DIGITAL ELECTRONIC CIRCUITS LAB
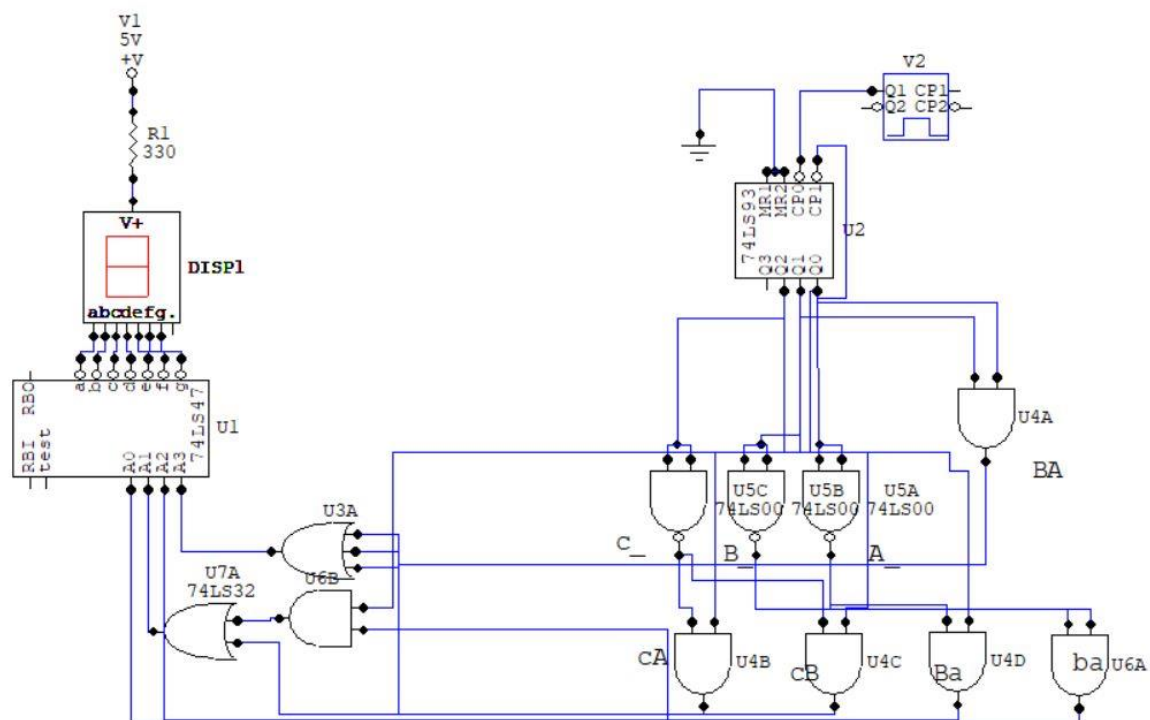
EXPERIMENT 2

Utkarsh Patel (18EC30048)

Objective

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

Circuit Diagram

Truth Table

In this experiment, $\langle C, B, A \rangle$ denotes the bits obtained from 7493 IC excluding the MSB. It is then mapped to $\langle Z, W, Y, X \rangle$ to represent the characters using logic gates.

m	C	B	A	Z	W	Y	X
0	0	0	0	0	0	0	1
1	0	0	1	1	0	0	0
2	0	1	0	1	1	1	0
3	0	1	1	1	0	1	0
4	1	0	0	0	0	1	1
5	1	0	1	0	0	0	0
6	1	1	0	0	1	0	0
7	1	1	1	1	0	0	0

K-maps

- **Z** $= AB + \bar{C}B + \bar{C}A$

C \ BA	00	01	11	10
0		1	1	1
1			1	

- **W** $= B\bar{A}$

C \ BA	00	01	11	10
0				1
1				1

- **Y** $= C\bar{B}\bar{A} + \bar{C}B$

C \ BA	00	01	11	10
0			1	1
1	1			

- **X** $= \bar{B}\bar{A}$

C \ BA	00	01	11	10
0	1			
1	1			

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/1q1_Y2Qxg5XZYKj0tljUsn2K595wZonjI/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 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 and 7493 IC.
  - 7493 IC converts a digit to into its binary representation.
  - 7447 IC is provided with this binary representation, and it maps it to the sequence needed to display a particular digit in 7-segment display.
- 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.
- The mapping was further simplified using K-maps. In this experiment, $\langle C, B, A \rangle$ denotes the bits obtained from 7493 IC excluding the MSB. It is then mapped to $\langle Z, W, Y, X \rangle$ to represent the characters.