } 0 \text{ and } \text{Led } 1) \text{ or } (\text{Led } 1 \text{ and } \text{Led } 2) \text{ or } (\text{Led } 2 \text{ and } \text{Led } 3)$$

Input Leds				Output Led that indicating the win status
Led 0	Led 1	Led 2	Led 3	Red Led
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

Table 1: Truth table of win condition represented on red led

Methodology:

First, the 74HC/HCT 163 counter is installed to breadboard. Then GND pin to ground; VCC, MR, CEP, CET, PE pins are connected to high voltage value. In addition, the CP pin is connected to the signal generator that generates a square signal. Then, the flip-flop outputs were checked with the help of an oscilloscope whether they were working properly or not. Then 74 LS/HC 08 Quad 2-input AND gate and 74 LS/HC 32 Quad 2-input OR gate are installed on the breadboard. The previously checked outputs were connected to the necessary places, and then the first outputs and the last output were connected to the leds for observed. Also Output Waveform observed with oscilloscope.



Picture 1: Output Waveform

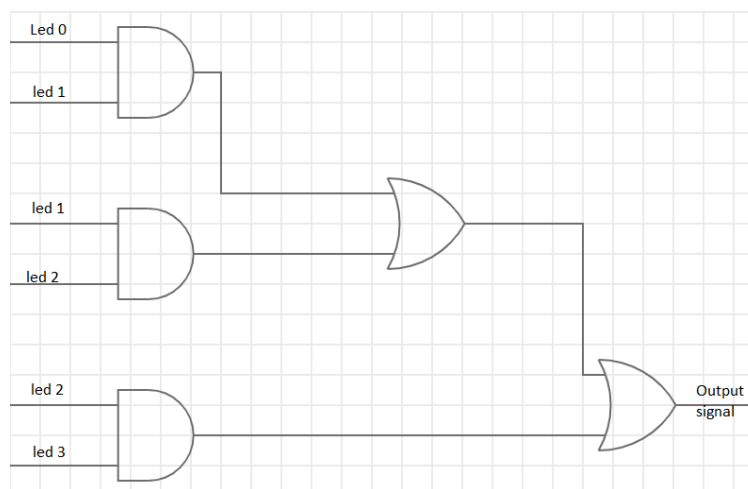
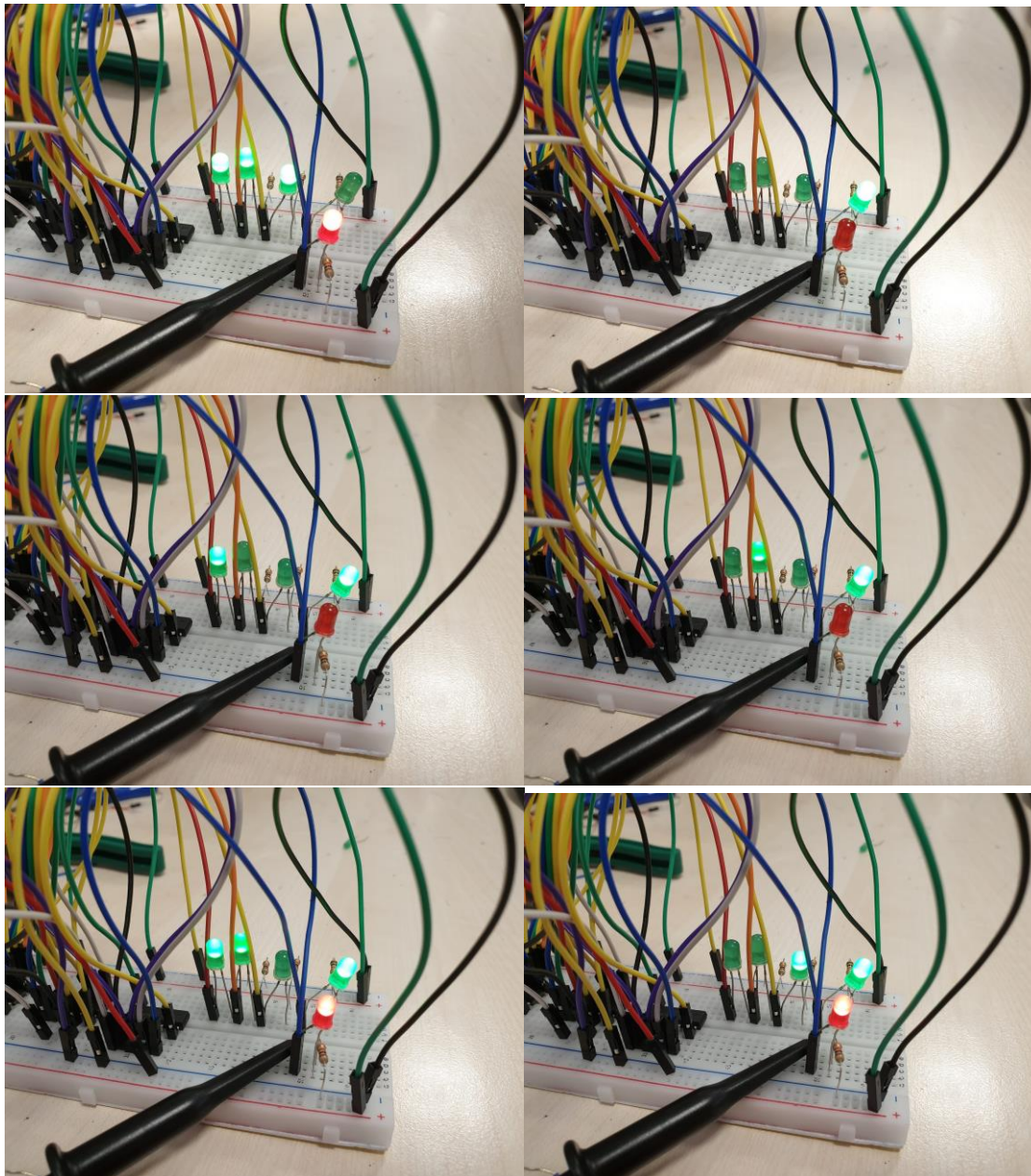


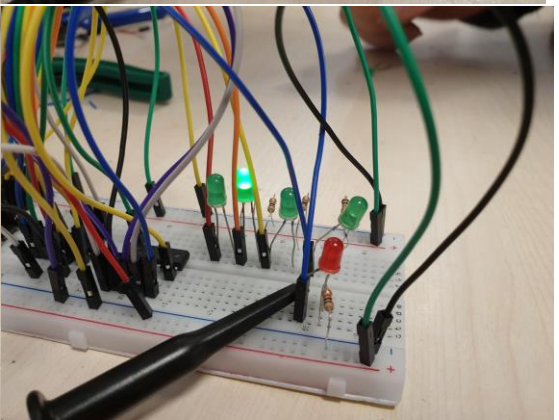
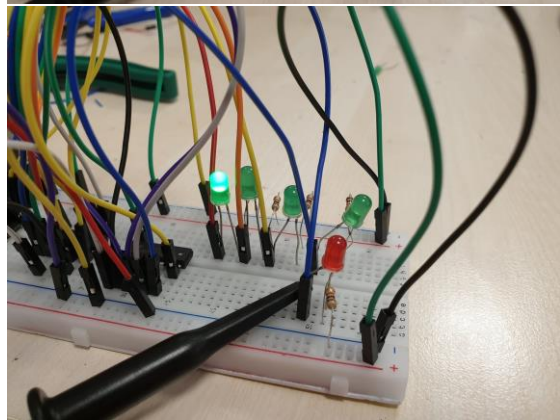
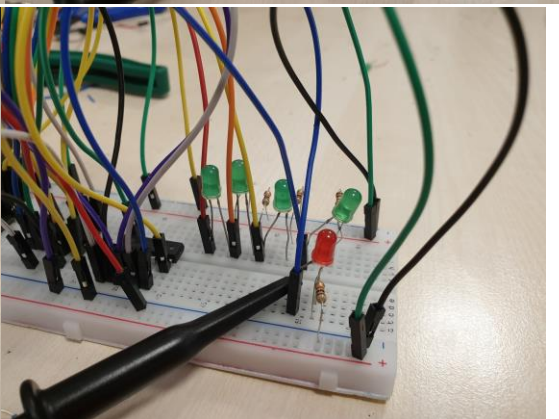
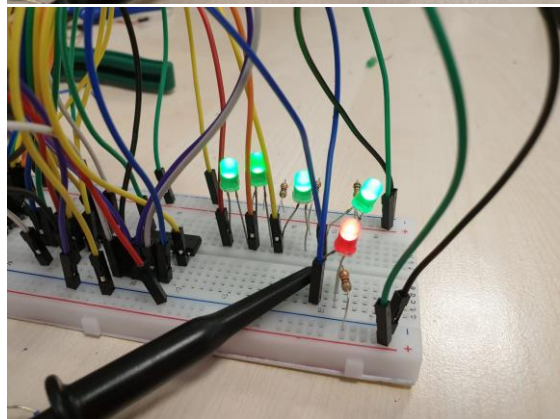
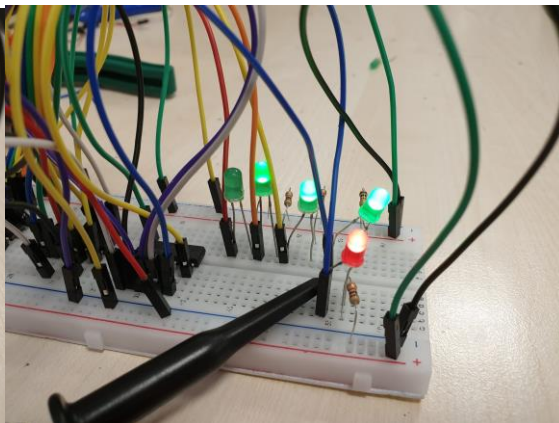
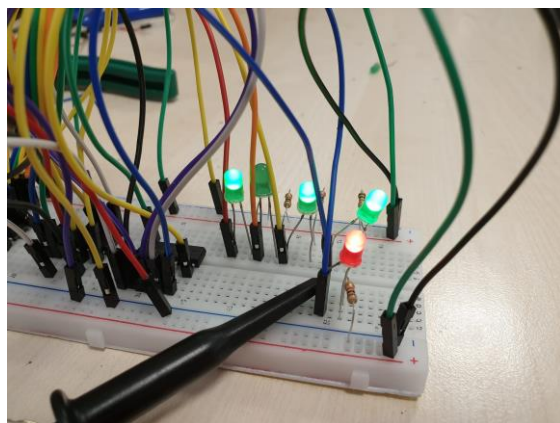
Table 2: Logic circuit of the function

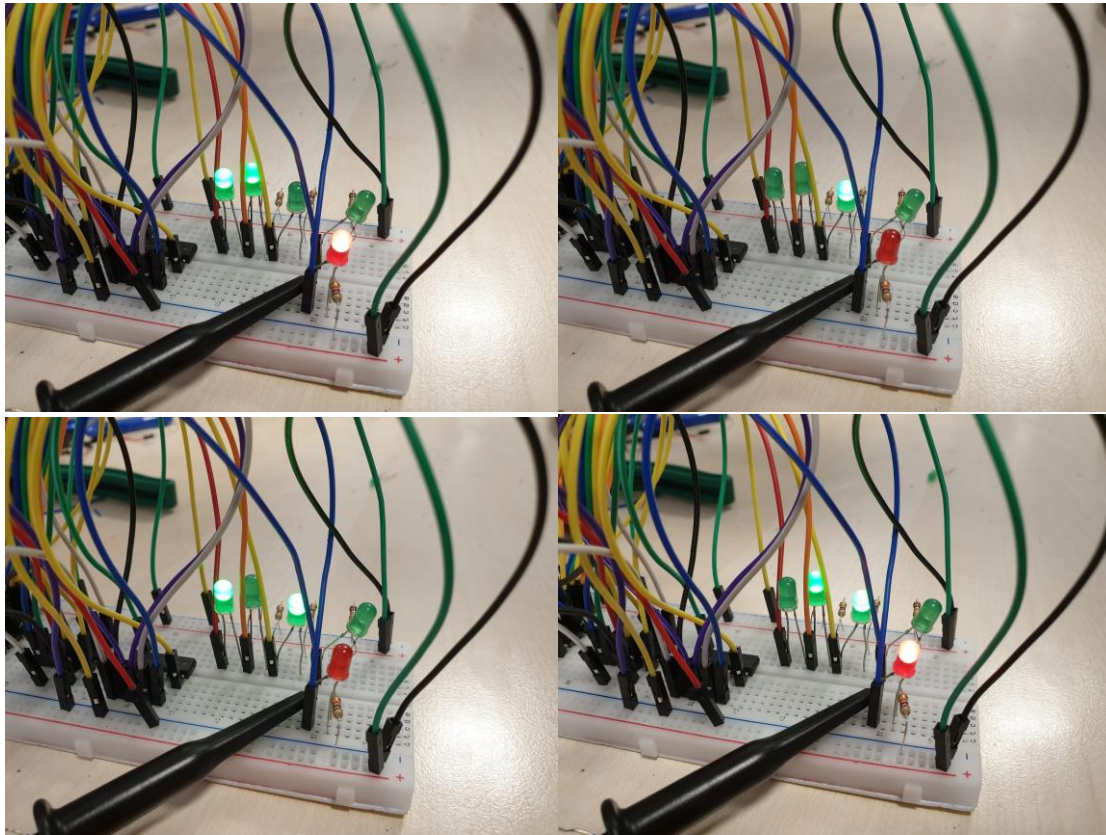
Conclusion:

Parts are successfully installed on the breadboard. Expected values were measured successfully and clock usage with the 74HC/HCT 163 was learned with how to connect logic circuits with output pins. In the last phase of the lab, the output led showed the expected behavior. Therefore, we can say that the Lab was successful.

Appendices:







Picture 2: Pictures of all situations

74HC/HCT 163 Datasheet:

<https://www.alldatasheet.com/view.jsp?Searchword=74hc163%20datasheet&gad=1>

74 LS/HC 08 Datasheet:

<https://www.alldatasheet.com/view.jsp?Searchword=74hc08%20datasheet&gad=1>

74 LS/HC 32 Datasheet:

<https://www.alldatasheet.com/view.jsp?Searchword=74hc32%20datasheet&gad=1>