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Section 2

# EEE-102 LAB3 REPORT
## Combinational Logic Circuits

### *Purpose*

The purpose of this experiment was to learn the implementation of combinational logic circuits on breadboards,the placement of gates and to learn how to connect wires correctly in order to get a functioning circuit. Also to show the voltage values that is logic values using leds. Signals were obtained from a 4-bit counter (74HC/HCT163) connected to signal generator.

### *Circuit Details-Methodology*

In my design, I used two 2-input OR gates integrated in one IC (74 LS/HC 32) and one 2-input NAND gate (74 LS/HC 00). I worked with 4 signals coming from 74HC/HCT163 respectively x1,x2,x3,x4. Two signals x1 and x2 ORed together as well as x3 and x4. Both OR gates are connected to the NAND gate.(Fig 1) I simulated the truth table using 4 red LEDs for each output signal of 4-bit counter. The logic values of each OR gate are simulated by Green LEDs and the final output is again showed with a red LED.(Fig 2) After each implementation I checked signals using oscilloscope.

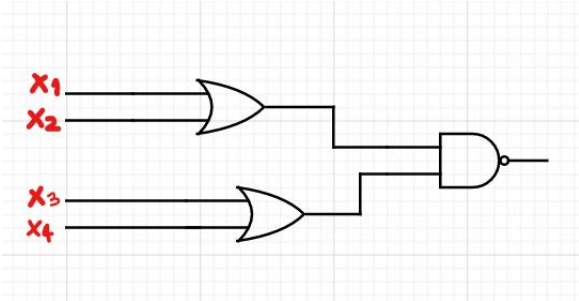


*Fig.1 Schematic Representation of the Circuit*

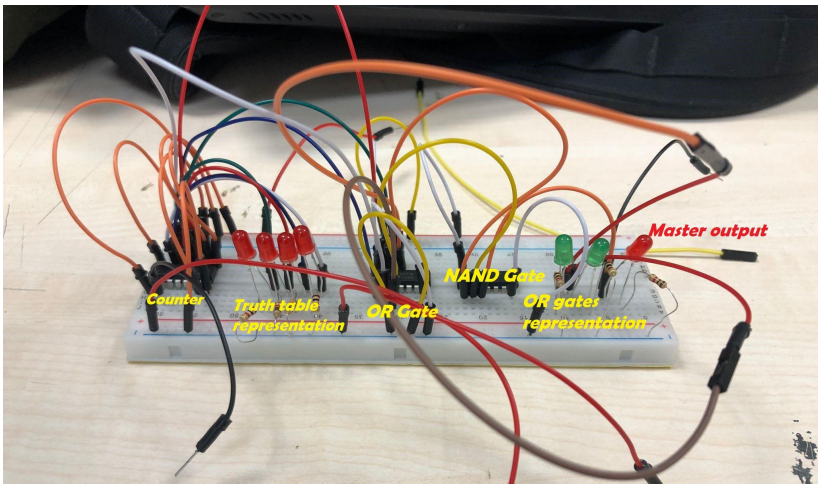


*Fig.2 Breadboard Design*

The truth table that I made manually ( table 1) was compatible with the LED sequence on the circuit.

| **INPUTS** | | | | **1st OR GATE** | **2nd OR GATE** | **MASTER OUTPUT** |
|---|---|---|---|---|---|---|
| X1 | X2 | X3 | X4 | X1 + X2 | X3 + X4 | ((X1 + X2) * (X3 + X4))' |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 |

*Table-1 Truth Table of the Circuit*

The representation of the truth table above can also be seen from the figure below. The rest can be found in Appendix.

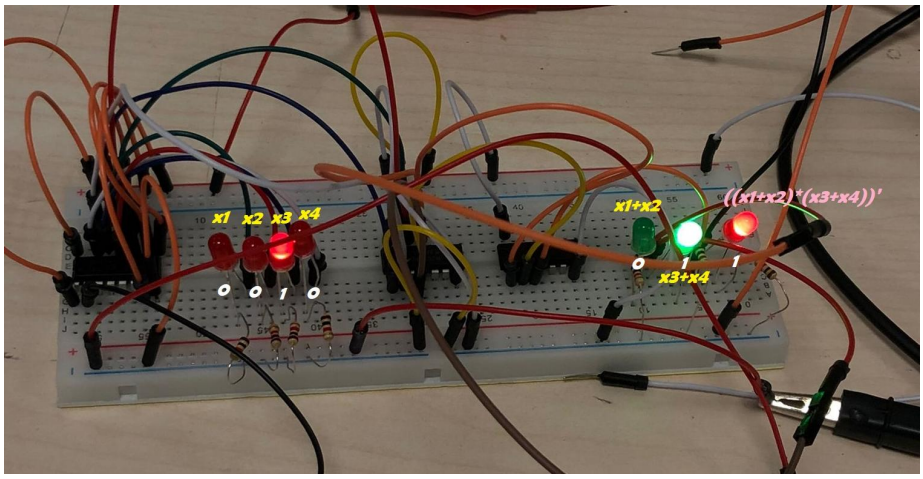


*Fig.3 Respresentation of the Truth Table*

## *Results*

After completing the circuit, I connected the final output to the oscilloscope. The signal that I measured was competible with the blink of the master output LED as can be seen from Figure 4.

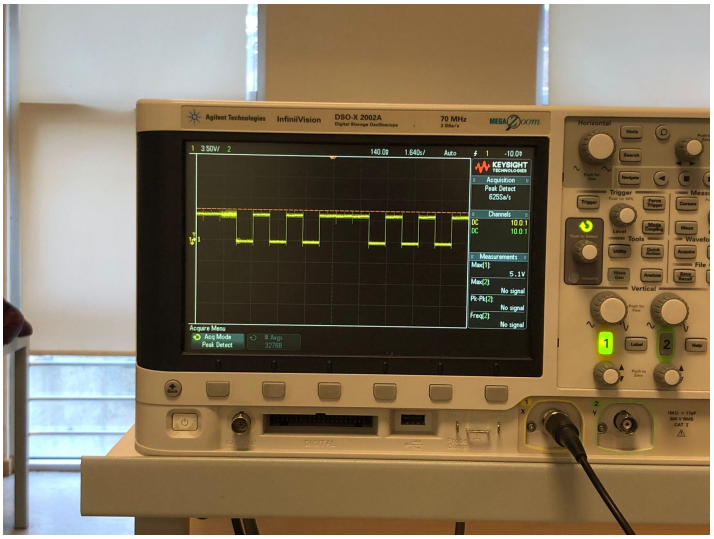


*Fig.4 Oscilloscope Screen*

## *Conclusion*

While conducting this experiment I had really hard time while trying to work the NAND LED. At the end it turned out that my IC was not working properly. While working with the breadboard, since it is very hard to detect the source of the problem I measured the voltage values using oscilloscope probe to detect the problem. In the end I managed to put on a working combinational logic circuit and learned how to deal with a breadboard.

*Appendix*