REPORT ON ECE PROJECT

BTech/ II Year CSE/ III Semester

19ECE282/ Digital Electronics and Systems Lab

Final Project Review (Report)

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Question:

A vending machine supplies the following beverages: coffee, tea, milk and cocoa. The machine can be accessed only based on a 3-bit login and 2-bit password (only four valid users). If the user is authenticated properly, the machine will assert the following signals

(i)coffee_OK if coffee is chosen and display the character '1' in a seven segment display.

(ii)tea_OK if tea is chosen and display the character '2' in a seven segment display.

(iii) milk_OK if milk is chosen and display the character '3' in a seven segment display.

(iv)cocoa_OK if cocoa is chosen and display the character '4' in a seven segment Display.

(v) The display will show "E" in case of wrong login/password.

Components Used:

- ❖ NOT gates–3
- ❖ 3-input AND gates–4
- ❖ 7 Segment Display – 2
- ❖ Resistor (1 k-ohm) – 8
- ❖ Breadboard – 2
- ❖ Digital IC Trainer – 1
- ❖ Connecting wires – as required

Details of Hardware Used:

I.   7 Segment Display :–
The 7-segment display consists of seven LEDs arranged in a rectangular fashion. Each of the seven LEDs when illuminated the segment forms part of a numerical digit to be displayed. An additional 8th LED is sometimes used within the same package allowing the indication of a decimal point, (DP) when two or more 7-segment displays are connected together to display numbers greater than ten.
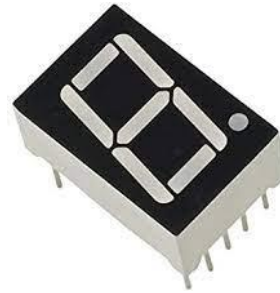
II. Resistor (1 k-ohm) :–
A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as a transistor.


III. 3-input AND gate(7411):–
A three-input gate has eight possibilities (000, 001, 010, 011, 100, 101, 110, and 111) for input states. The number of possible input states is equal to two to the power of the number of inputs: This increase in the number of possible input states obviously allows for more complex gate behavior.
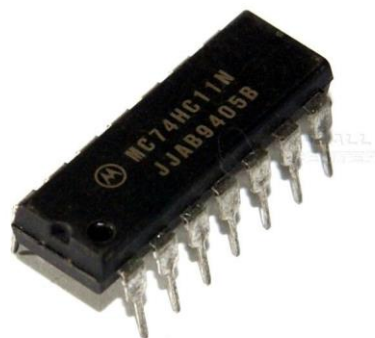
IV.   OR gate():–

An OR gate is a digital logic gate that gives an output of 1 when any of its inputs are 1, otherwise 0. An OR gate performs like two switches in parallel supplying a light, so that when either of the switches is closed the light is on.
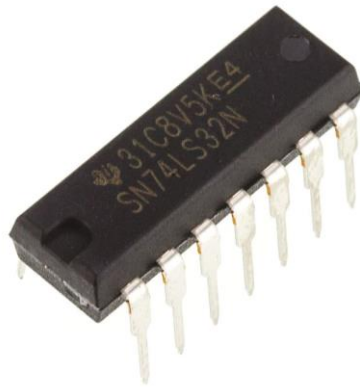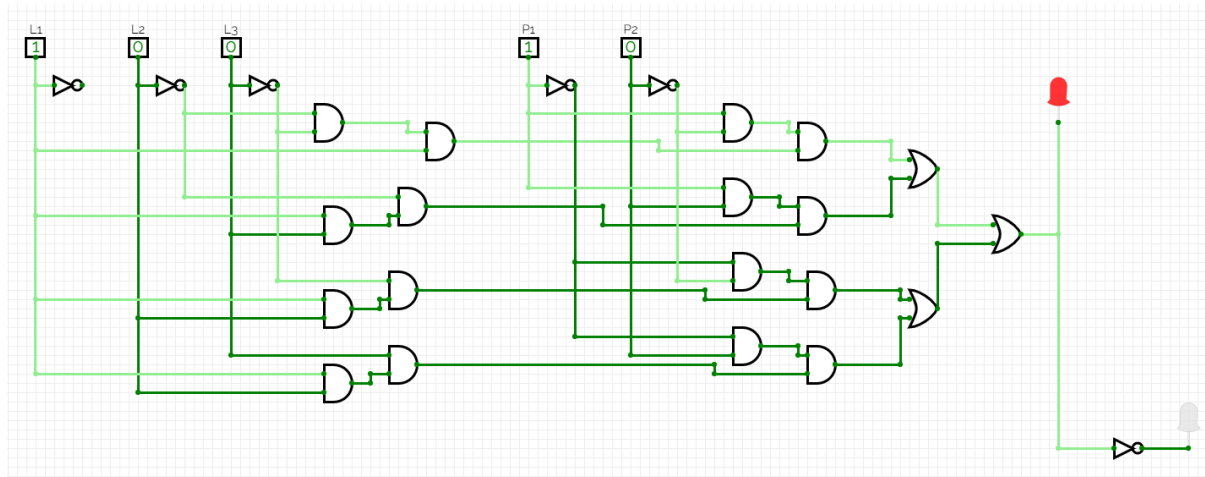

Design Diagram:

Our design should be valid to 4 users.

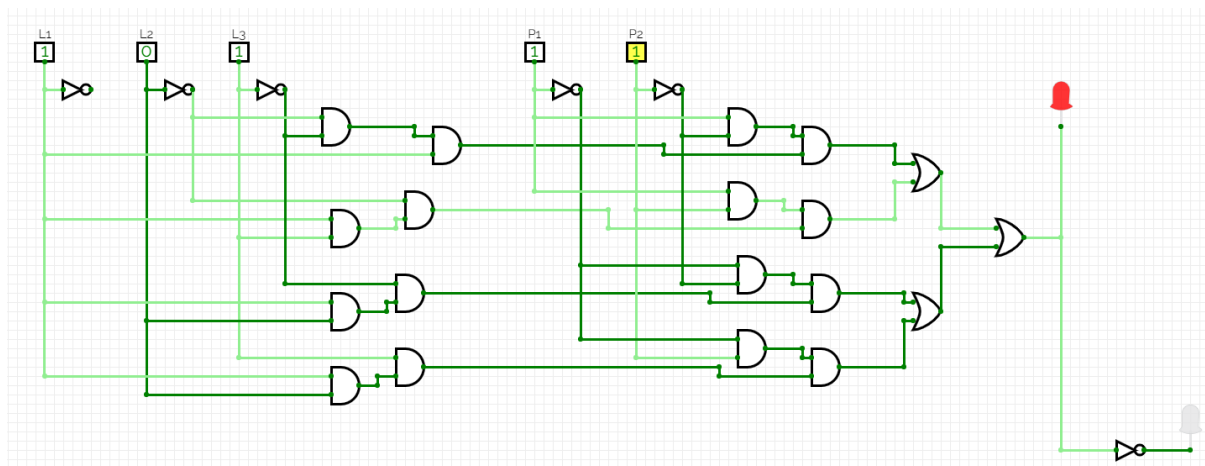| 3-bit login			2-bit password	
1	0	0	1	0
1	0	1	1	1
1	1	0	0	0
1	1	1	0	1

So the four cases of the design are as follows..
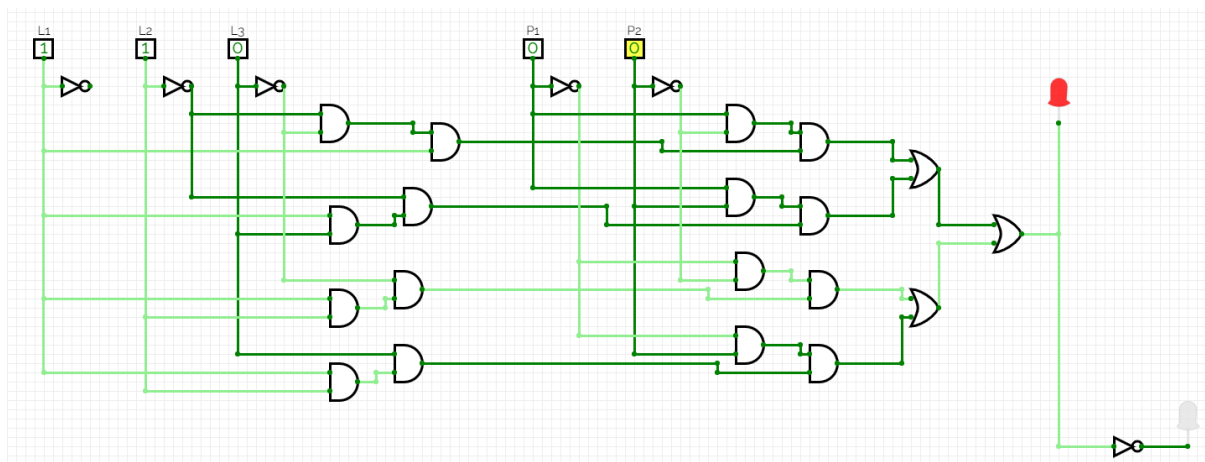
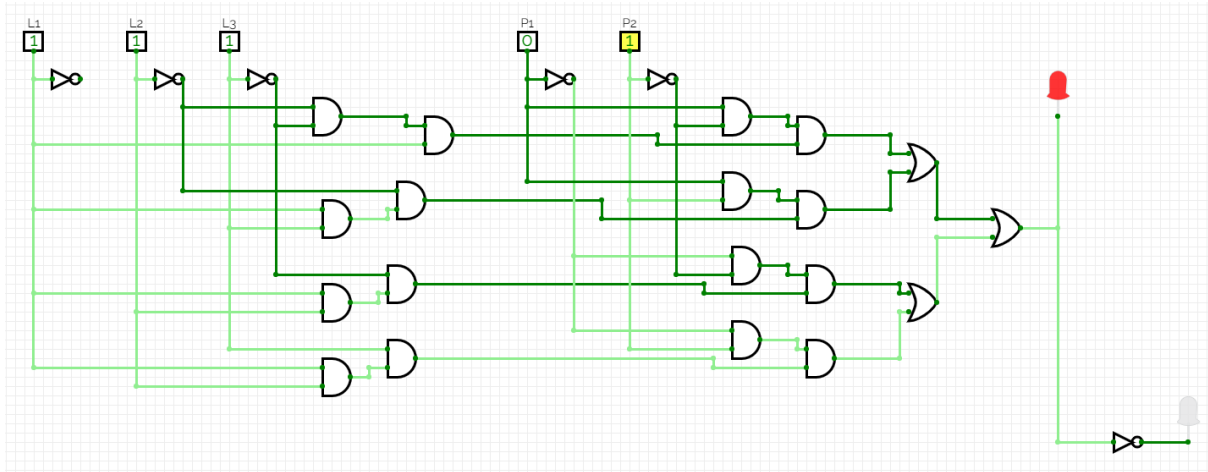## **Simulation Results:**

1. *Case 1 –*

2. *Case 2 –*

3. *Case 3 –*

4. *Case 4 –*

Now after verifing the login the user will have four options to select

Namely,

       1-for coffee
       2-for tea
       3-for milk
       4-for cocoa

which will be displayed on the 7-segment display.

k-maps for all the 7 LEDs in 7-segment display are as follows:

For a:

AB\CD	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	X	X	X	X
10	1	1	X	X

$$F(ABCD) = \neg B \neg D + C + BD + A$$

For b:

AB\CD	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	X	X	X	X
10	1	1	X	X

F(ABCD)=   ¬B   + ¬C¬D
    + CD

For c:

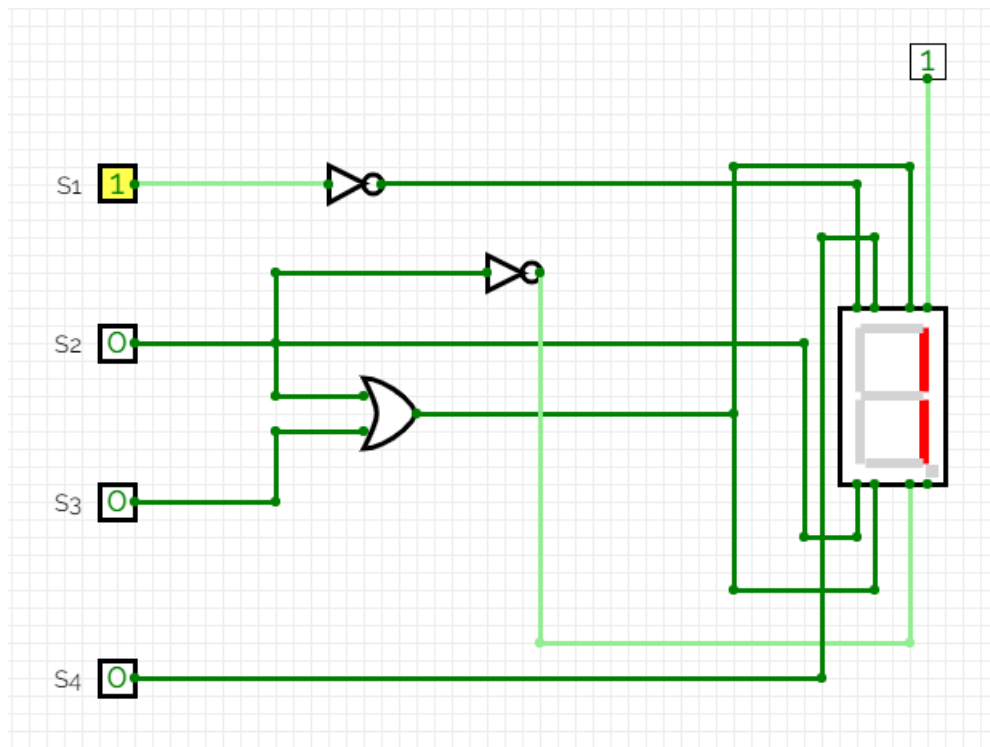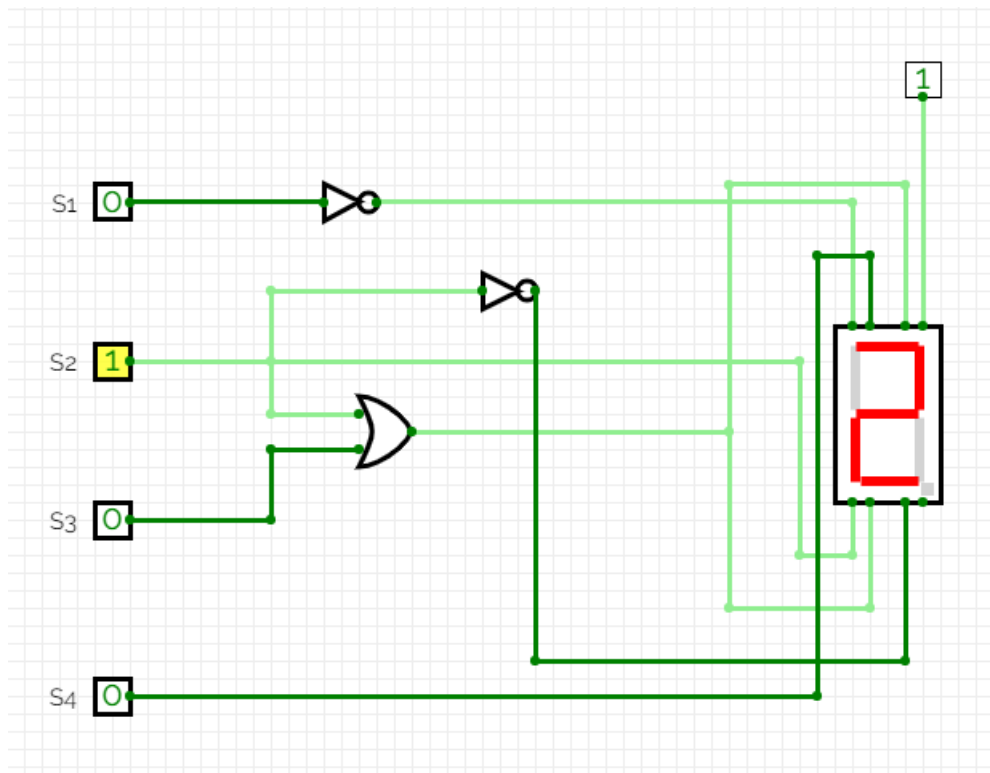| AB\CD	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

F(ABCD)=   ¬C   + D
    + B

For d:

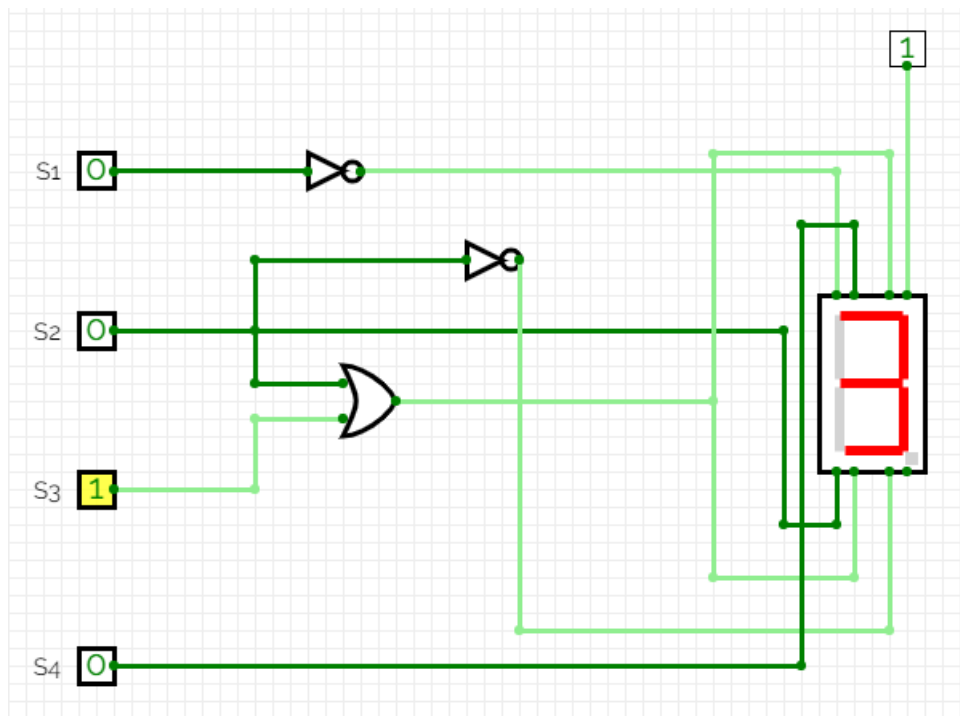| AB\CD	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	X	X	X	X
10	1	1	X	X

F(ABCD)=   ¬B¬D   + ¬BC
    + B¬CD   + C¬D   + A

For e:

AB\CD	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	X	X	X	X
10	1	0	X	X

F(ABCD)=   ¬B¬D   + C¬D

For f:

AB\CD	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

F(ABCD)=   ¬C¬D   + B¬C
    + B¬D   + A

For g:

AB\CD	00	01	11	10
00	0	0	1	1
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

F(ABCD)=   ¬BC   + B¬C
    + A   + B¬D
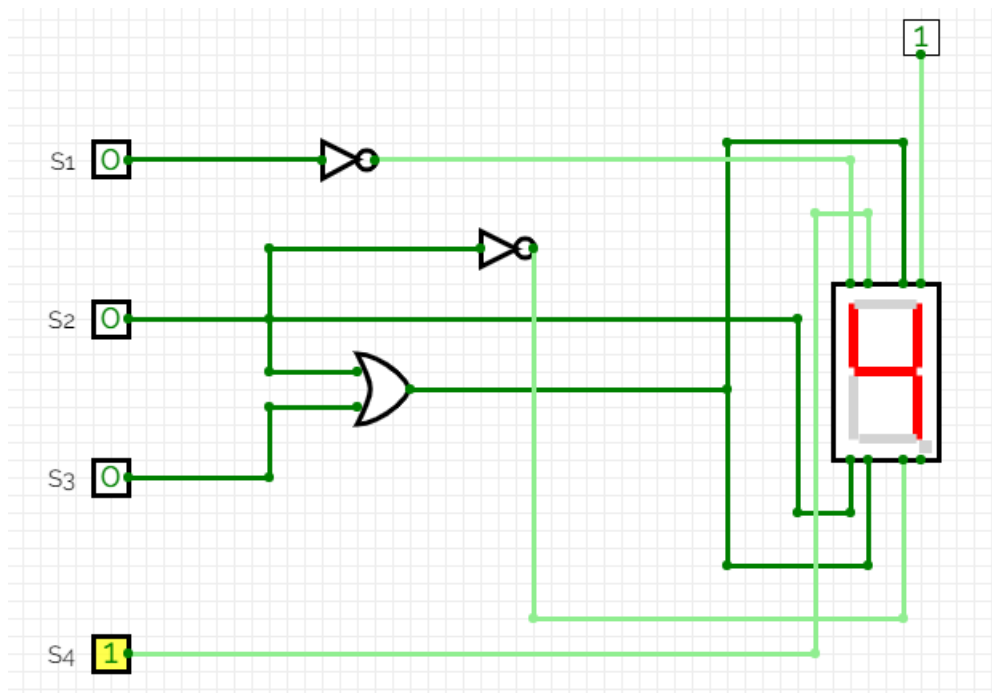
1. *Case 1 –coffee*

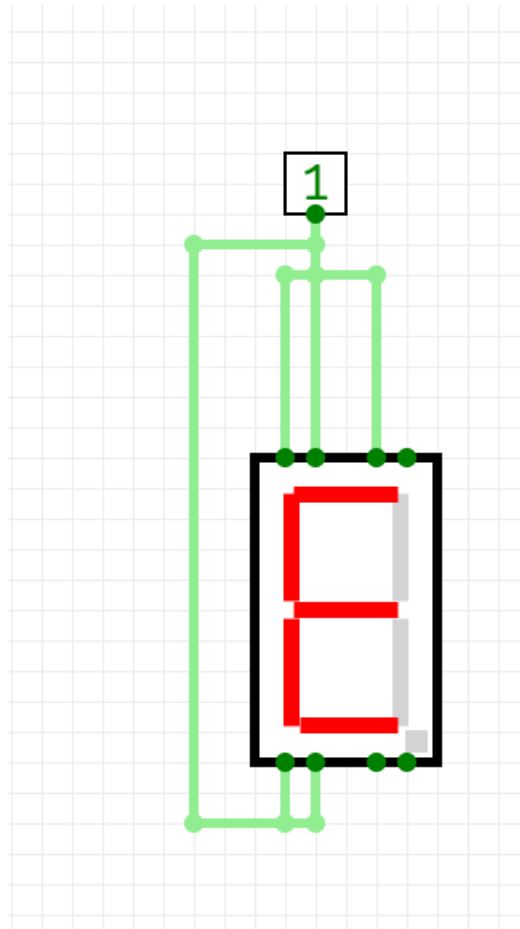2. *Case 2 –tea*

3. Case 3 – milk
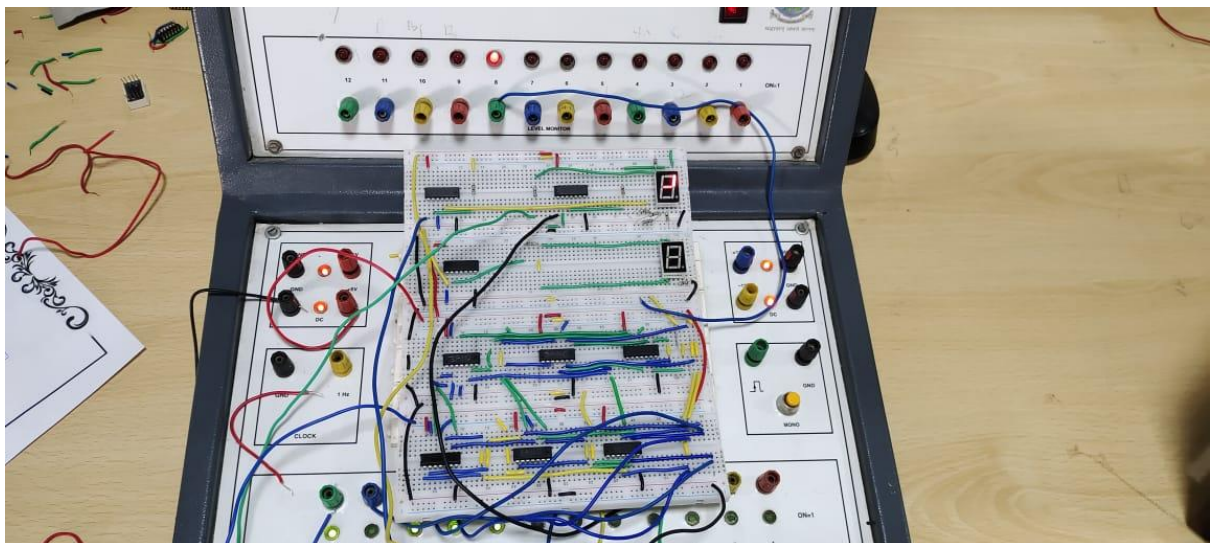

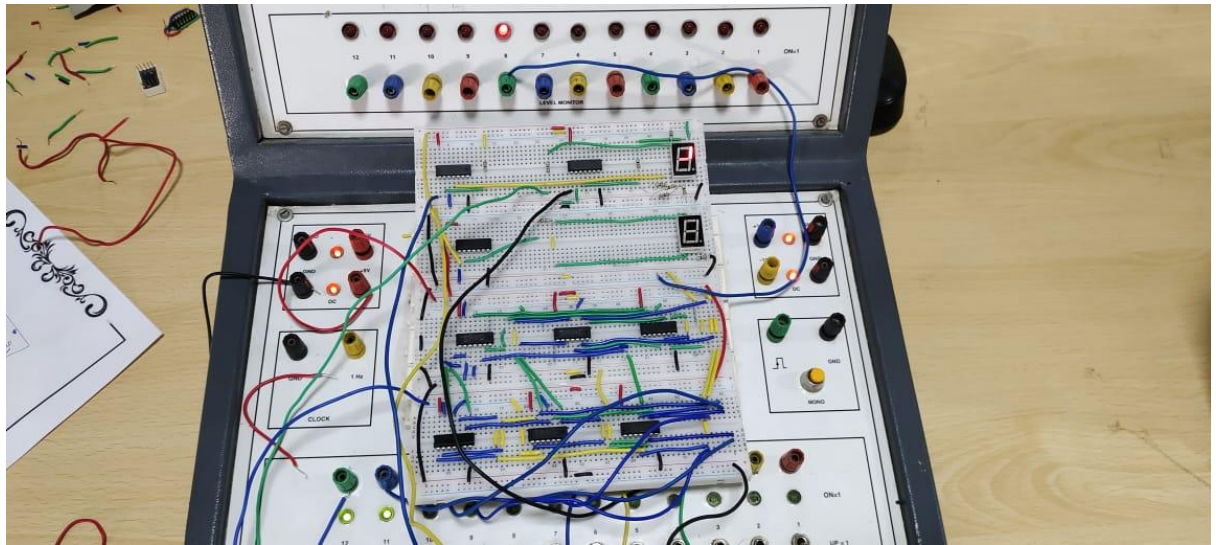## 4. Case 4 – cocoa

And an exception case, where user enters wrong login…
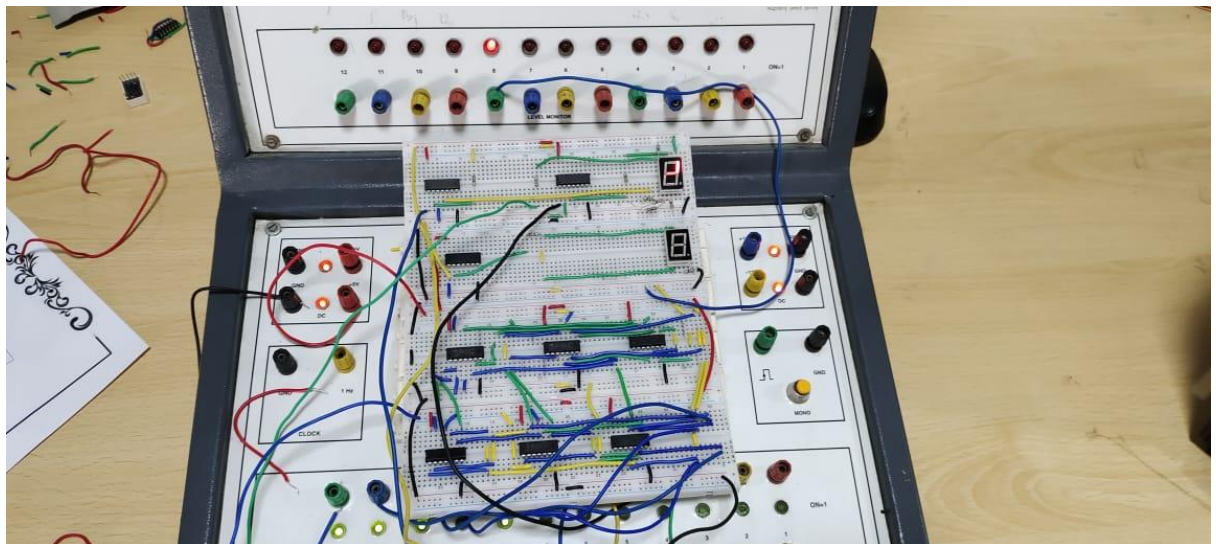
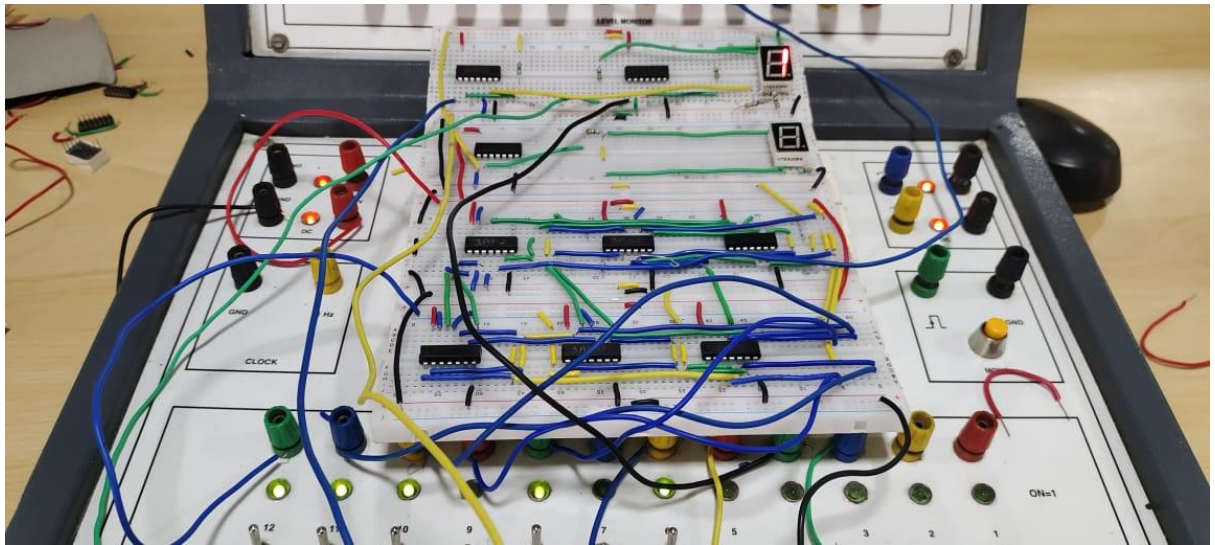*Case :–*

Hardware Output:
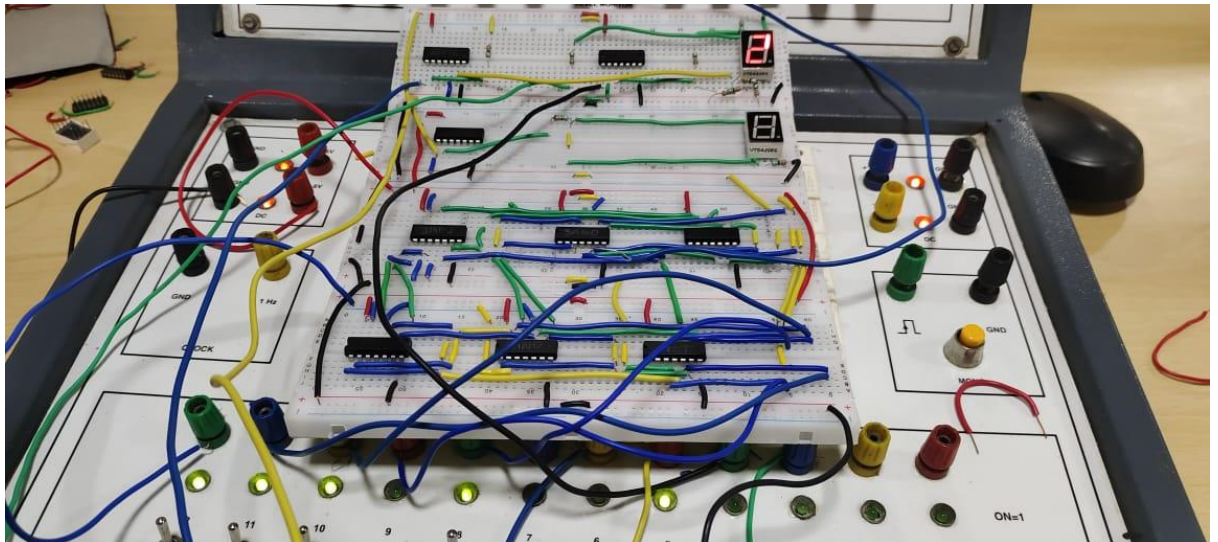
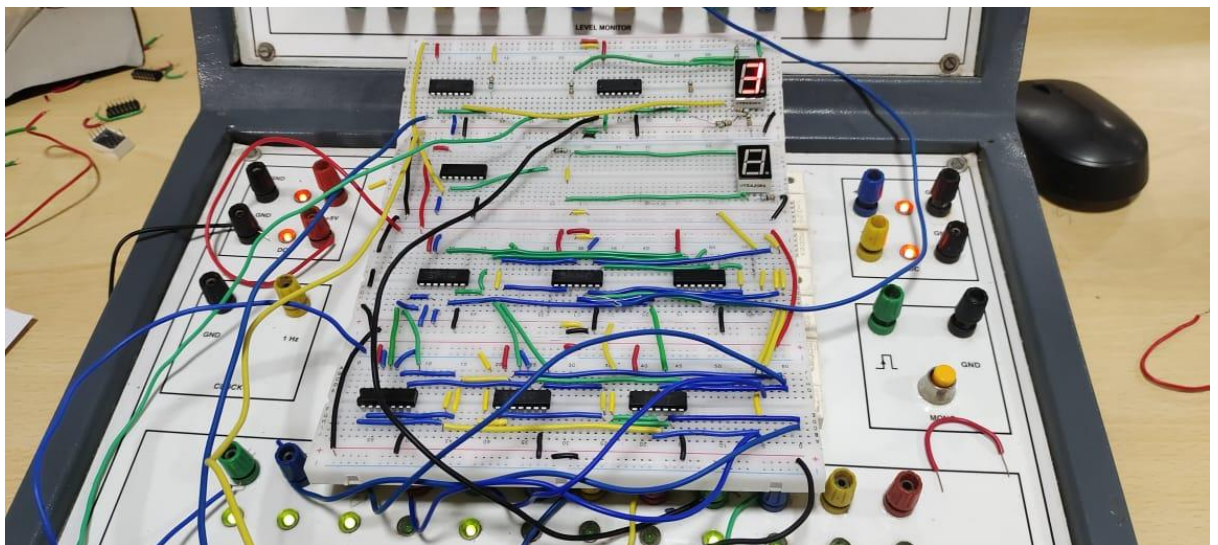*1.Case 1 –*

2.Case 2 –
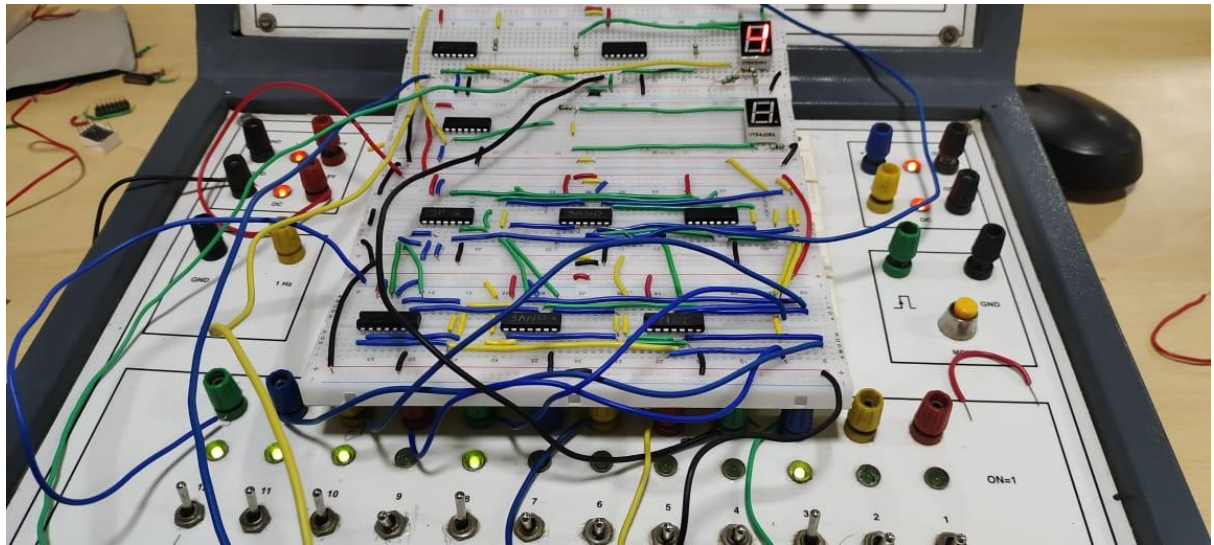

3.Case 3 –

4. Case 4-

5. Case 5-

6. Case 6-

7. Case 7-

RESULT:-

A combinational circuit that operates a vending machine when the user gives the correct user's name and password its login into the vending machine. When the chooses: coffee 1 is displayed, tea 2 is displayed, milk 3 is displayed, cocoa 4 is displayed in the seven-segment display. The outputs are verified and observed that it matches with the simulation results.

Vending machine project has been completed and all the test cases and outputs are verified.