NATIONAL INSTITUTE OF TECHNOLOGY,
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ECLR13 MICROPROCESSORS AND MICROCONTROLLERS
MINI PROJECT

Password based door lock system using 8051 microcontroller

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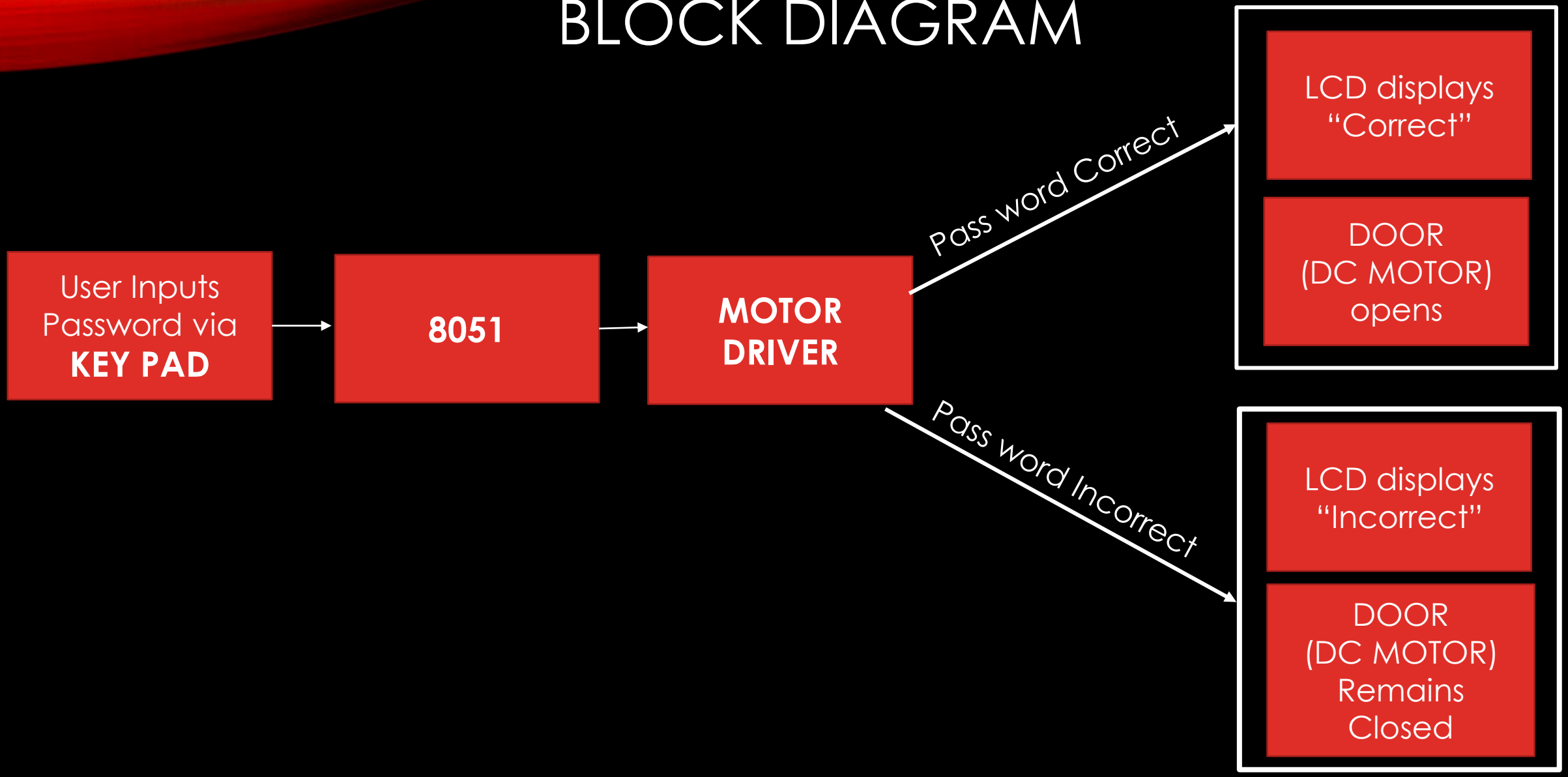
TABLE OF CONTENTS

INTRODUCTION

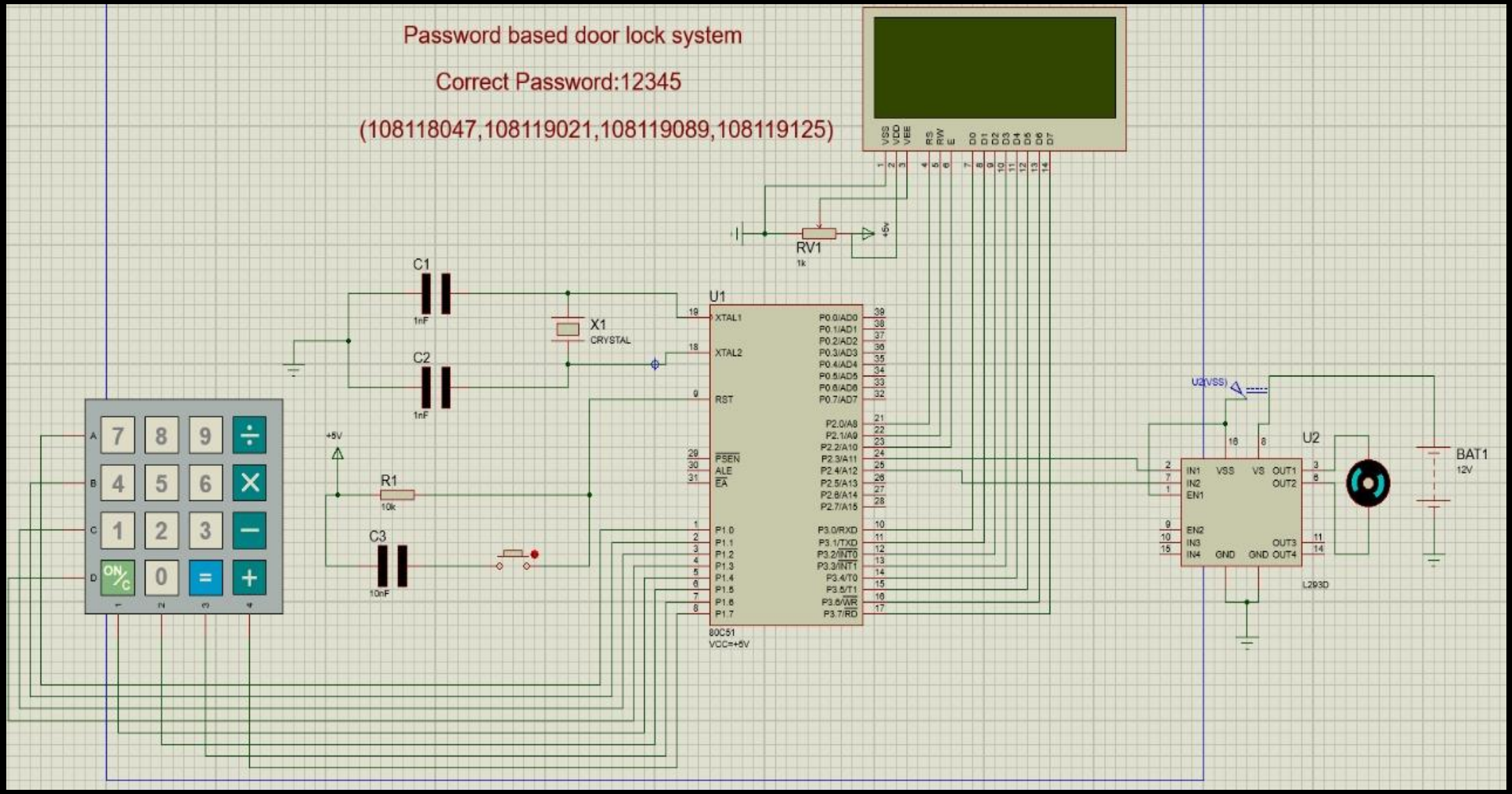
- Our project is a digital password-based door lock. The lock works by verifying the digitally inputted password with the predefined passcode. The digital door lock is operated by the help of 8051 microcontroller.
- In this project, we have designed the digital door lock using an 8051 microcontroller, a keypad, and a DC motor.
- The system collects 5 digit user input, compares the user input with the preset password inside the program, and if the user input and stored password matches, access will be granted

IMAGE OF A PASSWORD BASED DOOR LOCK

BLOCK DIAGRAM



CIRCUIT DIAGRAM



COMPONENTS OF CIRCUIT DIAGRAM

- **4*4 Keypad:** It is used to input the password which will be read and compared with the predefined password.
- **80C51:** It is used to send commands to all components of the circuit to execute the required functions.
- **20*4 LCD Module:** It is used to display the entered password and the status message of whether the password is correct.
- **MOTOR DRIVER(L293):** It controls the motor to be either on or off based on the result of comparing the entered and defined password.
- **DC MOTOR:** It acts as a substitute for the door in this circuit. The 'ON' state representing an open door and the 'OFF' state representing a closed door.

WORKING

- When the program is initialized, the LCD will prompt the user to enter the password through a 4*4 Keypad.
- After the user enters the 5 digit password, the LCD will display it on the screen and the program reads the user input and compares it with the predefined password.
- All the functions are executed in 80C51.If the entered password is correct then the status message "CORRECT" is displayed on a 20X4 LCD Module, and then using a Motor DRIVER(L293) the DC motor is made to rotate indicating that the door is unlocked.
- If the entered password is incorrect then the status message "INCORRECT" is displayed on a 20X4 LCD Module, the DC motor stays in its "OFF" state indicating that the door is locked and the LCD will prompt the user for new password.

CODE

There are 6 main subroutines we have used in this program.They are:

- MAIN: A base function where all the other subroutines are called to get executed in order.
- LCD_INIT : Commands in this subroutine are made for the initial setup of the LCD Module.
- SEND_DAT: sends the entire string character by character to the LCD Module.
- READ_KEYPRESS : is the subroutine to collect user inputs.
- KEY_SCAN : is the subroutine to identify a character entered by the user.
- CHECK_PASSWORD : is the subroutine to compare user input password.

MAIN

- All the function calls are made in this subroutine. They are in order:
- First, the LCD_INIT function is called.
- Next the string stored in MYDATA is moved to DPTR.
- Next, SEND_DAT is called which send the entire string character by character.
- Next DELAY function is called.
- Followed by READ_KEYPRESS function, which reads the user input.
- Next DELAY function is called again.
- CHECK_PASSWORD is called finally to compare the user input with the predefined password.

```
MAIN:
ACALL LCD_INIT
MOV DPTR,#MYDATA
ACALL SEND_DAT
ACALL DELAY
ACALL READ_KEYPRESS
ACALL DELAY
ACALL CHECK_PASSWORD
```

LCD INIT

LCD_INIT:- Commands in this subroutine are made for the initial setup of the LCD Module.

Commands such as 8H,0EH,01,06,80H,0 are called in this subroutine to initialise the LCD.

```
LCD_INIT:MOV DPTR,#MYCOM
C1:CLR A
MOVC A,@A+DPTR
ACALL COMNWRT
ACALL  DELAY
INC DPTR
JZ DAT
SJMP C1
DAT:RET
```

SEND_DAT

- Before calling SEND_DAT function, the string stored in code memory is being moved to DPTR.
- Then DPTR is increased by 1.
- Then DATAWRT function is called to write the data character by character.

```
SEND_DAT:
CLR A
MOVC A,@A+DPTR
ACALL DATAWRT
ACALL DELAY
INC DPTR
JZ AGAIN
SJMP SEND_DAT
AGAIN: RET
```

READ KEYPRESS

It is the subroutine to collect user inputs. A counter is set up using register R0 to count 5 times (this will limit the user input collection to the first 5 key presses). Register R1 is assigned address location 160D. The collected user inputs are saved in address location starting from 160D.

```
READ_KEYPRESS:
MOV R0,#5D
MOV R1,#160D
ROTATE:ACALL KEY_SCAN
MOV @R1,A
ACALL DATAWRT
ACALL DELAY2
INC R1
DJNZ R0,ROTATE
RET
```

KEY SCAN

It is the subroutine to identify a keypress. The method of column scanning is employed in identifying the pressed key. The pressed key is identified and is assigned a decimal equivalent value (ASCII value) of the pressed key. Hex key pad is essentially a collection of 16 keys arranged in the form of a 4×4 matrix.

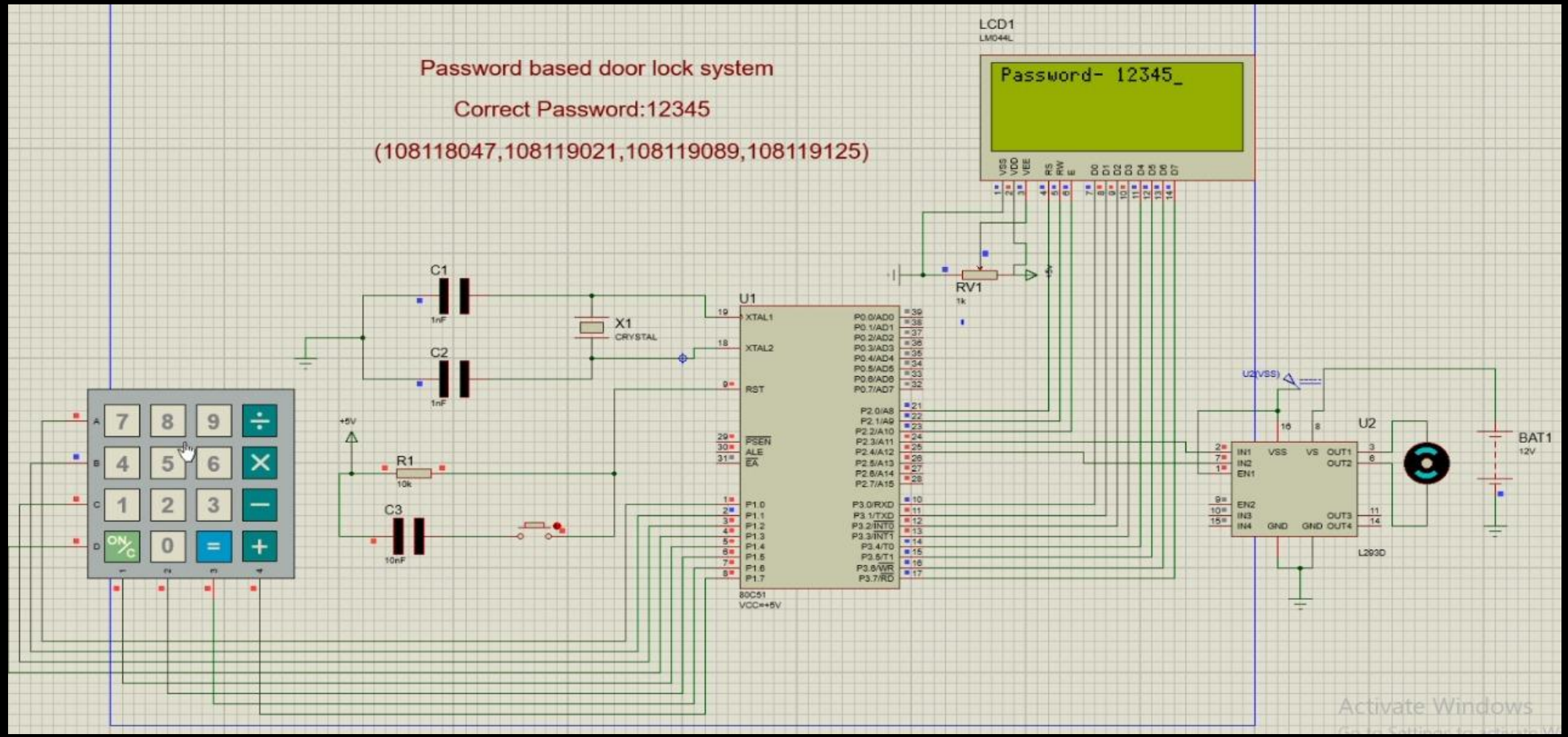
```
KEY_SCAN:MOV P1,#11111111B
CLR P1.0
JB P1.4, NEXT1
MOV A,#55D
RET

NEXT1:JB P1.5,NEXT2
MOV A,#56D

RET
NEXT2: JB P1.6,NEXT3
MOV A,#57D

RET
NEXT3: JB P1.7,NEXT4
MOV A,#47D

RET
NEXT4:SETB P1.0
CLR P1.1
JB P1.4, NEXT5
MOV A,#52D

RET
NEXT5:JB P1.5,NEXT6
MOV A,#53D

RET
NEXT6: JB P1.6,NEXT7
MOV A,#54D
RET
NEXT7: JB P1.7,NEXT8
MOV A,#42D

RET
NEXT8:SETB P1.1
CLR P1.2
JB P1.4, NEXT9
MOV A,#49D

RET
```

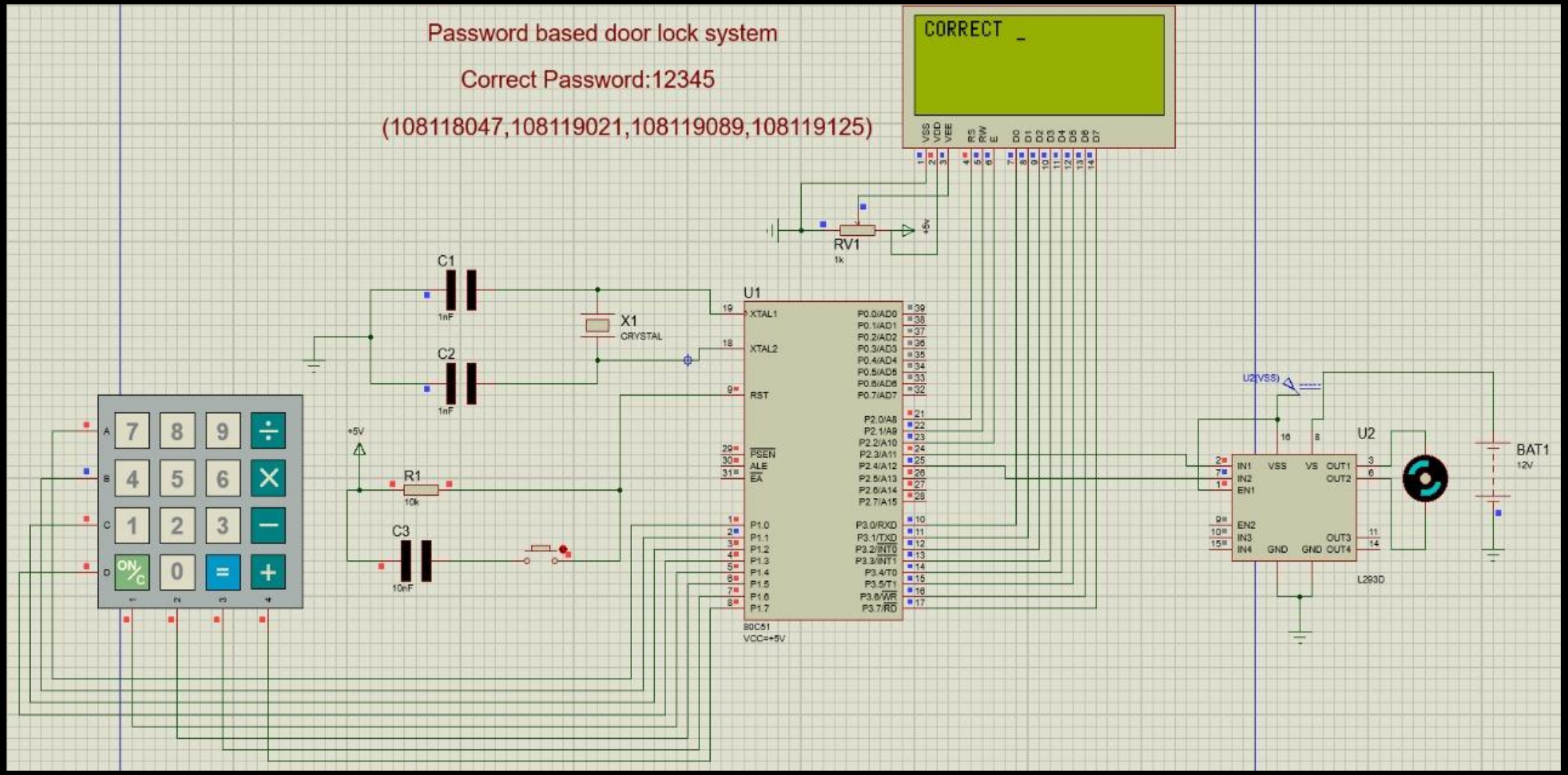
CHECK PASSWORD

It is the subroutine to compare user input password (5 digits) with the actually stored password in the program. Comparison is made digit by digit by selecting each digit from stored password with the help of DPTR and loading it to Accumulator (with MOVC A,@A+DPTR). Each digit loaded to the accumulator is then compared with the corresponding digit stored as user input.

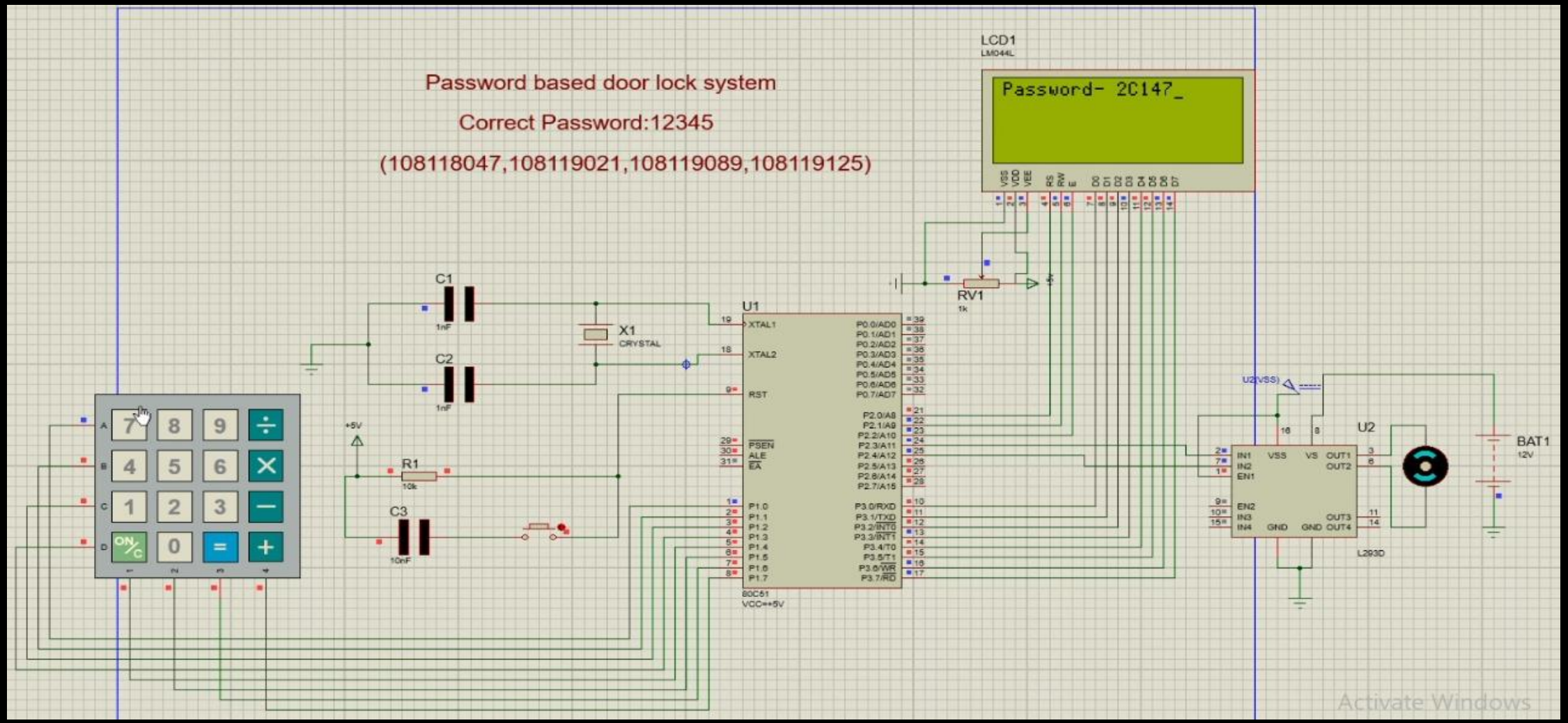
```
CHECK_PASSWORD:MOV R0,#5D
MOV R1,#160D
MOV DPTR,#PASSWORD
RPT:CLR A
MOVC A,@A+DPTR
XRL A,@R1
JNZ FAIL
INC R1
INC DPTR
DJNZ R0,RPT
ACALL LCD_INIT
MOV DPTR,#TEXT_S1
ACALL SEND_DAT
ACALL DELAY
SETB P2.3
CLR P2.4
SJMP GOBACK
FAIL:ACALL LCD_INIT
MOV DPTR,#TEXT_F1
ACALL SEND_DAT
ACALL DELAY
CLR P2.3
CLR P2.4
ACALL MAIN
GOBACK:RET
```

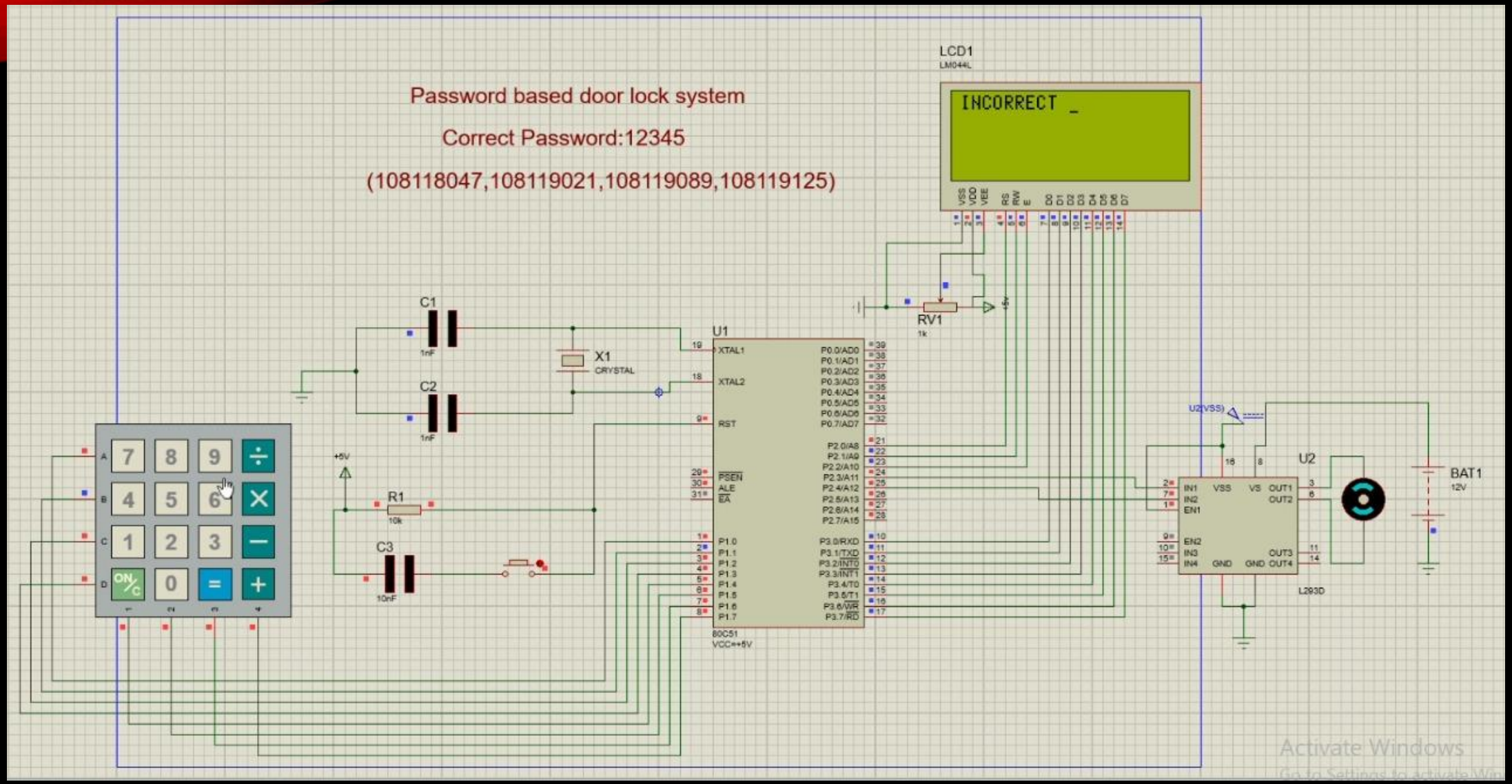
OUTPUT WHEN THE PASSWORD IS CORRECT




Password based door lock system
Correct Password:12345
(108118047,108119021,108119089,108119125)
CORRECT _
VSS VDD VEE RS RW E D0 D1 D2 D3 D4 D5 D6 D7
RV1
1k
+5v
C1
1nF
C2
1nF
X1
CRYSTAL
U1
XTAL1
XTAL2
RST
PSEN
ALE
EA
P0.0/AD0
P0.1/AD1
P0.2/AD2
P0.3/AD3
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12
P2.5/A13
P2.6/A14
P2.7/A15
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
80C51
VCC=+5V
+5V
R1
10k
C3
10nF
A 7 8 9 ÷
B 4 5 6 ×
C 1 2 3 −
D ON/C 0 = +
U2(VSS)
U2
IN1 VSS VS OUT1
IN2 OUT2
EN1
EN2
IN3 OUT3
IN4 GND GND OUT4
L293D
BAT1
12V

OUTPUT WHEN THE PASSWORD IS INCORRECT




Password based door lock system
Correct Password:12345
(108118047,108119021,108119089,108119125)
LCD1
LM044L
INCORRECT _
RV1
1k
C1
1nF
C2
1nF
X1
CRYSTAL
U1
80C51
VCC=+5V
R1
10k
C3
10nF
+5V
U2
L293D
BAT1
12V
U2(VSS)
Activate Windows

ADVANTAGES AND APPLICATIONS

Advantages:

- This project provides security.
- Power consumption is less.
- Uses commonly available components.

Applications:

- This simple circuit can be used at residential places to ensure better safety.
- It can be used at organizations to ensure authorized access to highly secured places.

CONCLUSION & FUTURE SCOPE

- The digital door lock is constructed in proteus simulation software and its executed successfully.
- This door lock can not be operated remotely, it has to be operated manually. In future, it could be developed so that it can be operated remotely with a handheld device.
- There is no method to recover the password if the user forgets it. So it could be developed in future to have a recovery method if you forget the password like an OTP can be sent to the mobile phone of the user in order to reset the password

REFERENCES

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- https://www.circuitstoday.com/interfacing-dc-motor-to-8051
- https://www.elprocus.com/interfacing-dc-motor-with-8051-microcontroller/#:~:text=The%20IC%20L293D%20is%20used,PWM%20generated%20by%20the%20microcontroller.&text=Thus%2C%20the%20speed%20of%20DC%20motor%20can%20be%20controlled