DIGITAL ELECTRONIC CIRCUITS LAB

EXPERIMENT 3

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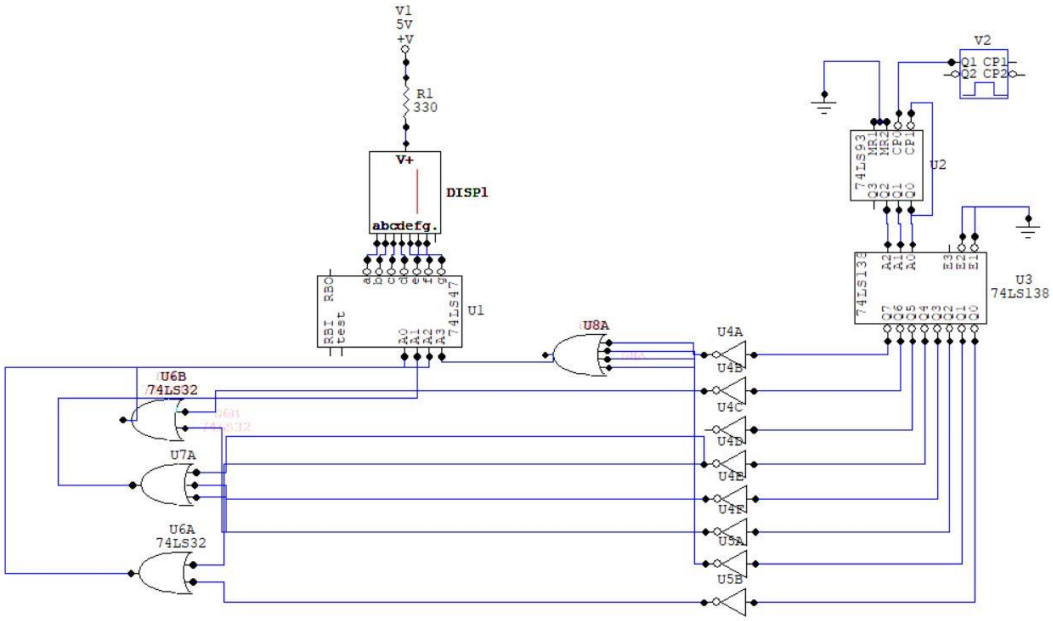
Objective

To display the 8 characters of roll number one after another using 74138 IC, 7447 IC, 7493 IC, 7-segment display and logic gates.

Circuit Diagram



Truth Table

In this experiment, $\langle Y_7, Y_6, Y_5, Y_4, Y_3, Y_2, Y_1, Y_0 \rangle$ denotes the complement of output from 74138 IC, and $\langle A_3, A_2, A_1, A_0 \rangle$ denotes the input to 7447 IC.

m	Y_7	Y_6	Y_5	Y_4	Y_3	Y_2	Y_1	Y_0	A_3	A_2	A_1	A_0
0	0	0	0	0	0	0	0	1	0	0	0	1
1	0	0	0	0	0	0	1	0	1	0	0	0
2	0	0	0	0	0	1	0	0	1	1	1	0
3	0	0	0	0	1	0	0	0	1	0	1	0
4	0	0	0	1	0	0	0	0	0	0	1	1
5	0	0	1	0	0	0	0	0	0	0	0	0
6	0	1	0	0	0	0	0	0	0	1	0	0
7	1	0	0	0	0	0	0	0	1	0	0	0

On simplifying, we get,

$$A_0 = Y_1 + Y_4$$

$$A_1 = Y_2 + Y_3 + Y_4$$

$$A_2 = Y_2 + Y_6$$

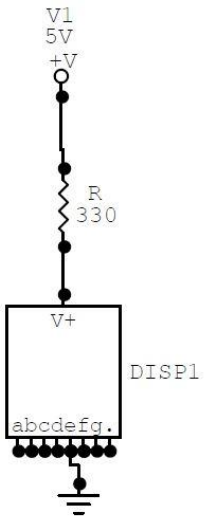
$$A_3 = Y_1 + Y_2 + Y_3 + Y_7$$

Results

During simulation, the circuit was observed to display the 8 characters of my roll number, i.e. **18EC3048** in a loop. The link for the simulation is given below.

https://drive.google.com/file/d/1PokoOQCX3zxJA7uVVybz_BRMssckjbhd/view?usp=sharing

Discussion:



- In this experiment, I simulated the circuit to display the eight characters of my roll number using a 7-segment display, a 7447 IC, a 74138 IC, a 7493 IC, a clock and few logic gates.
- A potential difference of about 1.6 V is required to light up a red LED.
- Calculating value of resistance R in the circuit:
    - The current in the circuit is bounded by 10 mA. The voltage supply was fixed to 5 V. Therefore, $R = \frac{5-1.6}{10}\frac{V}{mA} = 330\ ohms$
- The input of the 7-segment display is controlled using 7447 IC:
    - 7493 IC converts a digit to into its binary representation.
    - 74138 IC uses the binary representation to activate a particular terminal corresponding to the binary representation. In order to do this, firstly, the IC must be enabled. It is done by keeping the $\overline{E_1}$ and $\overline{E_2}$ to low and E_3 to high voltage.
    - 7447 IC is provided input using combinational logic on output of 74138 IC and encodes it to the 7-segment display input.
- A clock is provided as input to 7493 IC of least significant digit. The falling edge of the clock is employed as trigger for the IC.
- In order to map the characters with the counter, truth table was constructed.