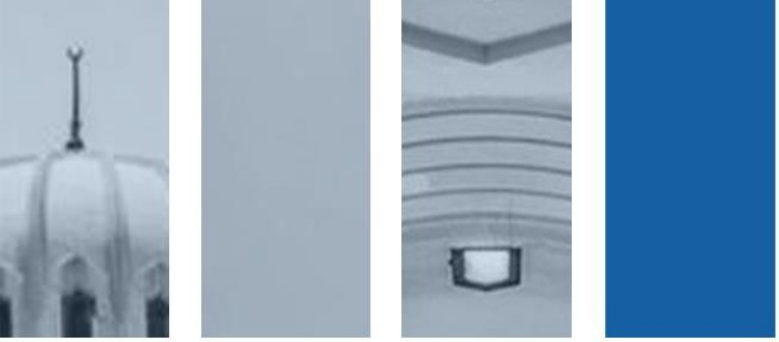

PROJECT A SUBMISSION

Program: Computer Engineering and Software Systems

Course Code: CSE111

Course Name: Digital Design

Examination Committee

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1.0 Project Description:

The objective is to design and implement a digital circuit that acts like a digital lock for a safe which accepts a binary passcode, compare it to a preset code by a comparator and takes an action depending on the validity of the entered value. If a wrong code is entered for three successive trials, the lock should no longer accept a new value unless a Reset switch is pressed.

2.0 Project Requirements:

1. A 3-bit binary passcode is entered through switches (Preferably dipswitches for ease of use). The preset code is also adjusted through dipswitches.
2. A switch is used to pass the input to the comparator via flip flops.
3. Wrong trials counter is incremented each time a code is passed and a false indication is given by the comparator. Ready-made counter IC could be used.
4. Output action is to illuminate a green LED in case of correct code or a red LED otherwise and another output LED is to be illuminated when wrong trials counter reaches three

3.0 Equipments Used:

(2) Dip Switch	(4 inputs)
(5) D-flipflop	(IC 7474)
(1) 2-input Xnor	(IC 74266)
(1) 3-input Nand	(IC 7411)
(1) Inverter	(IC 7404)
(1) And	(IC 7408)
(1) OR	(IC 7432)
(1) NOR	(IC 7402)
(2) Push Button	
(7) Resistance	(1kΩ)
(3) LEDs	
Male-Male wires	
Power supply(5v)	

4.0 Comparator:

Truth Table:

Password = $A_o\ A_1\ A_2$
Input = $B_0\ B_1\ B_2$

A_o	B_o	F1
0	0	1
0	1	0
1	0	0
1	1	1

A1	B1	F2
0	0	1
0	1	0
1	0	0
1	1	1

A2	B2	F3
0	0	1
0	1	0
1	0	0
1	1	1

F1	F2	F3	F
1	1	1	1
0	0	0	0
0	0	0	0
1	1	1	1

Kmaps:

	B_o`	B_o
A_o`	1	0
A_o	0	1

	B1`	B1
A1`	1	0
A1	0	1

	B2`	B2
A2`	1	0
A2	0	1

$F1 = A_o` B_o` + A_o B_o$

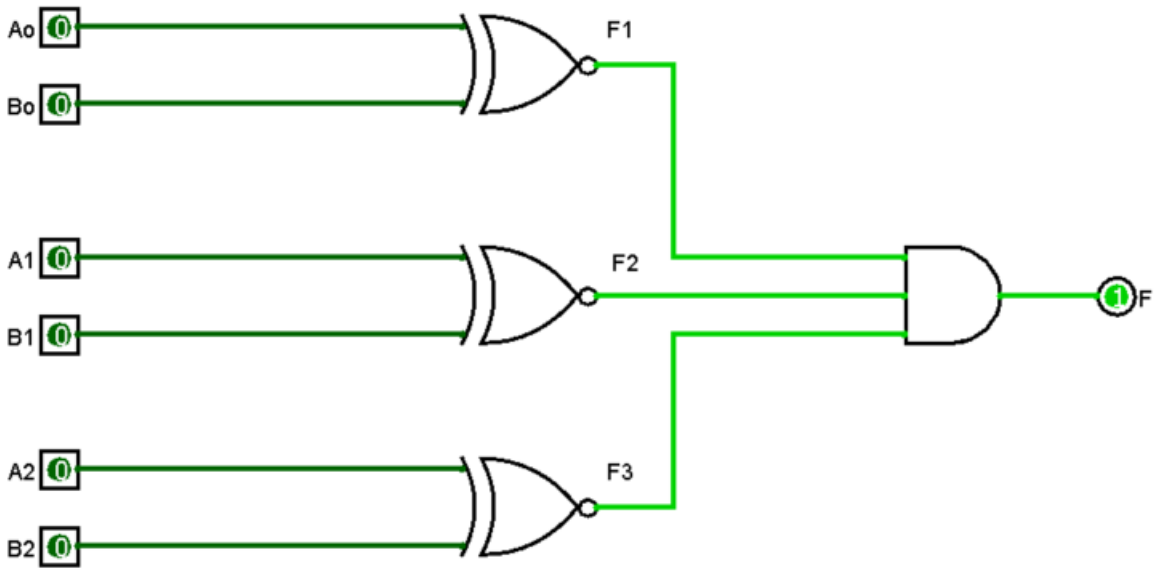
$F2 = A_1` B_1` + A_1 B_1$

$F3 = A_2` B_2` + A_2 B_2$

	F2`		F2	
F1`	0	0	1	0
F1	0	0	1	0
	F3`	F3		F3`

F = F1 F2 F3

Simulation:



5.0 Lock LED:

Truth Table:

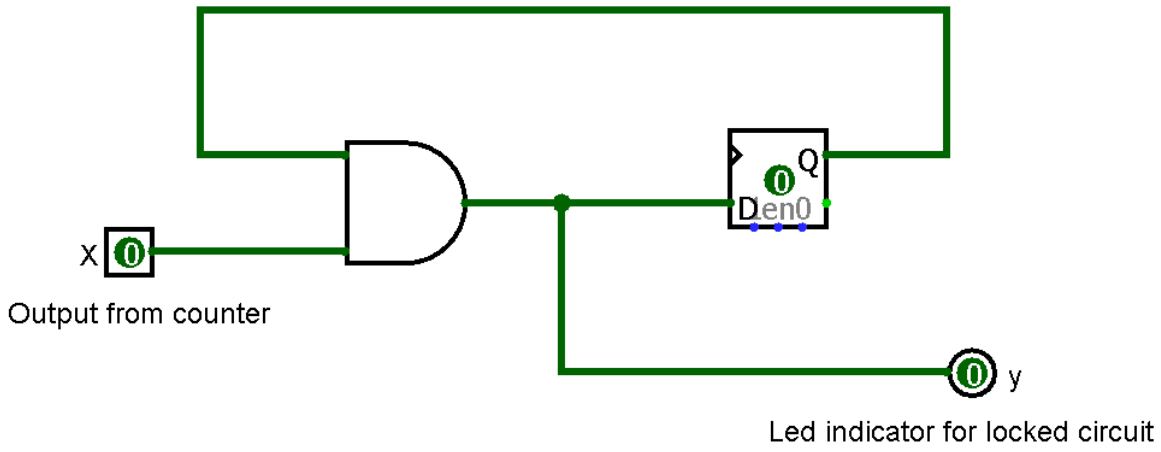
X	A	A^+	Y	D_A
0	0	0	0	0
0	1	1	1	1
1	0	1	1	1
1	1	1	1	1

Kmap:

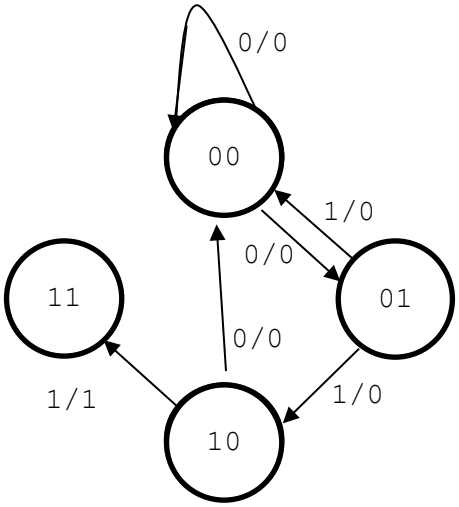
	A`	A
X`	0	1
X	1	1

$D_A = A + X$ $y = A + X$

Simulation:



6.0 Flip Flops:



Truth Table:

X	A	B	A^+	B^+	D_A	D_B	y
0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0
0	1	1	0	0	0	0	0
1	0	0	0	1	0	1	0
1	0	1	1	0	1	0	0
1	1	0	1	1	1	1	1
1	1	1	x	x	x	x	x

Kmap:

	A`		A	
X`	0	0	0	0
X	0	1	x	1
	B`	B		B`

$D_A = XA + XB$

	A`		A	
X`	0	0	0	0
X	1	0	x	1
	B`	B		B`

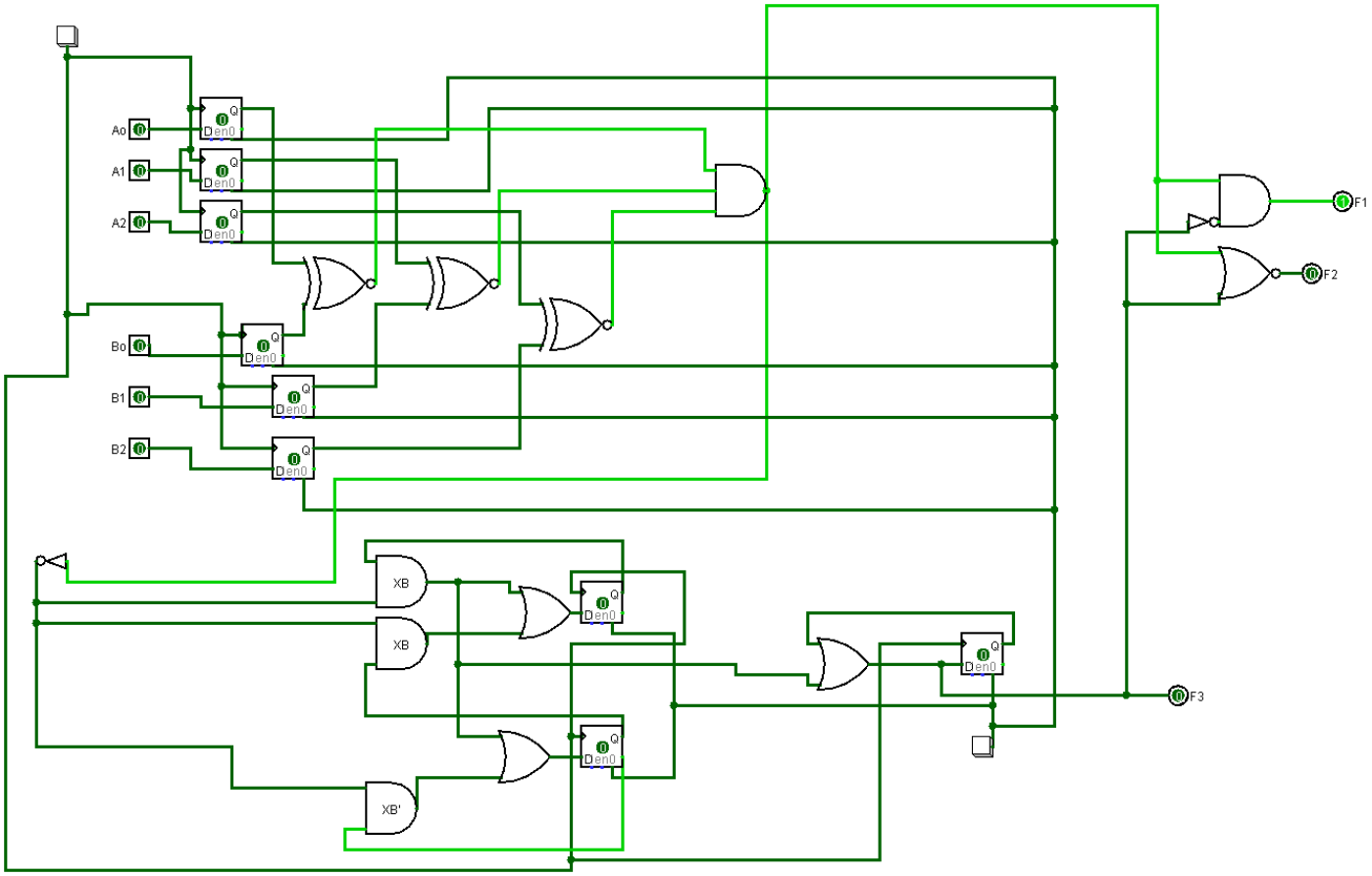
$D_B = XB`$

	A`		A	
X`	0	0	0	0
X	0	0	x	1
	B`	B		B`

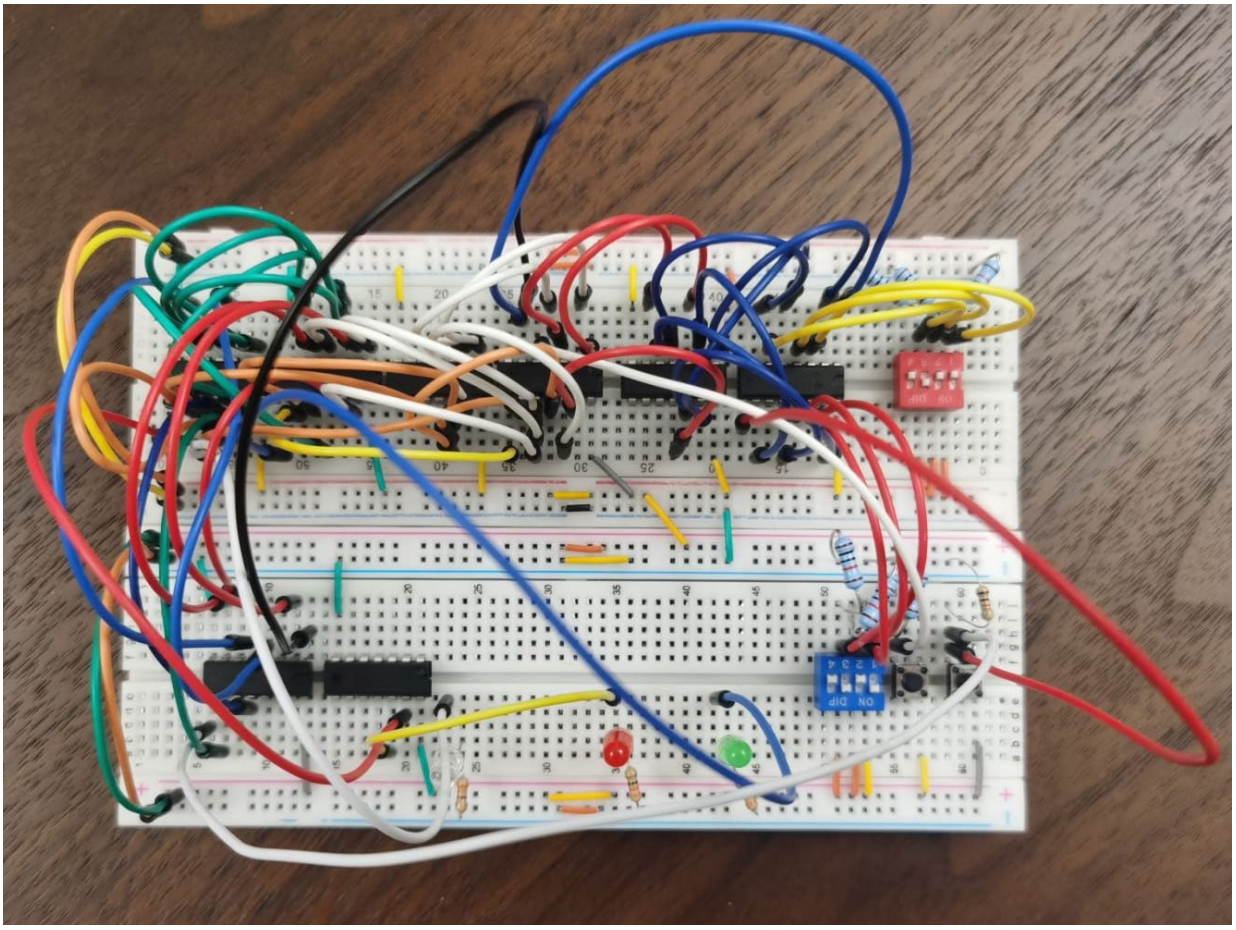
$y = XA$

7.0 Final Result:

Simulation:



Implementation:



Videos while circuit working:

https://drive.google.com/drive/folders/1zgUDWRA3RxaD7G7DkqcJwamPcUiSnO4s?usp=sharing