ADDIS ABABA UNIVERSITY

DIGITAL LOGIC DESIGN
GROUP PROJECT
TITLE : HOME ALARM SYSTEM

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Part I : Introduction

- ✓ A home alarm system is a sophisticated security system specifically designed to detect and promptly notify homeowners of any unusual activity or potential threats. Our project involved the development of three home security alarm systems.
- ✓ The first system we implemented was a door and window alarm system. This system utilized a PIR sensor to detect any movement or opening of doors and windows. If an attacker attempted to break in, the sensor would activate an alarm.
- ✓ The second system implemented was a fire detection alarm system. This system utilizes flame sensors to detect the presence of fire or smoke, promptly notifying homeowners of a potential fire threat.
- ✓ The third one was door lock system this one is really fascinating and active means of defending our house security in this system we utilized JK flip flops to tally how many times a mismatched password has entered if it is above or equal to Five times it will activate the alert cause some someone might be trying to break the lock mechanism for instance employing Brute Force Attacks.

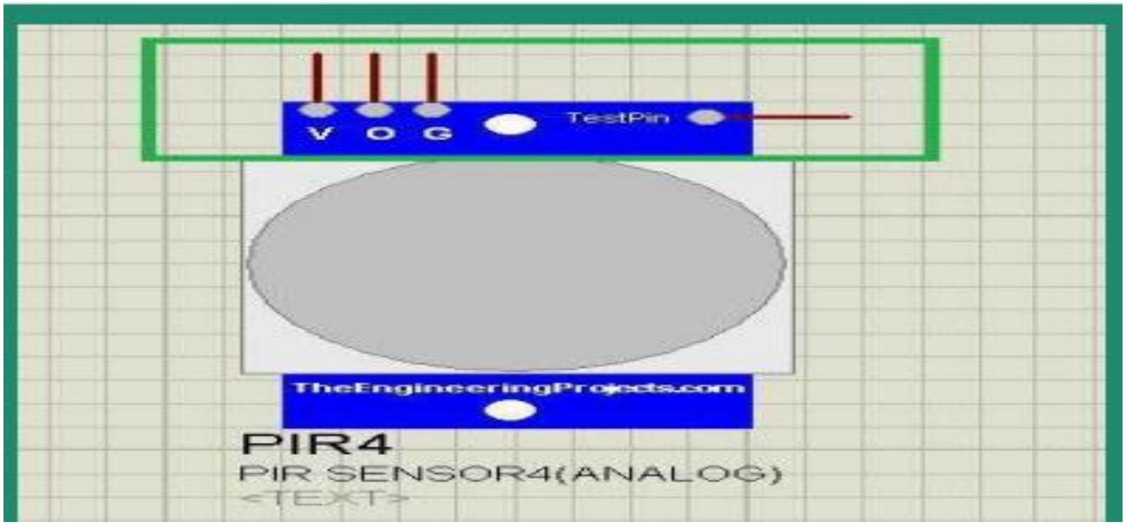
- This project is created using sensors, a buzzer, flip-flops, and logic gates for a basic home alarm security system. The system utilized flame and passive sensors, an infrared sensor, a buzzer, and basic logic gates.
- A home alarm system: is a sophisticated security system designed to safeguard your residence and individuals from unauthorized individuals. The system generally has a central control panel, sensors, and an alert. The control panel serves as the central processing unit of the system, overseeing the sensors and activating the alarm upon detecting an intruder.

The sensors:are placed throughout the home and include door and window sensors, motion sensors, and glass break sensors. These sensors detect any unauthorized entry into the home and send a signal to the controlpanel.

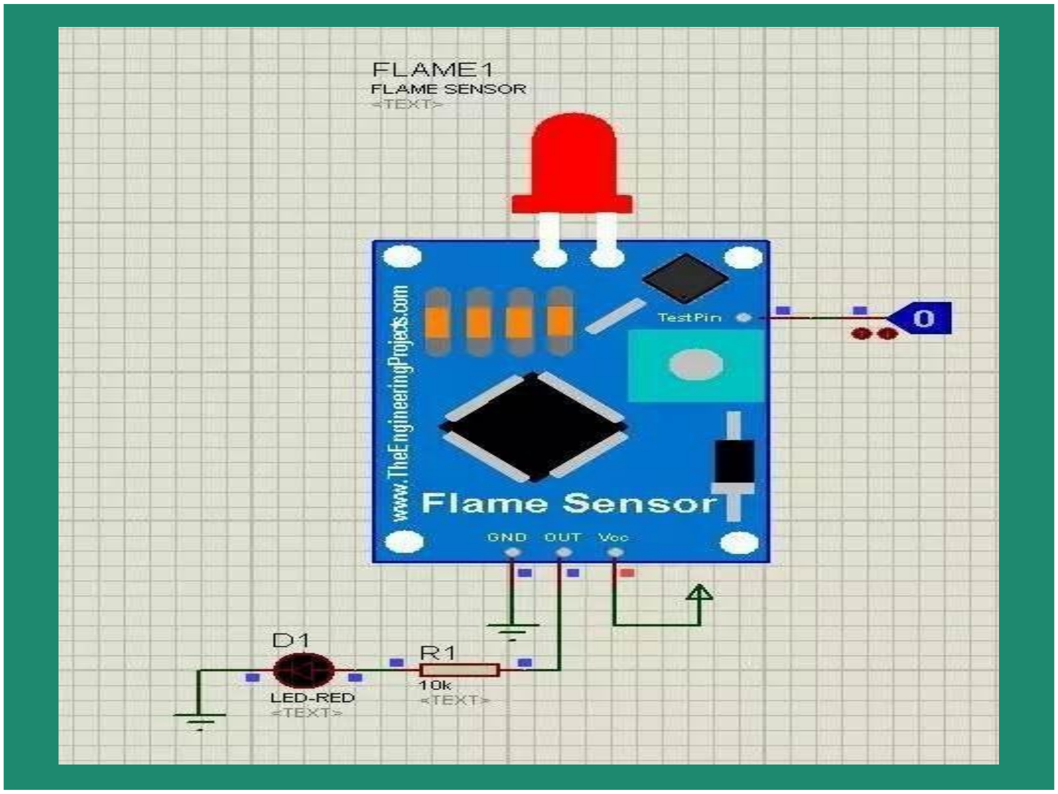
The alarm : An alarm is a loud audible signal that is activated when an intruder is detected. This alarm acts as a deterrent to potential burglars and notifies both you and your neighbors of the possible danger.

PART II: THEORY

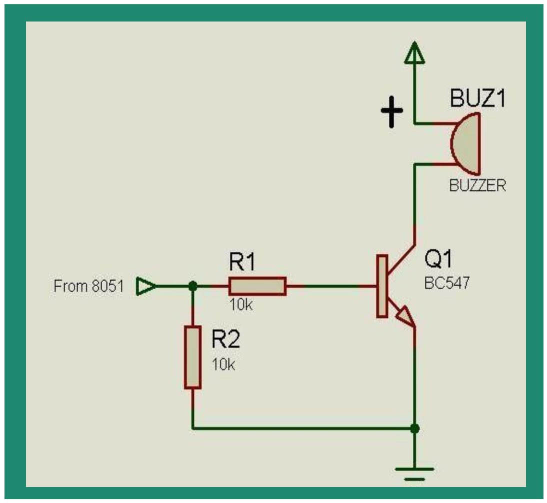
A PIR (PASSIVE INFRARED) SENSOR: is a motion sensor that detects changes in infrared radiation in the surrounding region. When an intruder reaches the region of the sensor, the sensor detects the changes in the IR radiation and triggers an alarm to notify the homeowner of potential danger. PIR sensors are often used in door and window alarms, and its advantage is that they can discern between human and animal movement, minimizing the chance of false alerts.



A FLAME SENSOR: is a sensor that detects the presence of flames or smoke. The sensor operates by monitoring the infrared radiation released by flames and triggering an alarm when a fire hazard is detected. Flame sensors are often used in fire alarms and can provide early detection of possible fire threats, allowing homeowners to take timely action to protect their property and loved ones.


FLAME1
FLAME SENSOR
<TEXT>
www.TheEngineeringProjects.com
TestPin
0
Flame Sensor
GND OUT Vcc
D1
R1
LED-RED
<TEXT>
10k
<TEXT>

A BUZZER : is a warning device that makes a loud noise when triggered by the sensors. The bell is an important component of a home security system as it warns homeowners of possible risk and can stop invaders from continuing their activities at home and send a signal to the control panel.

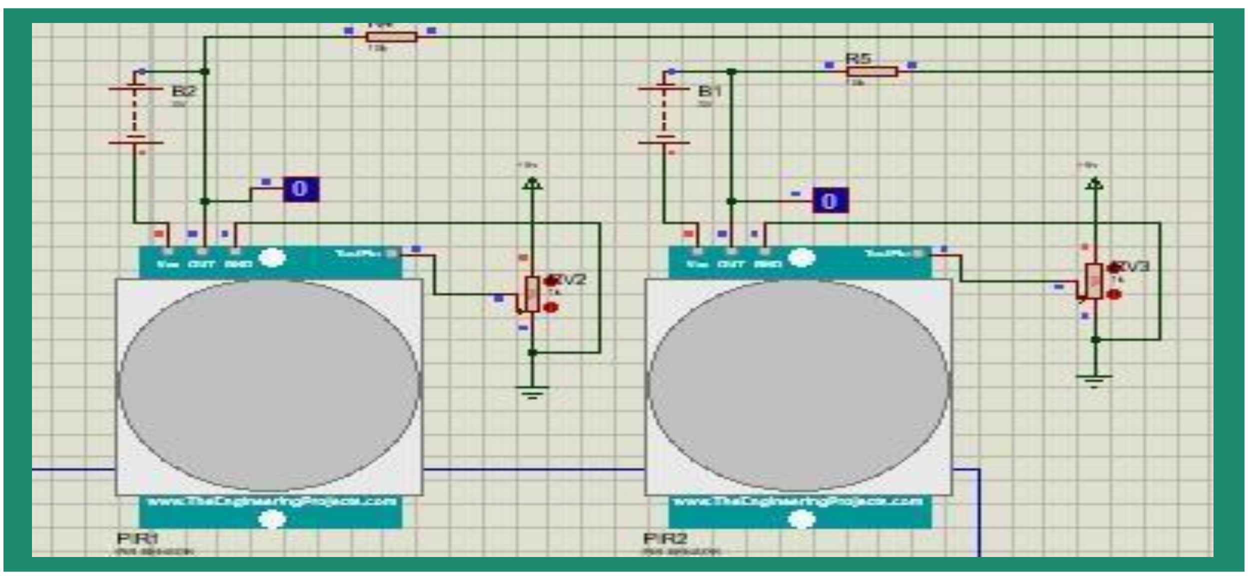


PART III : DESIGN PROCEDURES

DOOR AND WINDOW ALARM SYSTEM DESIGN PROCEDURE:

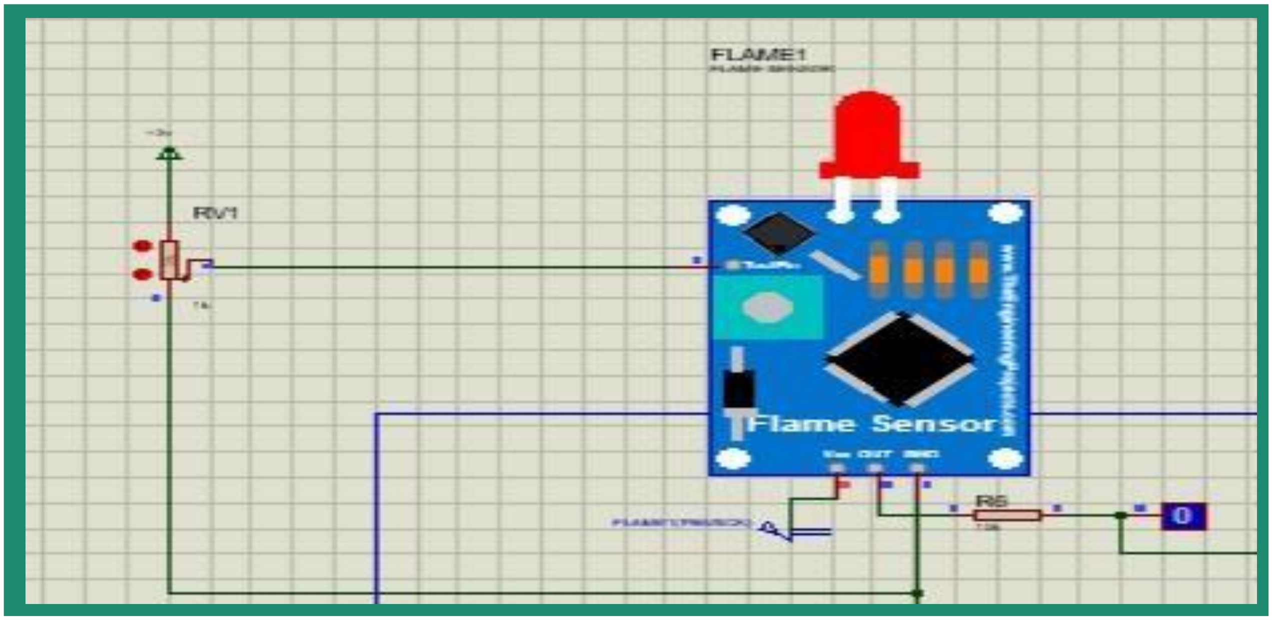
1. Open Proteus and make a new model
2. Add a 5v source battery to the schematic
3. Add two potentiometer and two PIR sensors
4. Add a transistor and bell to the schematic

5. connect the transistor and buzzer
6. connect the plus end of the battery to the VCC in of the two PIR sensor
7. connect the test pin of each PIR sensor to the potentiometer and supply 3v to the potentiometer and connect the other side to the ground
8 connect the output of each PIR sensor to the input of OR gate using small resistance and connect the sensors to the ground.
9. connect the output of OR gate to the input of transistor and run the simulation.



FIRE DETECTOR ALARM SYSTEM DESIGN:

1. Open Proteus and make a new model
2. Add a 5v DC source battery to the diagram
3. Add a regulator and a flame sensors
4. Add a transistor and bell to the schematic
5. Connect the transistor and buzzer
6. Connect the DC source to the VCC of the flame sensor
7. Connect the test pin of the flame sensor to the potentiometer and give 3v to the potentiometer and connect the other side to the ground
8. Connect the output of the flame sensor to the input of OR gate using small resistance and the sensor to ground.
9. Connect the output of OR gate to the input of transistor and start the test.

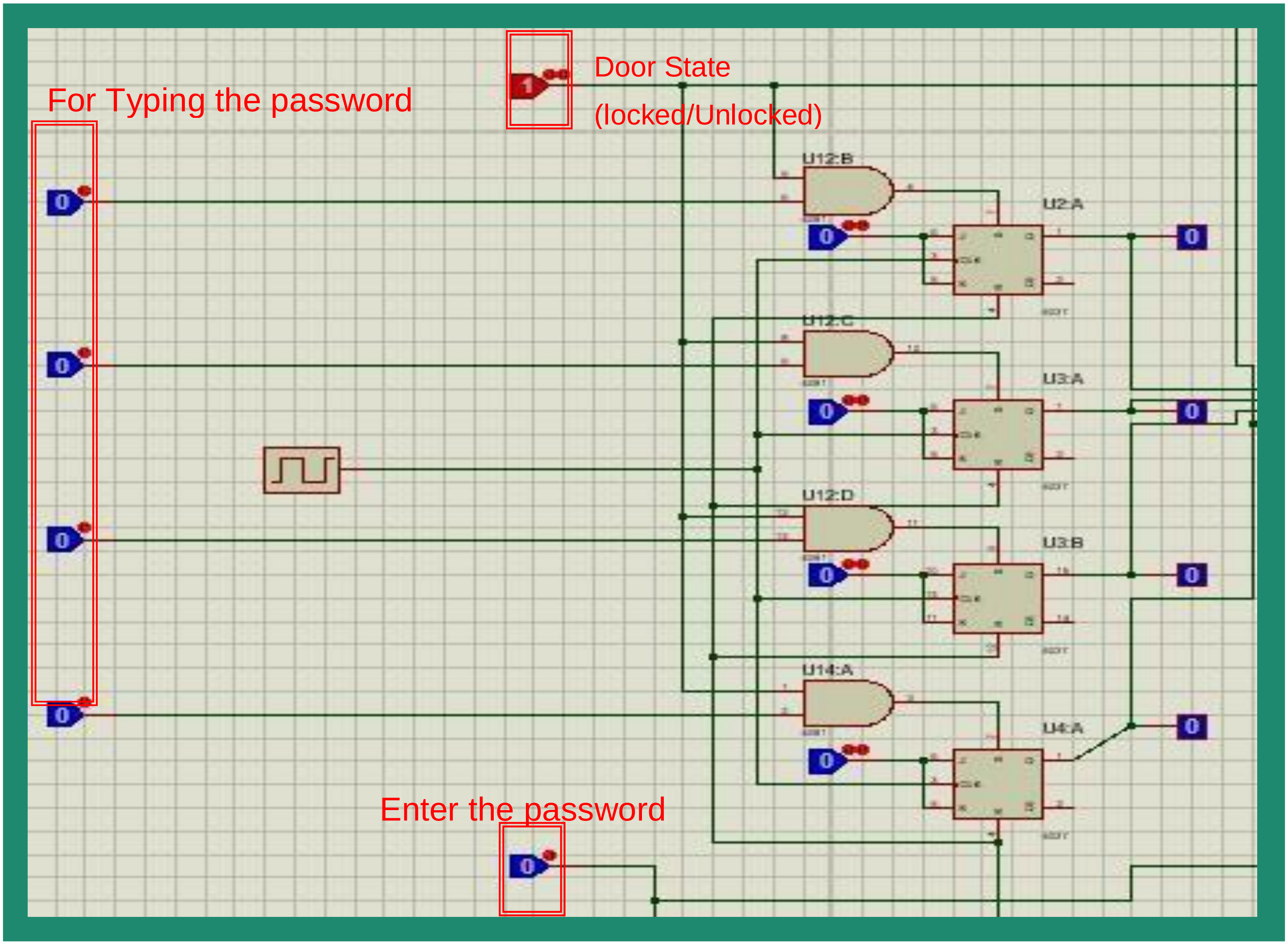


DOOR LOCK SYSTEM DESIGN PROCEDURE:

A:

1. Open Proteus and make a new model.
2. Add a clock, 5 logic toggles, 5 logic states, 4 2-input AND gates, and
4. flip flops to the design.
3. And link them according to the below picture.

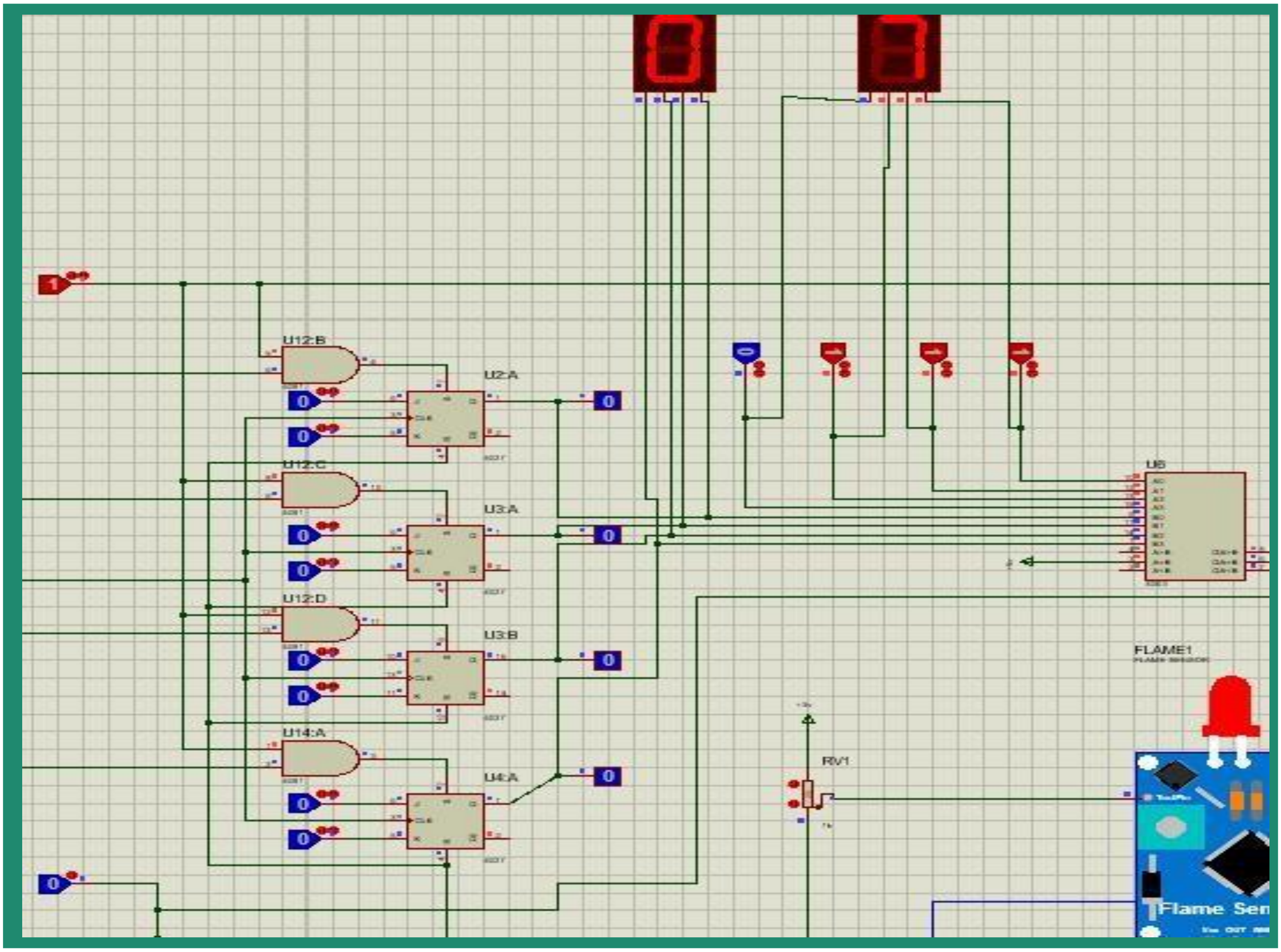
- ✓ Here, the four logic toggles are used for typing the password. And the first logic state is used for locking and opening the door, and the last logic toggle is used for ordering the written password to be checked for freeing. The rest of the of the logic states are used to make the JK flip-flops gain their memory.



B:

1. Add four logic states that will hold the right password to the design.
2. Add one 4-bit comparison that will match the written and right passwords to the design.
3. And link them according to the below picture.

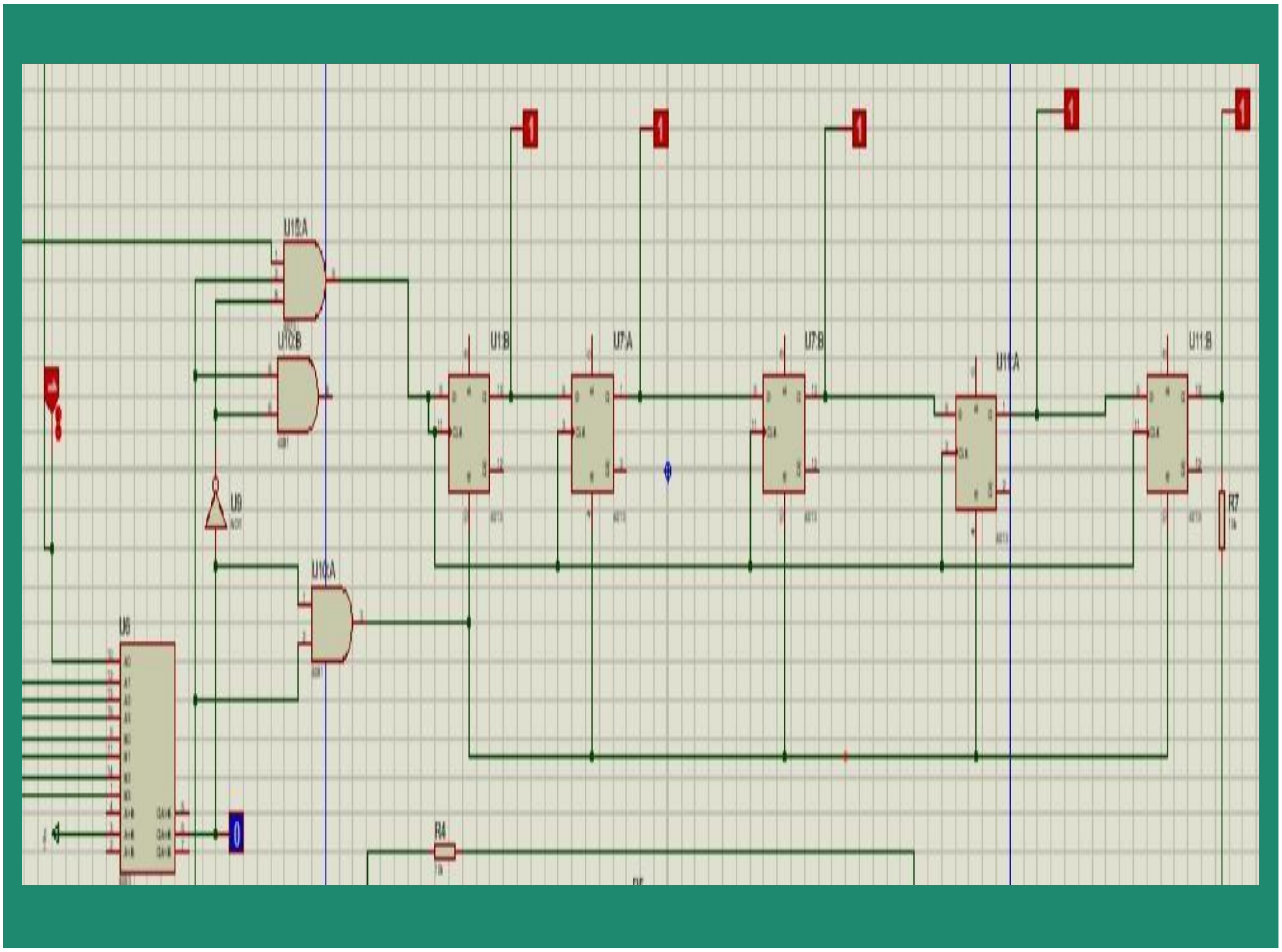
✓ Here we used the four reasoning states to store the right password, and the comparison will tell us if the written and saved passwords are equal. We know this from the result a=b.



C:

1. Add two 2-iinput AND gates, one 3-input AND gate, 5 D flip flops, and one NOT gate to the design.
2. And link them according to the below picture.

✓ Here, we used the flip-flops to remember how many times a wrong password has been entered. It uses the a=b comparison output with the enter password logic state and the door state.

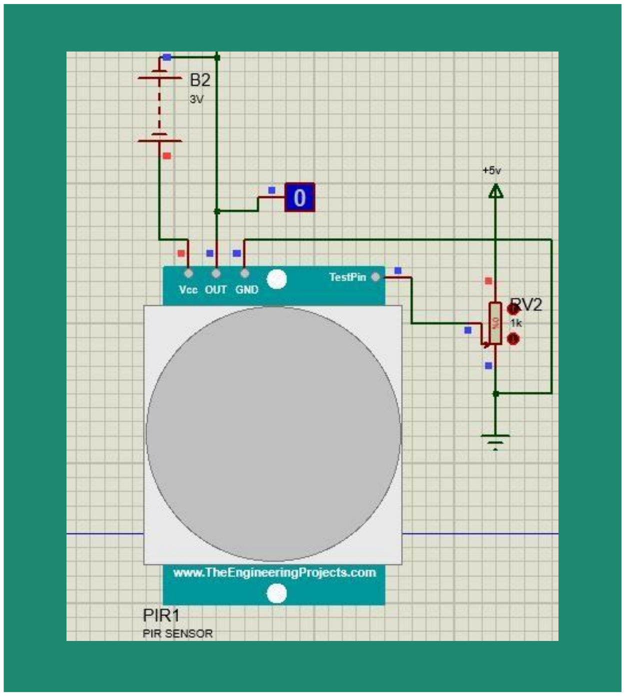


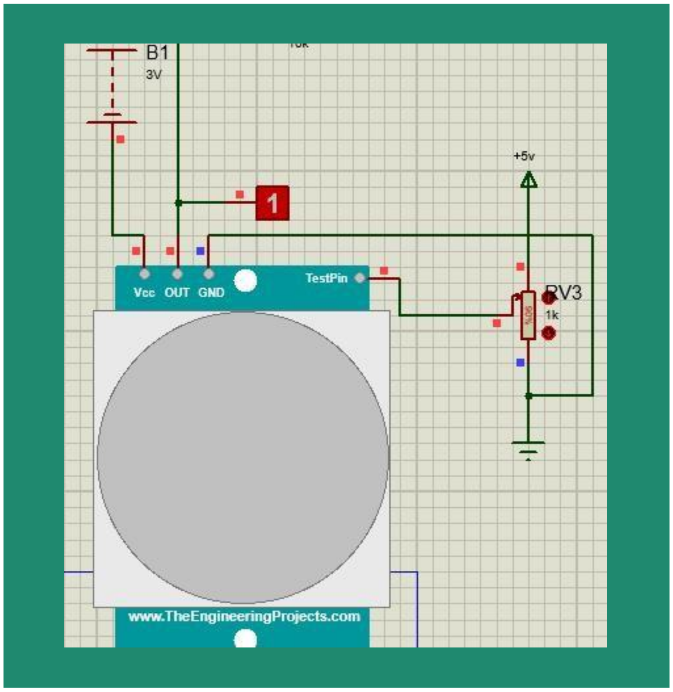
PART IV : THE WORKING PRINCIPLES

1. DOOR AND WINDOW SENSOR ALARM:

Since sensors work in real-life scenarios, we used potentiometers (pot-hg) to give the sensors something to detect, so when the potentiometer is above 0%, there is some kind of motion that can be noticed by the sensors. The first PIR sensor is the door sensor, and the second one is the window sensor. Here we have two states coming from the output of the pir sensors: "0 "and "1". "0" means no motion was detected, whereas "1" means there was some motion observed.

Input	output
Pot-hg ≈ 0%	0
Pot-hg >> 0%	1

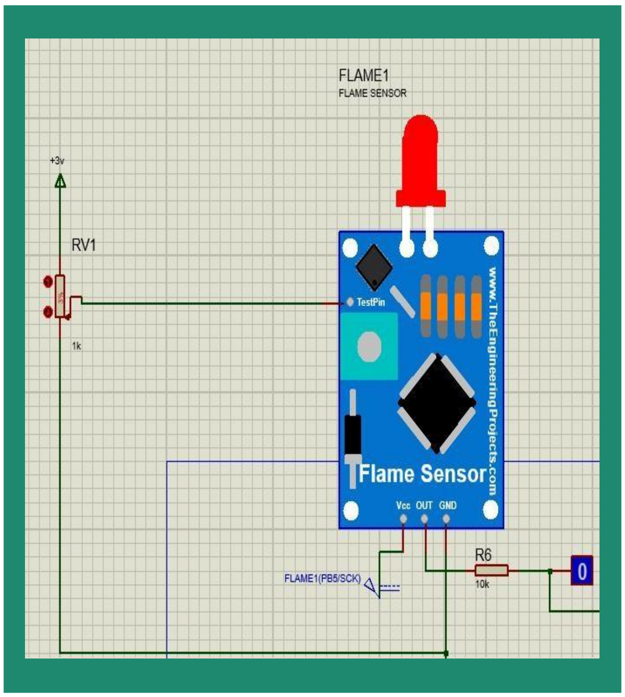


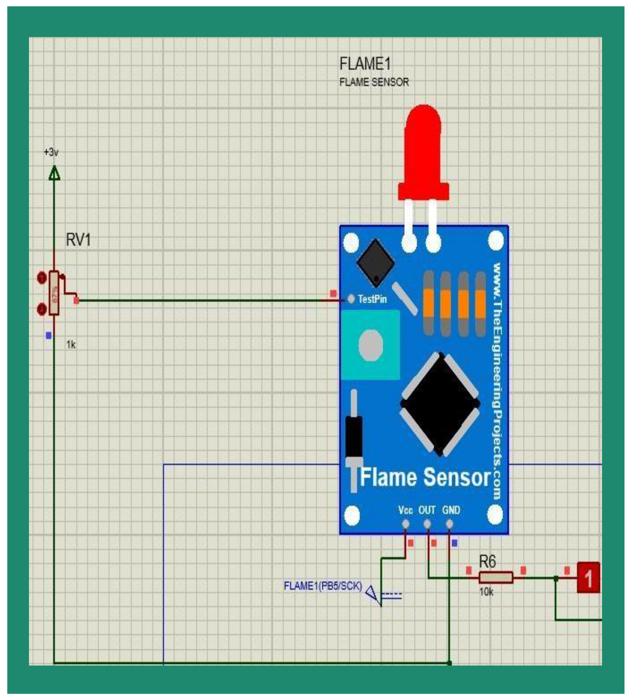


2. FIRE ALARM SYSTEM:

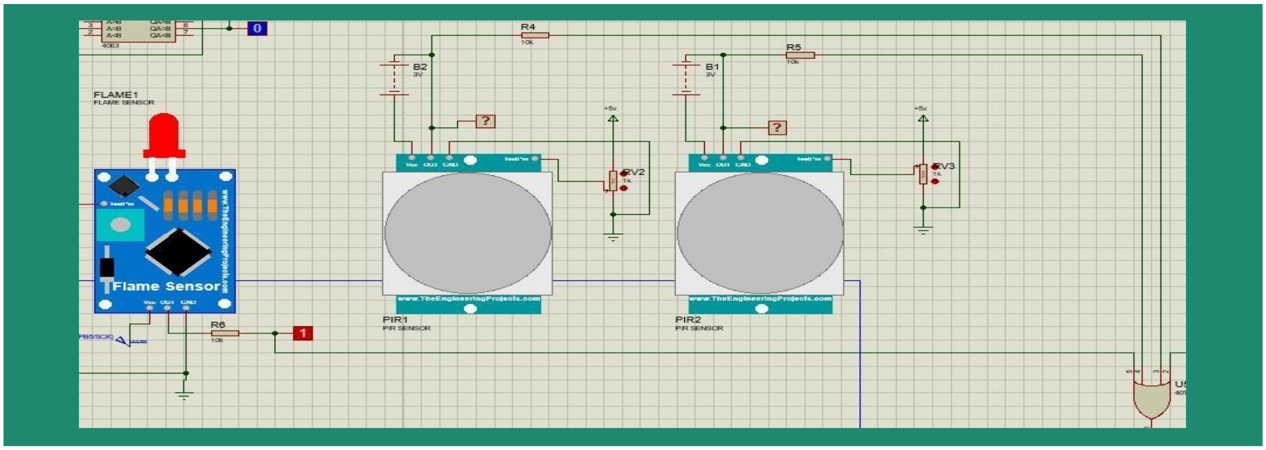
Here, we have two states originating from the flame sensor in addition to using a potentiometer (pot-hg) to give the sensor a realistic motion.
"0" indicates that no motion is observed, whereas "1" indicates some motion has been seen.

Input	output
Pot-hg ≈ 0%	0
Pot-hg >> 0%	1





And we connected all the three sensors' outputs in series with resistors to the input of our buzzer using OR gate.



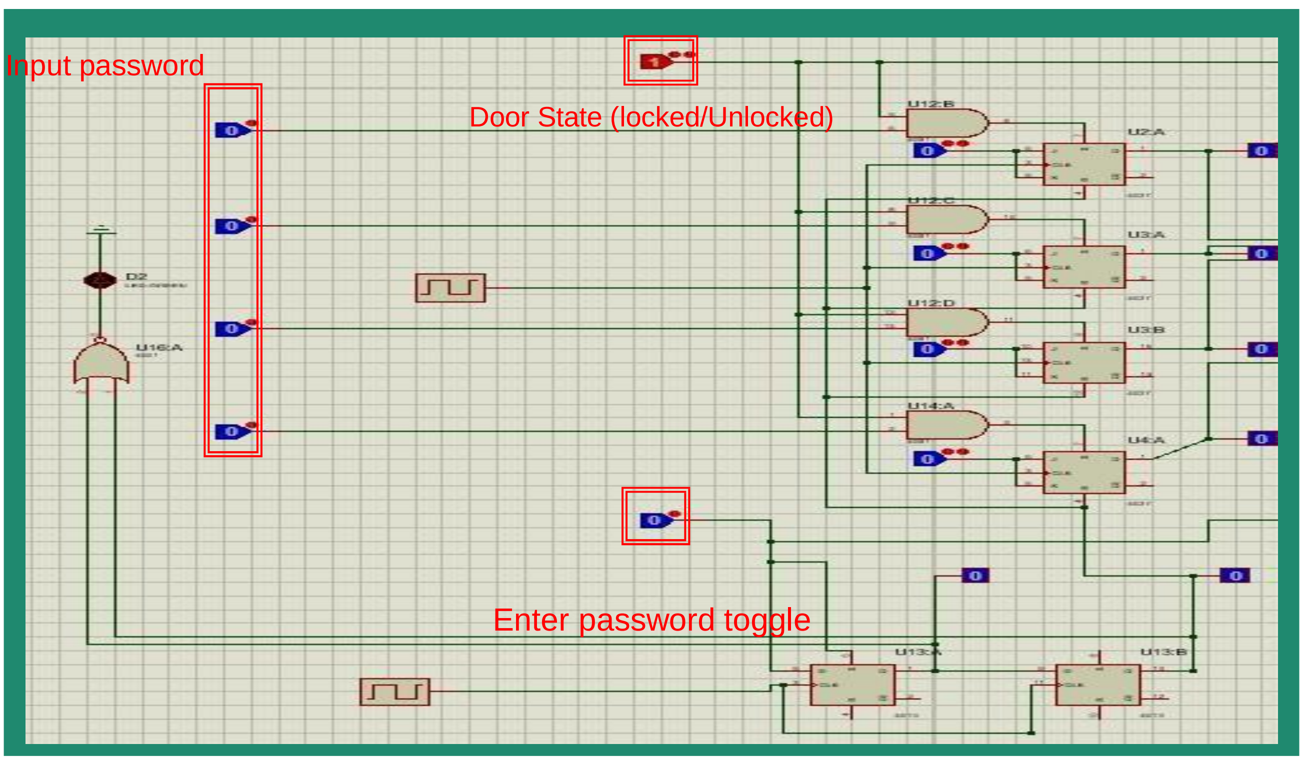
R4
10k
B2
3V
R5
10k
B1
3V
FLAME1
FLAME SENSOR
Flame Sensor
RV2
RV3
PIR1
PIR SENSOR
PIR2
PIR SENSOR
R6
10k
4063
www.TheEngineeringProjects.com

3. DOOR LOCK SYSTEM:

I. Password Typing System :

- Here we used logic toggles to enter the passwords because if logic states were used, they could not go back to their original state after being pressed, which means once a correct password is entered, it will remain unchanged until the system breaks down. But since logic toggles remain for small fractions of seconds, we needed to use memory elements to store their value to compare them with the correct password. So we used JK flip flops where J=K=0 to attain its memory once some value is entered. and we used the enter logic toggle to reset the flip-flops.

- J=k=0, set=AND gate of one input and door locked state, and reset=enter password toggle state.



II. Incorrect Password Counting System

Here, we counted up to five mismatched passwords using 5D flip flops, which set off the alert. In order to accomplish this, we used the 3-input state as both an input and a clock. This is because the flip flop operates on a positive edge, meaning that it can only act as a clock when the input rises from 0 to 1. As a result, the first D flip flop will use D = 1 and a positive edge clock for the first "enter" toggle state, causing Q1 to become 1. In this case, even if the other four flip-flops share the same input clock, their D value is still 0, even if their output cannot become 1. For the first toggling state of "enter":

“enter password” toggle	NOT (A=B(comparator output))	“Door state”	ANG gate of the three	D1	Q1
0	0	0	0	0	0
0	0	1	0	0	0
0	1	0	0	0	0
0	1	1	0	0	0
1	0	0	0	0	0
1	0	1	0	0	0
1	1	0	0	0	0
1	1	1	1	1	1

- For the second “enter” toggle state the second D flip flop output will be one.

“enter password” toggle	NOT (A=B(comparator output))	“Do or stat e”	ANG gate of the three	Clock	D1	Q1	D2	Q2
0	0	0	0	0	0	1	1	0
0	0	1	0	0	0	1	1	0
0	1	0	0	0	0	1	1	0
0	1	1	0	0	0	1	1	0
1	0	0	0	0	0	1	1	0
1	0	1	0	0	0	1	1	0
1	1	0	0	0	0	1	1	0
1	1	1	1	0-1	1	1	1	1

- ✓ For the third also the third D flip flop output will be one.

“enter password” toggle	NOT (A=B(comparator output))	“Do or state ”	ANG gate of the three	Clock	D1	Q1	D2	Q2	D3	Q3
0	0	0	0	0	0	1	1	1	1	0
0	0	1	0	0	0	1	1	1	1	0
0	1	0	0	0	0	1	1	1	1	0
0	1	1	0	0	0	1	1	1	1	0
1	0	0	0	0	0	1	1	1	1	0
1	0	1	0	0	0	1	1	1	1	0
1	1	0	0	0	0	1	1	1	1	0
1	1	1	1	0-1	1	1	1	1	1	1

- ✓ For the fourth also the fourth D flip flop output will be one.

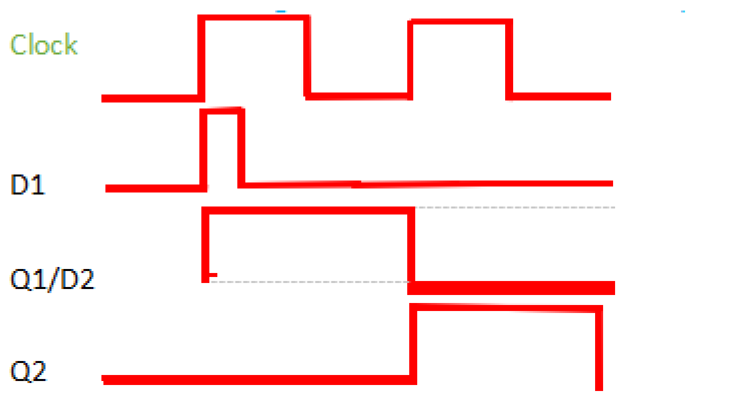
“enter password ” toggle	NOT (A=B(comparato r output))	“Doo r state ”	ANG gate of the thre e	Cloc k	D 1	Q 1	D 2	Q 2	D 3	Q 3	D 4	Q 4
0	0	0	0	0	0	1	1	1	1	1	1	0
0	0	1	0	0	0	1	1	1	1	1	1	0
0	1	0	0	0	0	1	1	1	1	1	1	0
0	1	1	0	0	0	1	1	1	1	1	1	0
1	0	0	0	0	0	1	1	1	1	1	1	0
1	0	1	0	0	0	1	1	1	1	1	1	0
1	1	0	0	0	0	1	1	1	1	1	1	0
1	1	1	1	0-1	1	1	1	1	1	1	1	1

- ✓ For the fourth also the fourth D flip flop output will be one.

“enter password” toggle	NOT (A=B(comparator output))	“Door state”	ANG gate of the three	Clock	D1	Q1	D2	Q2	D3	Q3	D4	Q4	D5	Q5
0	0	0	0	0	0	1	1	1	1	1	1	1	1	0
0	0	1	0	0	0	1	1	1	1	1	1	1	1	0
0	1	0	0	0	0	1	1	1	1	1	1	1	1	0
0	1	1	0	0	0	1	1	1	1	1	1	1	1	0
1	0	0	0	0	0	1	1	1	1	1	1	1	1	0
1	0	1	0	0	0	1	1	1	1	1	1	1	1	0
1	1	0	0	0	0	1	1	1	1	1	1	1	1	0
1	1	1	1	0-1	1	1	1	1	1	1	1	1	1	1

- ✓ The graphic above illustrates how the "enter password" toggle is attached to D flip flops. This is to allow some time for the JK flip flops to reset. If the "enter password" toggle is connected directly to the reset terminal, the JK flip flops' password will be reset, which will cause the NOT A=B comparator output to be 1 and the clock to be on the positive edge. As a result, even if the password is correct, the D flip flops will begin to count because the JK flip flops will have reset.

- ❖ Here is how we give sometime to reset the JK flip flops.we used two D flip flops.:



In the above illustration, we can clearly see a delay in time between D1 and Q2, so we use the Q2 output to reset the flip-flops. And using this output, we connected a LED element to indicate when one can enter the password, because if it is before Q2 is high, then it is going to be reset.

4. THE BUZZER ALARM SYSTEM:

After connecting each output to a 4-input OR gate, the outputs are linked to an LED and a transistor input, which are then connected to the buzzer. The buzzer's sound was amplified by us using the transistor.
We added a 2-input AND gate with logic state and the OR gate output, which will subsequently be linked to the logic state and function as an interceptor, so that we would have something to intercept the buzzer.