DIGITAL DESIGN
22COMP05C

PROJECT REPORT

Submitted to

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COMP. Dep., BUE

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COMP. Dep. DY2

1. Password Based Door-Lock Security system:

The purpose of a security system is to keep unwanted guests out of a certain place. To achieve that, a door lock is required. Moreover, the door lock system expects the user to enter a password that consists of four numbers. Only one combination will grant access.
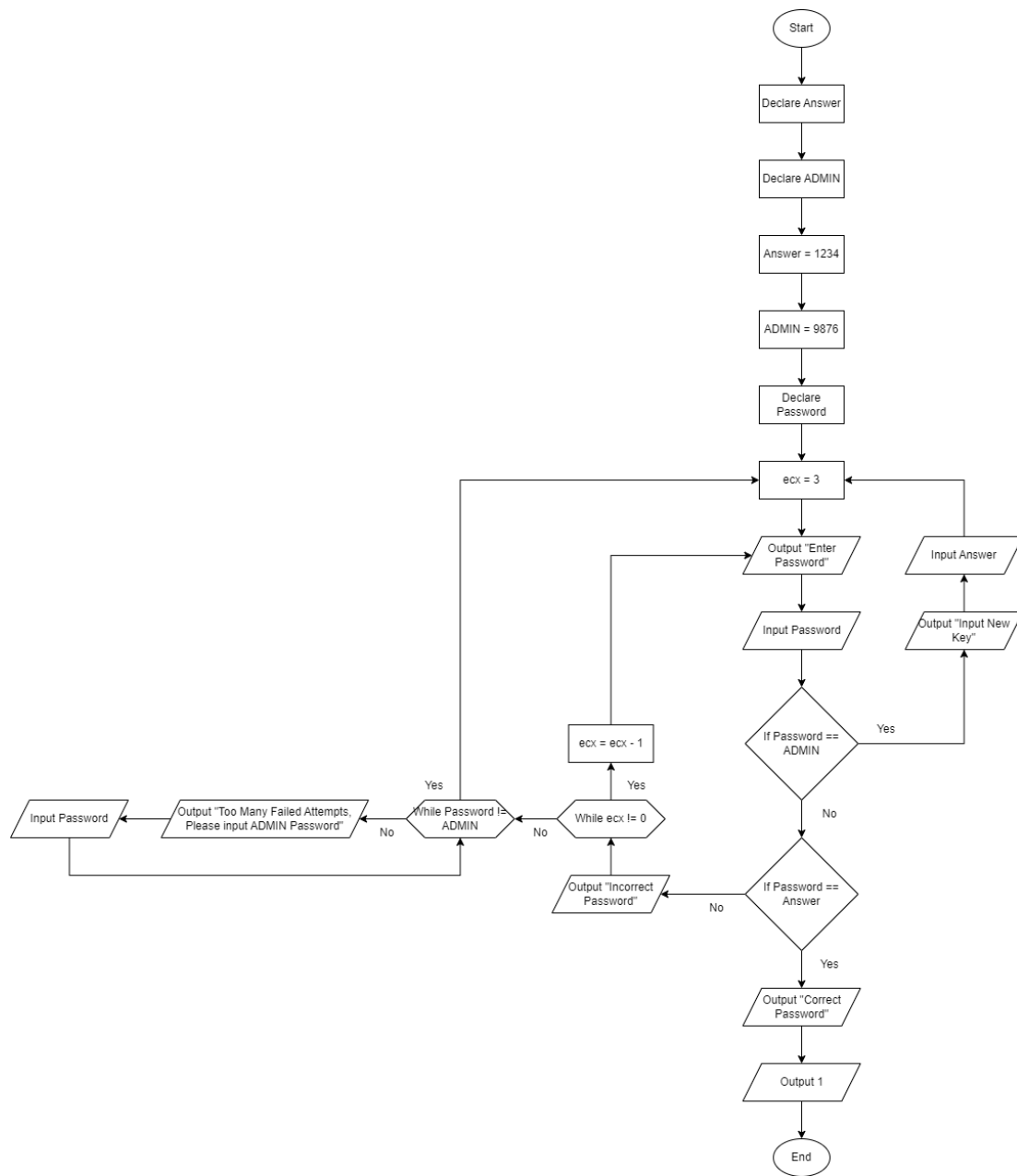
2. Flowchart:

FIGURE 1: SHOWS FLOWCHART USED

As mentioned earlier, the door lock system grants access to the user if the input password matches the desired password. To do so, the microprocessor holds two variables, the "Password" and the "Answer". The former saves the input from the user, while the latter contains the correct password.

Once the input password is acquired, the microprocessor will compare the "Password" and "Answer" together. If the comparison yields True, the user will be granted access, and the LCD device will show the output: "Correct password"; else, the user will be prompted to resubmit another password, and the LCD will display "Incorrect Password". If the user submits the password wrong repeatedly, he will be prompted to enter the "Admin" password. This part is used to lock the system; protecting the system from intruders. Once the admin password is entered, the user will be able to re-enter the password again, and the program will be unlocked.

Moreover, if the user wants to change the password entirely, he will have to gain administrator access by typing in the "Admin" password. If the input matches "Admin", the user will be allowed to change the password. Once the password is changed, the program will loop back to the start and ask the user to enter a password to continue. If the password it true, the program will output "1" and the gate will be opened.
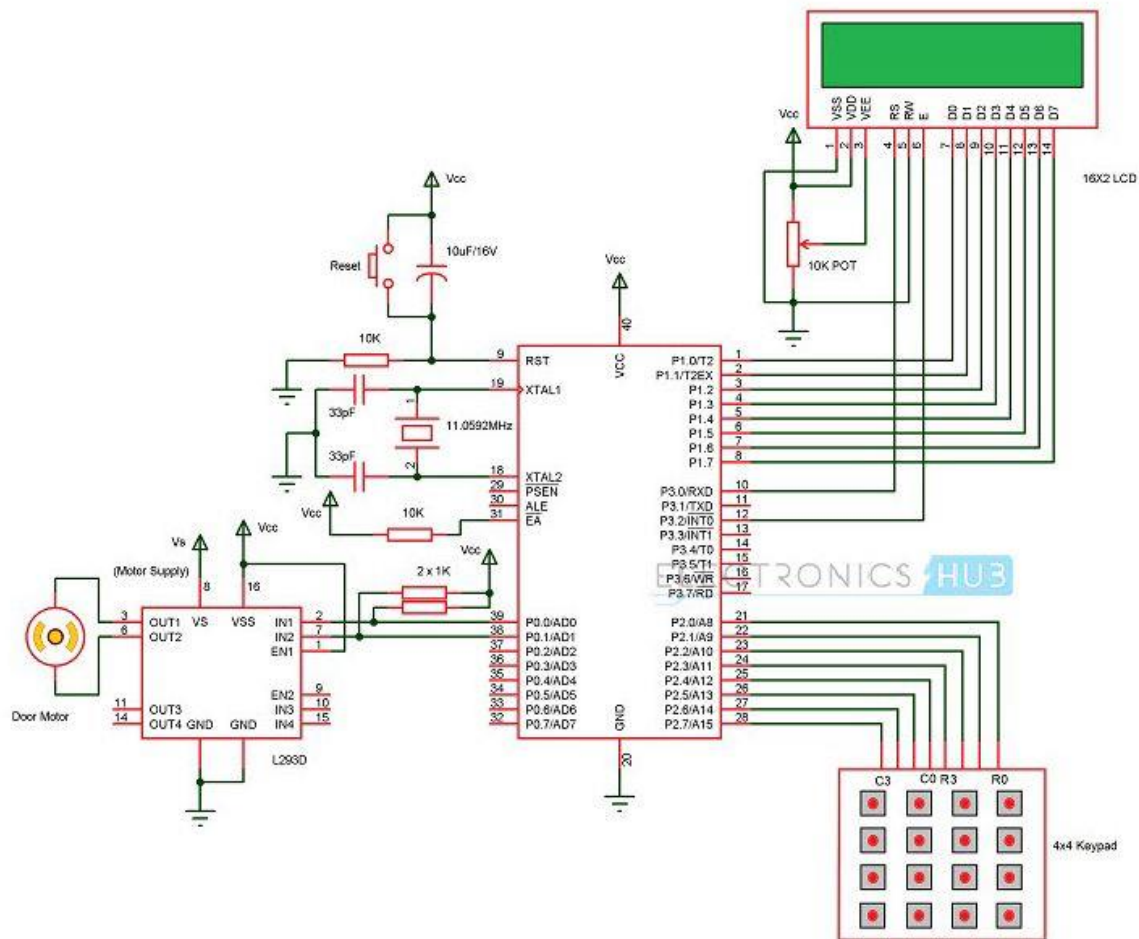
3. Block Diagram:
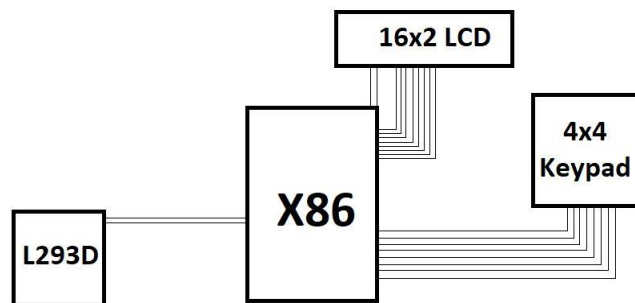

FIGURE 2: DETAILED BLOCK DIAGRAM

FIGURE 3: SIMPLIFIED BLOCK DIAGRAM

1. 4X4 Keypad:

The output bits of the keypad are connected in a crisscross configuration such that the first 4 bits are connected as columns and the last 4 bits are connected as rows. When a button is pressed, 2 specific row and column bits are triggered. For example, if the top-right button is pressed, which is connected to bit 1 (last column) and bit 8 (first row), the keypad will output 1000 0001 to be sent to the microprocessor.

2. LCD 16x2:

The RS pin (also known as Register Select) stores data to be displayed on the LCD. Pin 6 (Enable/Control Pin) is connected to the microcontroller unit & should constantly be held high to execute the Read/Write process. It controls the cursor, the information to be displayed, and the duration of which it stays on the screen.

The RW pin (also known as Read/Write pin) is used to determine the mode in which the LCD functions. If the pin receives 0, it reads. If the pin receives 1, it writes. Pins 7-14 (Data Pins) are used to send data to the display. The LCD receives ASCII code from the microprocessor to be displayed on screen.

3. IC L293D:

The IC chip is in charge of carrying out the tasks signaled by the microprocessor. It determines specifically how the task should be implemented on the door motor, which is responsible for opening and closing the gate.

The input signal mentioned earlier is acquired throughout pins 2 and 7. Once the chip is done processing the signal, the new output signal is sent to pins 3 and 6. To power up these procedures, the IC obtains Voltage from pins 8 and 16. Since the door motor is purely an analog device, the IC can only communicate with it using electrical signals. By sending a current throughout pin 3, which goes out from pin 6. If the current follows this path, the door motor will unlock the door. If the current gets reversed, it will instead lock the door.

4. Assembly Code:

```
TITLE MASM Template                                    (main.asm)

INCLUDE Irvine32.inc
.data
Answer DWORD 1234d
ADMIN DWORD 9876d
Password DWORD ?
Msg1 BYTE "Enter Password",0
Msg2 BYTE "Correct Password",0
Msg3 BYTE "Input new Key",0
Msg4 BYTE "Incorrect Password",0
Msg5 BYTE "Too many failed attempts, please input admin password",0
Msg6 BYTE "Output 1, which will activate the IC to turn the motor on",0

.code
main PROC

    L1:
            mov ecx, 3

    L2:
            mov edx,offset Msg1
            Call WriteString
            Call crlf
            Call ReadInt
            mov Password, eax
            mov eax,ADMIN
            cmp eax,Password
            je L3
            mov eax, Answer
            cmp eax, Password
            je L6
            jmp L4

    L3:
            mov edx, offset Msg3
            Call WriteString
            Call crlf
            Call ReadInt
            mov Answer,eax
            jmp L1

    L4:
            mov edx, offset Msg4
            Call WriteString
            Call crlf
            Loop L2

    L5:
            mov edx, offset Msg5
            Call WriteString
```

```
        Call crlf
        Call ReadInt
        mov Password, eax
        mov eax,ADMIN
        cmp eax, Password
        je L1
        jmp L5


L6:
        mov edx, offset Msg2
        Call WriteString
        Call crlf
        mov edx,offset Msg6
        Call WriteString
        Call crlf


    exit
main ENDP

END main
```
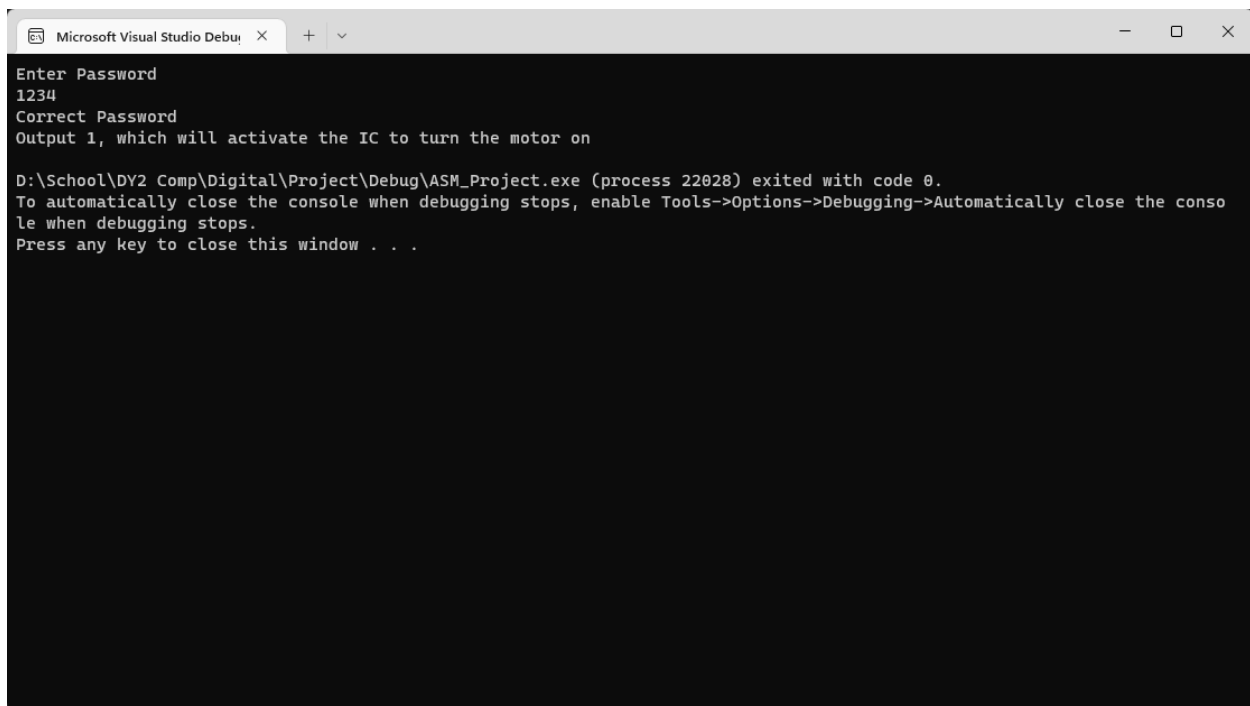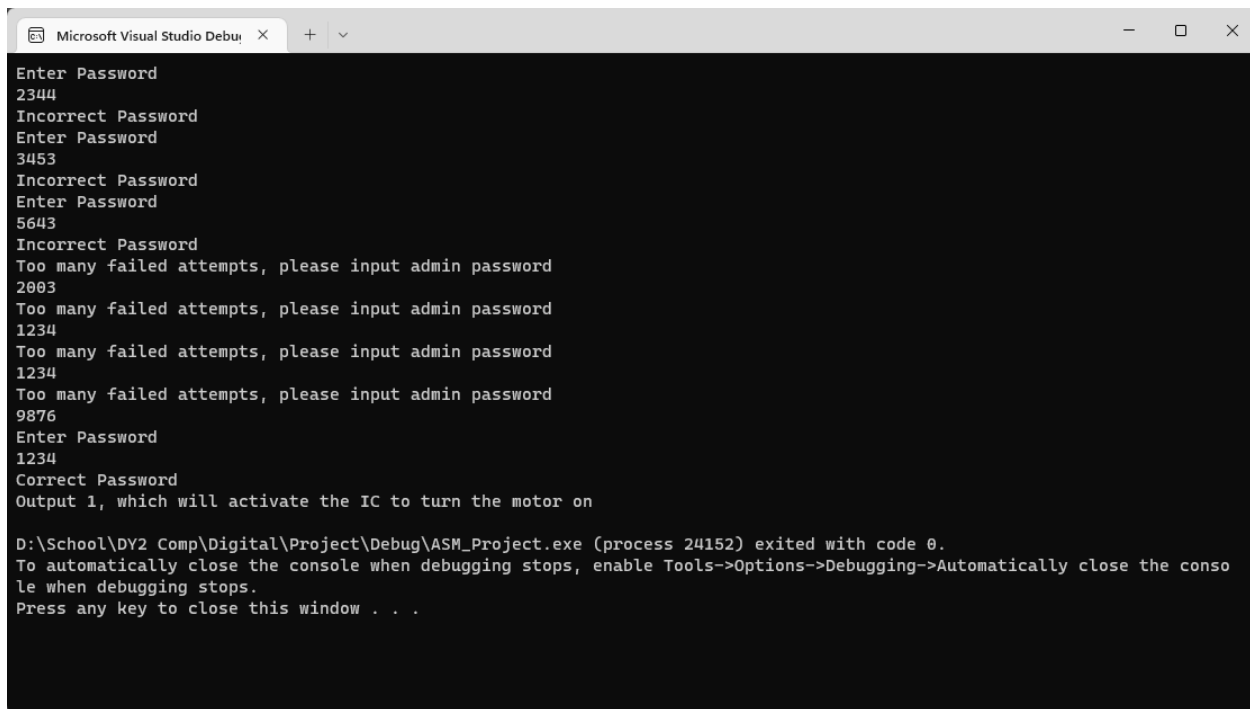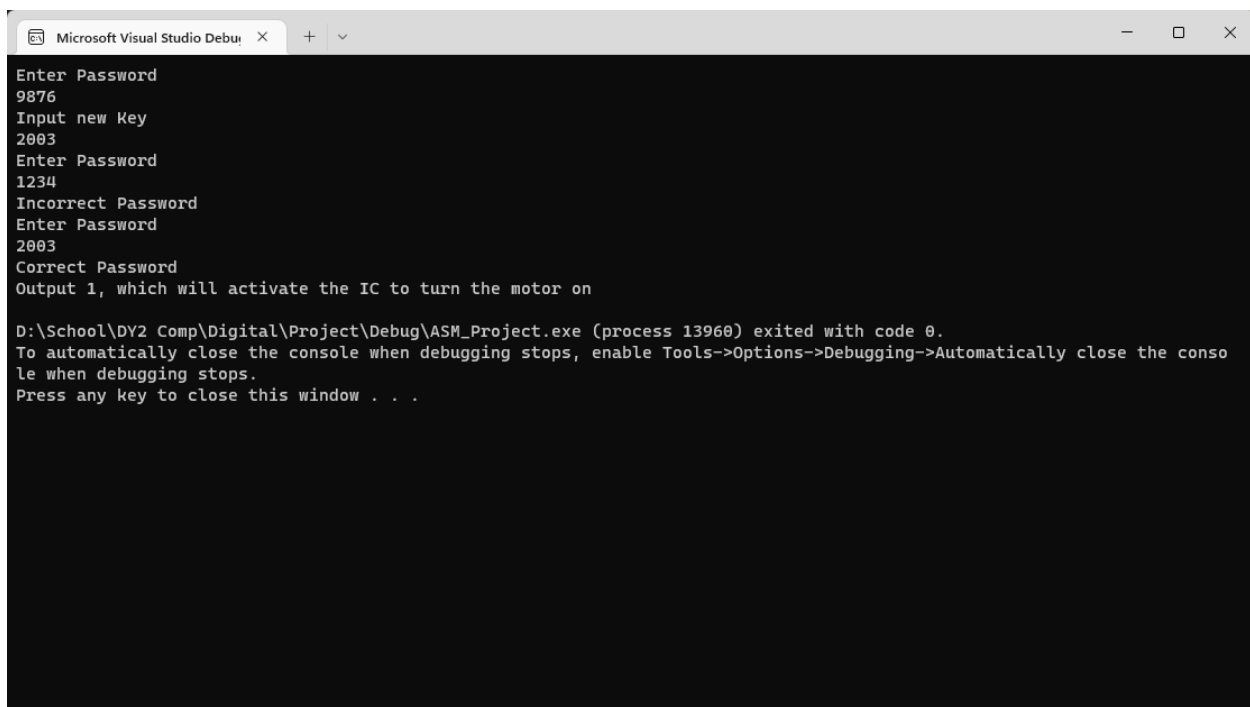

FIGURE 4: CORRECT PASSWORD CASE

FIGURE 5: INCORRECT PASSWORD CASE

FIGURE 6: CHANGING PASSWORD CASE

The code starts with defining some variables and messages to be displayed during program execution. The Answer variable is set to 1234, and the ADMIN variable is set to 9876, representing the correct password for regular users and the administrator password, respectively. The program then starts with a loop labeled L1, which keeps running until the user enters the correct password or the administrator password.

Inside the L1 loop, the program prompts the user to enter a password by displaying a message "Enter Password." The entered password is stored in the Password variable, and the program compares it with the correct password (Answer) and the administrator password (ADMIN) using the CMP instruction. If the entered password matches the correct password, the program jumps to the L3 loop, where the user is prompted to enter a new key value. If the entered password matches the administrator password, the program displays a message "Output 1, which will activate the IC to turn the motor on" and exits the program.

If the entered password is incorrect, the program displays a message "Incorrect Password" and allows the user to try again up to three times. The program uses the Loop instruction to decrement the ECX register and check whether it has reached zero to exit the loop. If the user enters an incorrect password more than three times, the program displays a message "Too many failed attempts, please input admin password" and asks for an administrator password. The program then checks whether the entered password matches the administrator password, and if it does, the user is allowed to proceed. If the entered password is incorrect, the program goes back to the L5 loop and repeats the process.

Finally, the program exits using the EXIT instruction.