HIGH SECURITY DOOR LOCK SYSTEM

TEAM DETAILS

TEAM 1

GUIDE : **Prof. Jacob Mathew**

TEAM MEMBERS:

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TABLE OF CONTENTS

PROBLEM STATEMENT

- RFID based door locks are vulnerable to unauthorized access and data thefts

OBJECTIVE

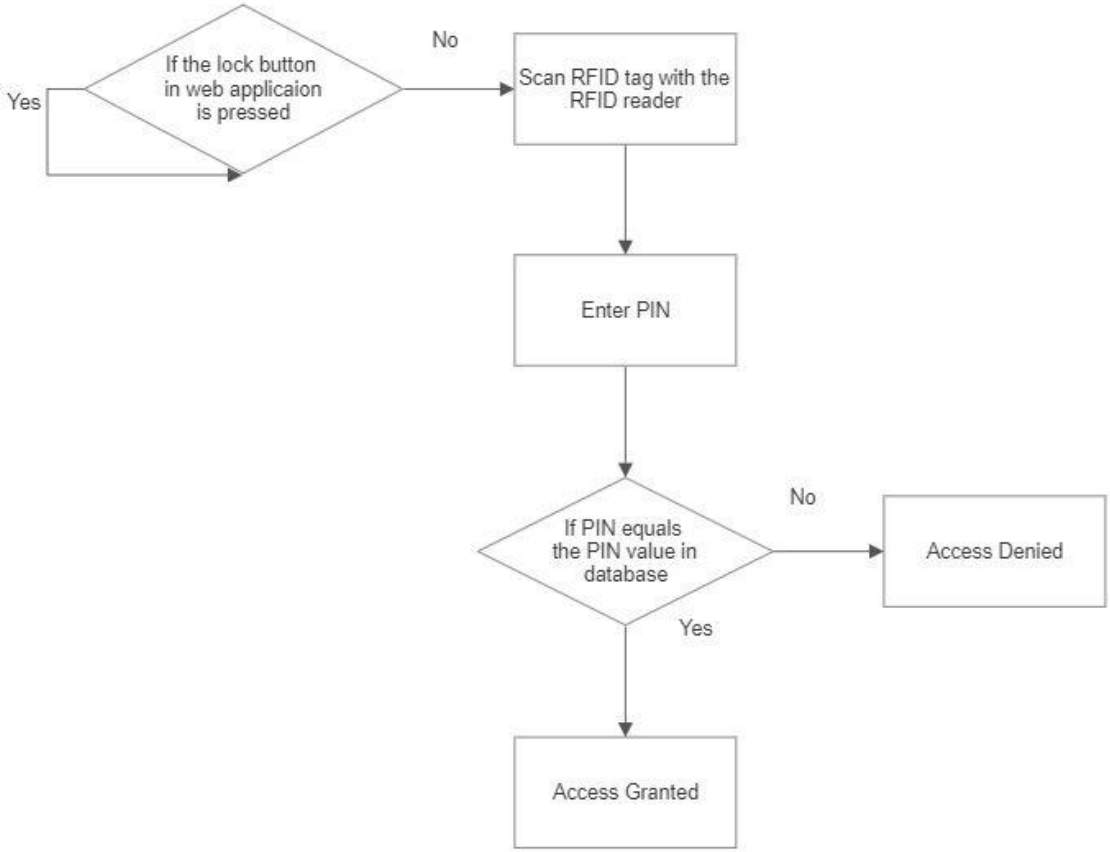
- Countermeasure against easy hacking of RFID
- Multi layer security system
- Low budget system

EXISTING SOLUTIONS

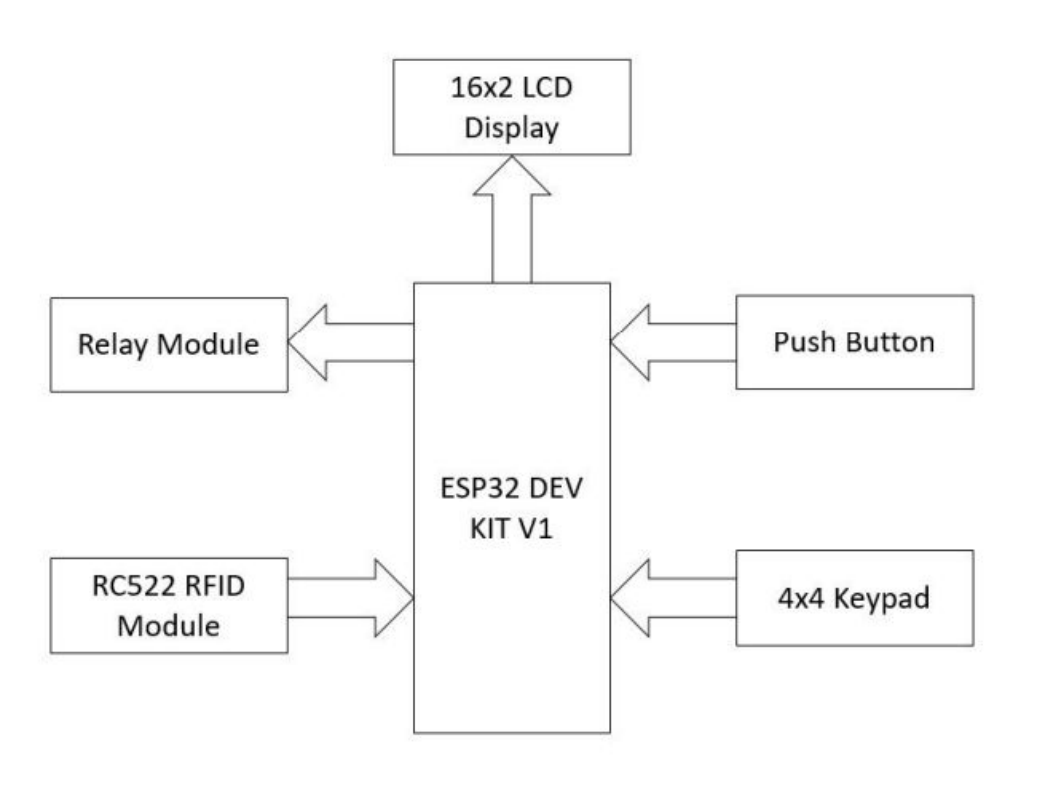
- RFID door lock system.
- NFC based smart door lock system.

PROPOSED SYSTEM

- An RFID based door lock system.
- Each RFID tag has a corresponding unique PIN.
- The PIN along with the details of the person are stored in a real time database.
- Along with this there is a web application which acts as a master lock that is used to shutdown the complete system.

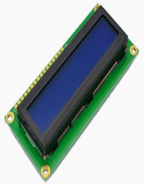

If the lock button in web applicaion is pressed
Yes
No
Scan RFID tag with the RFID reader
Enter PIN
If PIN equals the PIN value in database
No
Access Denied
Yes
Access Granted

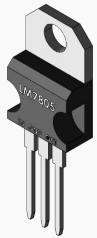
SYSTEM ARCHITECTURE



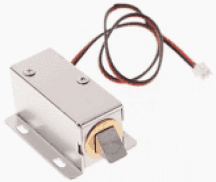
COMPONENTS REQUIRED

- ESP32 Dev Kit V1
- RC522 RFID Reader Writer Module
- 4x4 Matrix Membrane Type Keypad
- 16x2 LCD Display
- LM 7805 IC

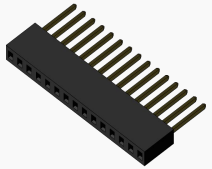


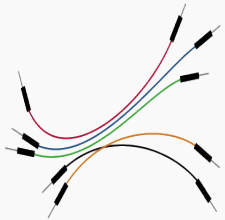


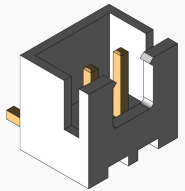
- I2C Module
- Relay Module
- Push Button
- Solenoid Lock
- RFID Tag
- DC Jack

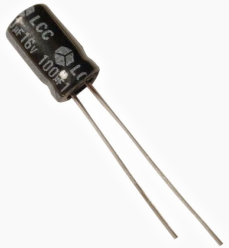


- Circuit Board
- Jumper wires
- 2 Pin Jst Connector
- Female Header
- Male header
- Single Strand wire
- 10u Capacitor
- 1u Capacitor

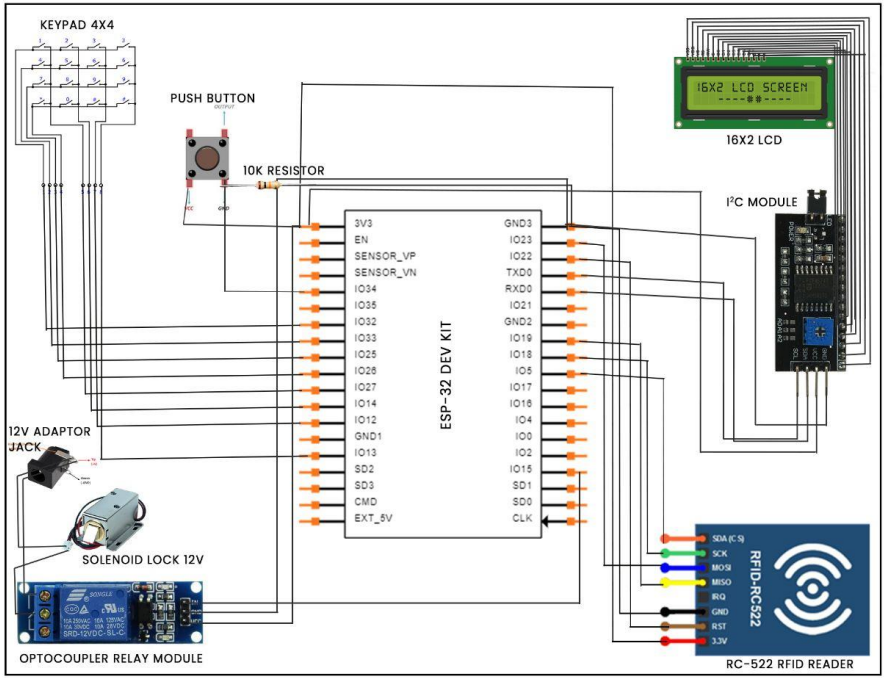




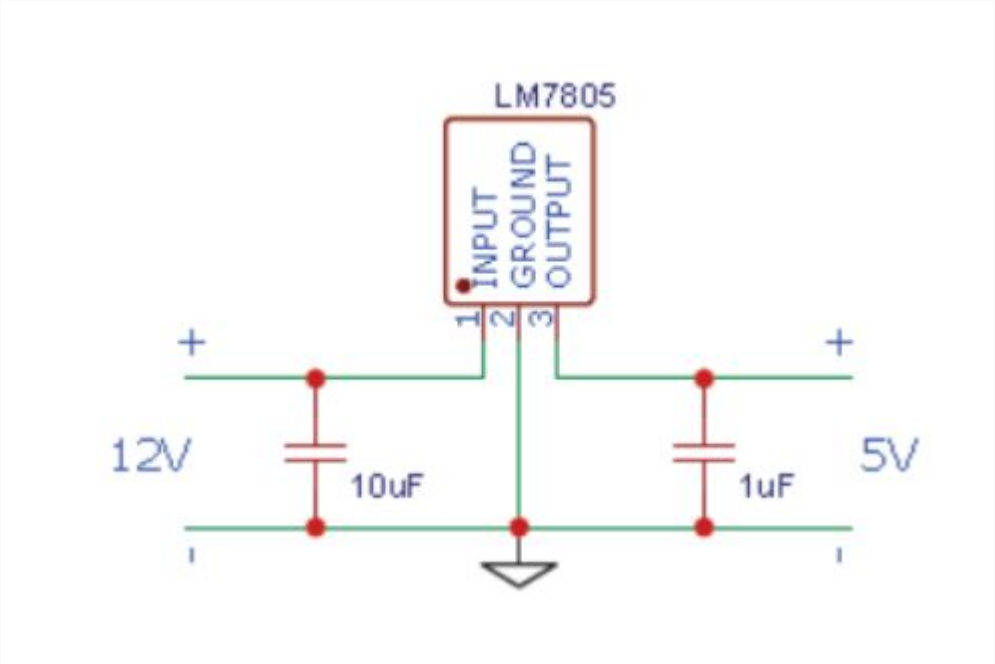




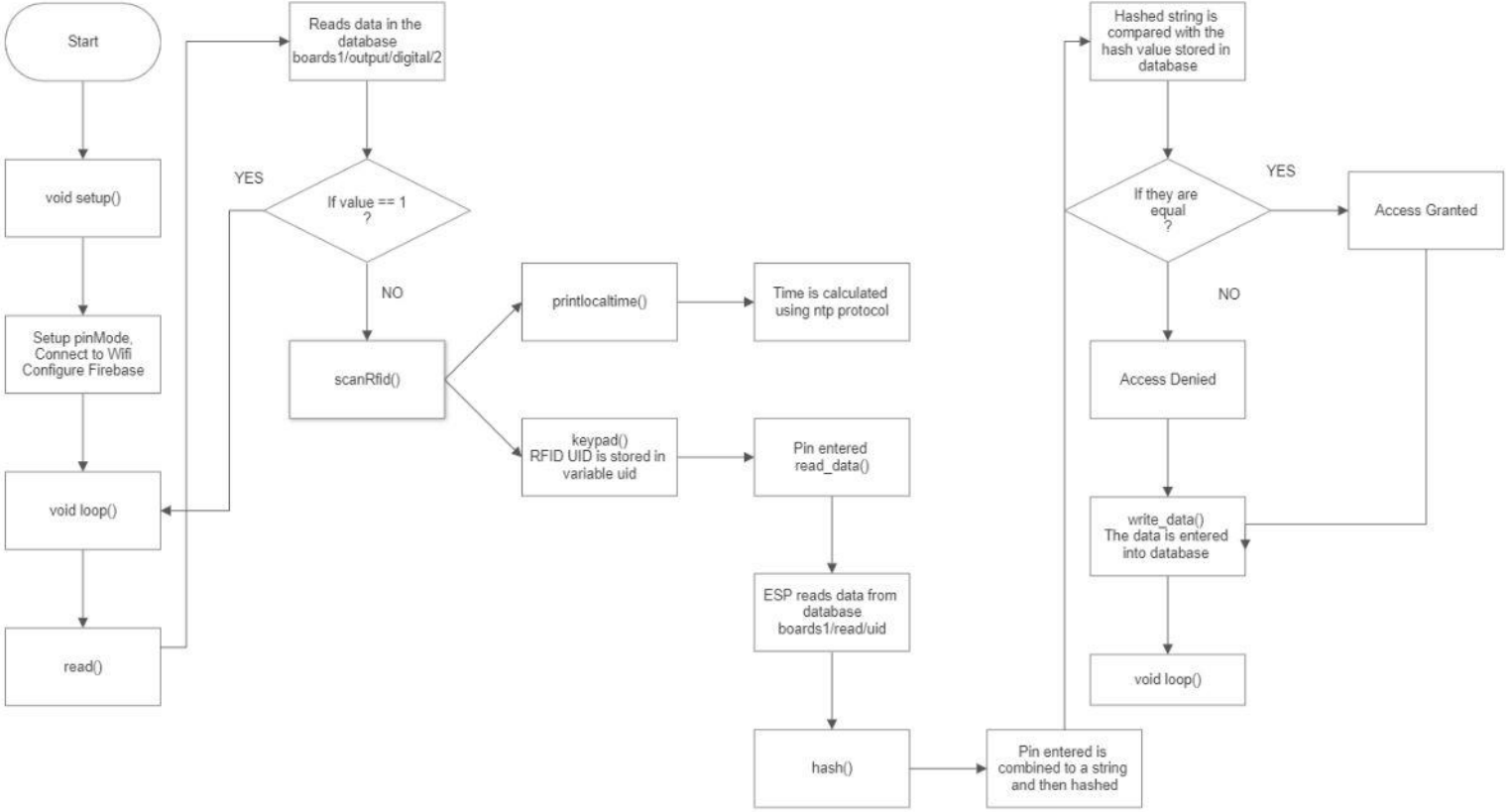
CIRCUIT DIAGRAM



CIRCUIT CONNECTION STRUCTURE


LM7805
INPUT
GROUND
OUTPUT
1
2
3
+
+
12V
5V
10uF
1uF

FLOW CHART

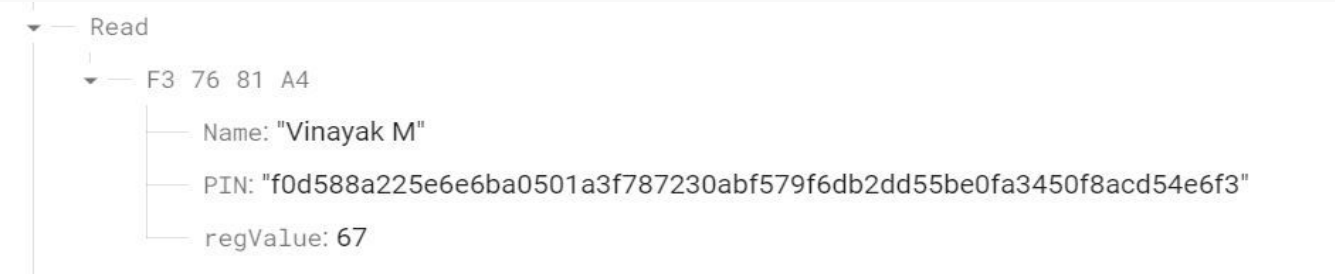

Start
void setup()
Setup pinMode, Connect to Wifi Configure Firebase
void loop()
read()
Reads data in the database boards1/output/digital/2
YES
If value == 1 ?
NO
scanRfid()
printlocaltime()
Time is calculated using ntp protocol
keypad() RFID UID is stored in variable uid
Pin entered read_data()
ESP reads data from database boards1/read/uid
hash()
Pin entered is combined to a string and then hashed
Hashed string is compared with the hash value stored in database
If they are equal ?
YES
Access Granted
NO
Access Denied
write_data() The data is entered into database
void loop()

ALGORITHM

- Set up pin modes, connect to wifi, configure the firebase, set up RFID and configure ntp protocol to calculate real time.
- Enter the void loop function.
- Read function is called.
- Reads the data within the outputs node and if value is 1, jumps back to void loop else rfid function is called.
- When swiped tag is read by the reader, the keypad function and print local time function is called and unique string is stored in variable uid.
- Keypad function expects the pin to enter
- After 4 keys are pressed, read_data function is called.

- In the read_data function, ESP reads the data stored within the corresponding uid variable
- The hash function is then called. Within the hash functions, the pin which is in the form of array is combined to a single string.
- And this string is then hashed with an inbuilt library <mbedtls/md.h>
- This hashed value is then compared with the hash string stored within the database that was read in the previous function
- If they are equal, access is granted and the relay function and write data function is called. Else access is denied and write data function is called
- In the relay function, relay is switched ON and after 5 seconds it is switched OFF.
- In the write data function, a node is created with the key value as the time that was identified by print local time function
- Within this node, the name of the user, RFID uid and whether the access granted or not is stored
- Returns to void loop.

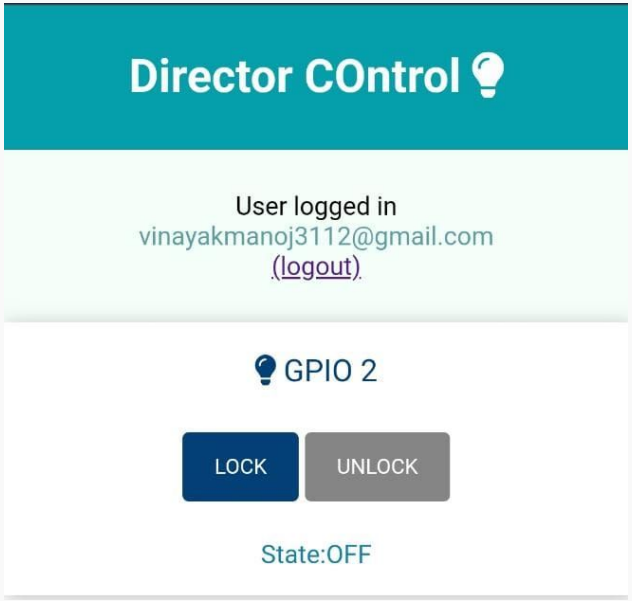
REAL TIME DATABASE

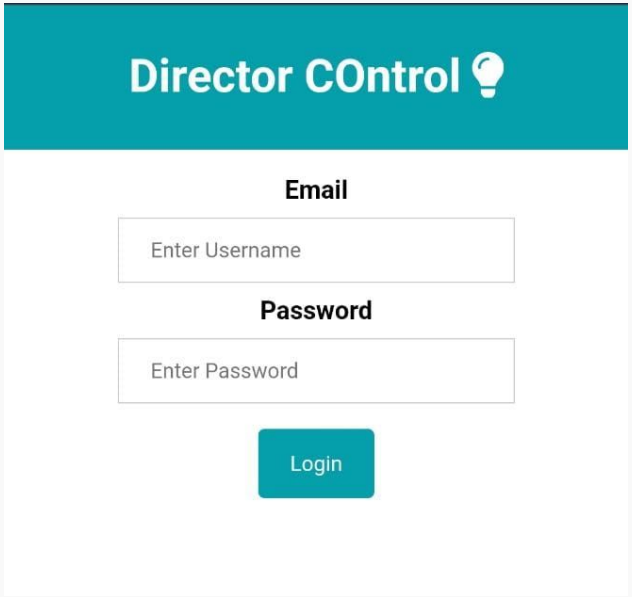



outputs
digital
2: 0

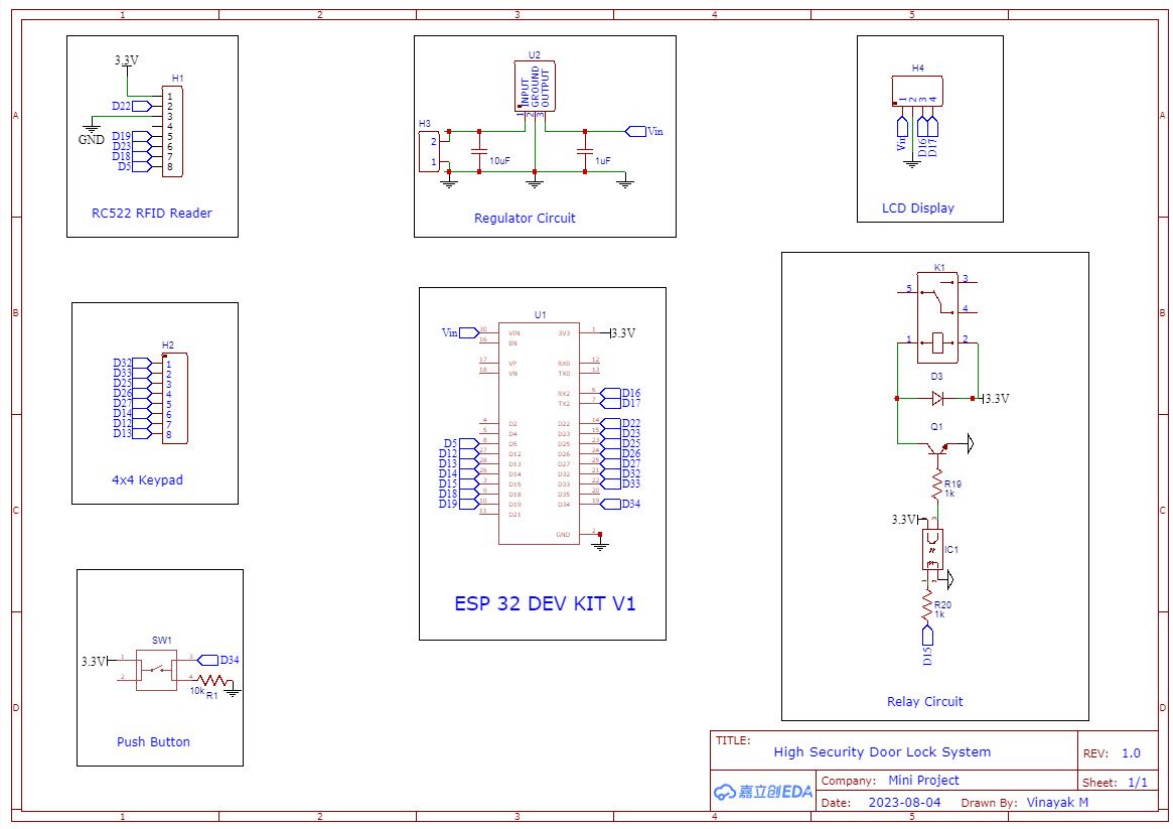

write
2023-5-30 12:28:29
Entry: "Granted"
Reg No: 67
Swipe Time: "F3 76 81 A4"

WEB APP

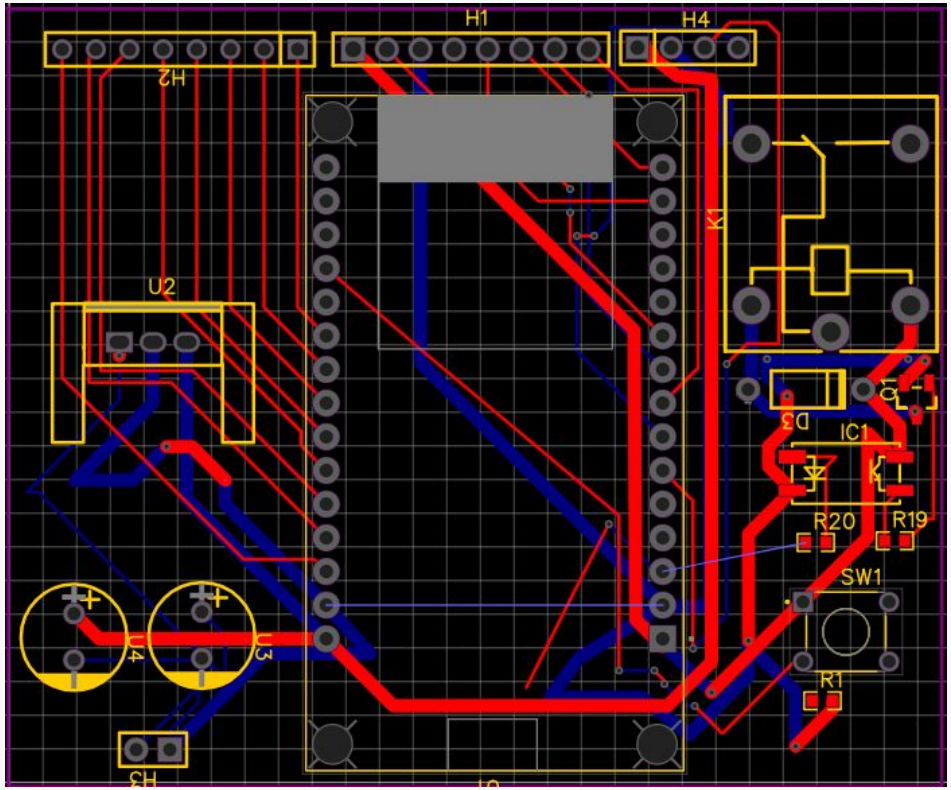

Director COntrol
User logged in
vinayakmanoj3112@gmail.com
(logout)
GPIO 2
LOCK
UNLOCK
State:OFF

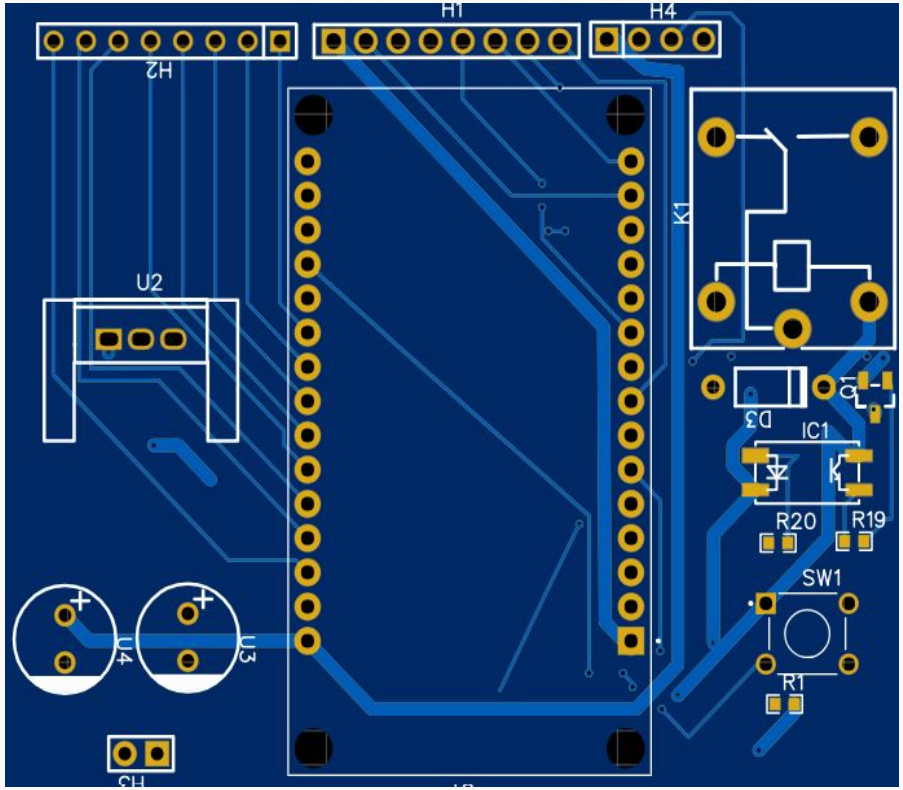

Director COntrol
Email
Enter Username
Password
Enter Password
Login

SCHEMATIC

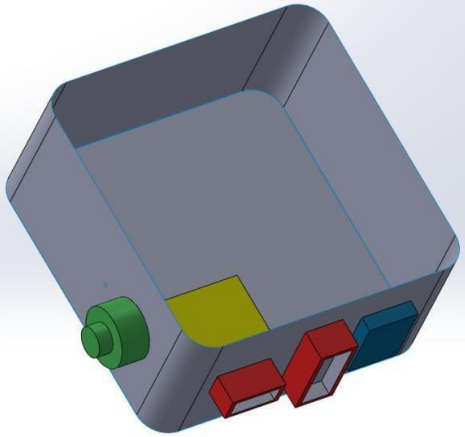

3.3V
H1
D22
GND
D19
D23
D18
D5
RC522 RFID Reader
U2
INPUT
GROUND
OUTPUT
H3
Vin
10uF
1uF
Regulator Circuit
H4
Vin
D16
D17
LCD Display
H2
D32
D33
D25
D26
D27
D14
D12
D13
4x4 Keypad
U1
Vin
3.3V
D16
D17
D5
D13
D13
D14
D15
D18
D19
D22
D23
D25
D26
D27
D32
D33
D34
ESP 32 DEV KIT V1
K1
D3
3.3V
Q1
R19
1k
3.3V
IC1
R20
1k
D15
Relay Circuit
SW1
3.3V
D34
10K
R1
Push Button
TITLE:
High Security Door Lock System
REV: 1.0
Company: Mini Project
Sheet: 1/1
Date: 2023-08-04
Drawn By: Vinayak M

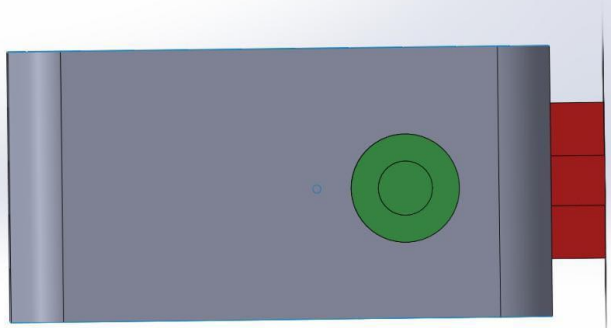
PCB LAYOUT

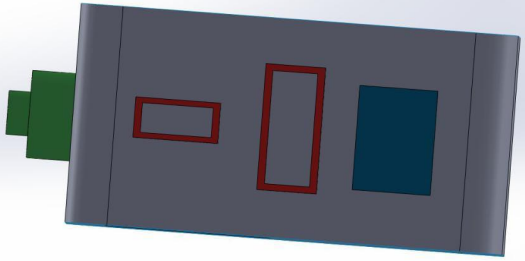

H1
H4
H2
U2
K1
D3
IC1
R20
R19
SW1
R1
U4
U3
H3


H1
H4
H2
U2
K1
D3
IC1
R20
R19
SW1
R1
U4
U3
H3

CAD MODEL







FUTURESCOPE

- Implementation of rechargeable batteries
- A mobile application can be developed
- EEPROM in ESP can be used to store data temporarily.

BUDGET

SL. No	COMPONENTS	QUANTITY	PRICE
1.	ESP32 Dev Kit V1	1	₹380
2.	RC522 RFID Reader Writer Module	1	₹94
3.	4x4 Matrix Membrane Type Keypad	1	₹75
4	RFID 13.56 MHz Card	5	₹55
5	Relay Module	1	₹38
6.	LCD Display	1	₹105
7	I2C Module	1	₹100
8	Solenoid Lock	1	₹315
9	Push Button	1	₹5

10	Circuit board	1	₹60
11	12V DC Power supply adapter	1	₹99
12	Wires		₹45
13	Miscellaneous		₹1000
	Total		₹2371

REFERENCE

- Shafin, Kishwar & Kabir, KaziLutful & Hasan, Nazmul & Mouri,Israt & Islam, Samina & Ansari,Lazima & Karim, Md & Hossain,Md. (2015). Development of an RFID Based Access Control System in the Context of Bangladesh.10.1109/ICIIECS.2015.7193024
- S. Shepard, “RFID Radio Frequency Identification”, USA, ISBN: 0-07-144299-5, 2005.
- https://randomnerdtutorials.com/?s=firebase
- https://randomnerdtutorials.com/security-access-using-mfrc522-rfid-reader-with-arduino/

THANK YOU