NPTEL
Summer Workshop on Microcontrollers
WEL, IIT Bombay

Problem set: 6 Date: June 13, 2023

KeyPad Interfacing

The task is to write an embedded C program to read password using keypad and grant (or deny) access based on the correctness of the password.

The flow-chart below describes the algorithm to read any key from the keypad.

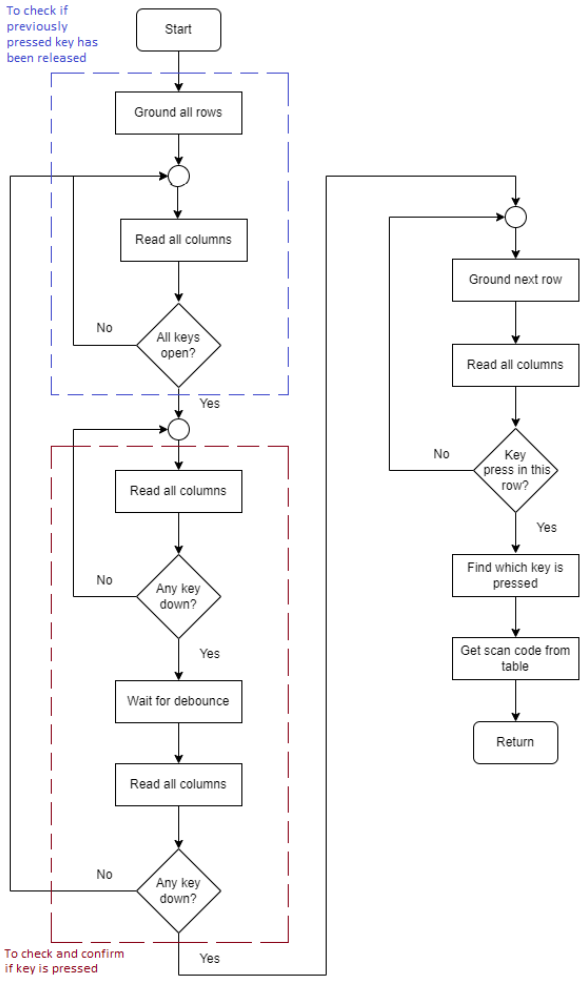

Figure 1: Flowchart describing procedure for reading keys

Note: Keep debounce delay of 20 ms.

The internal circuit diagram of the keypad is given in the below figure.

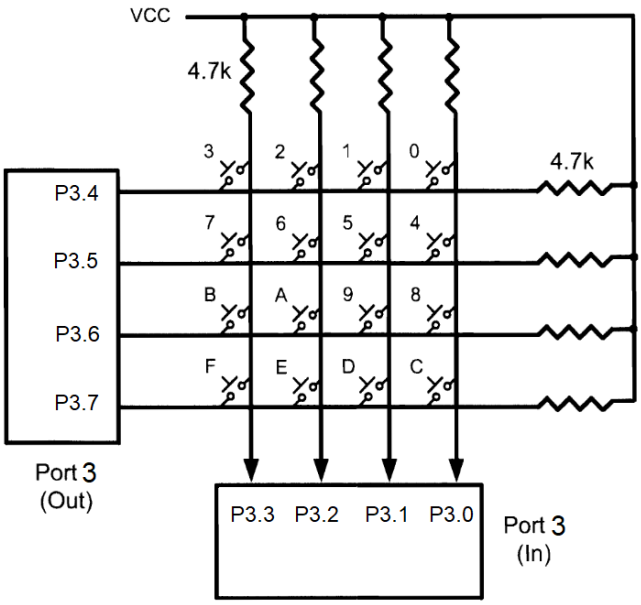

Figure 2: Keypad Circuit

Note that the rows are outputs and columns are inputs.
Refer the below figures to understand the keypad.

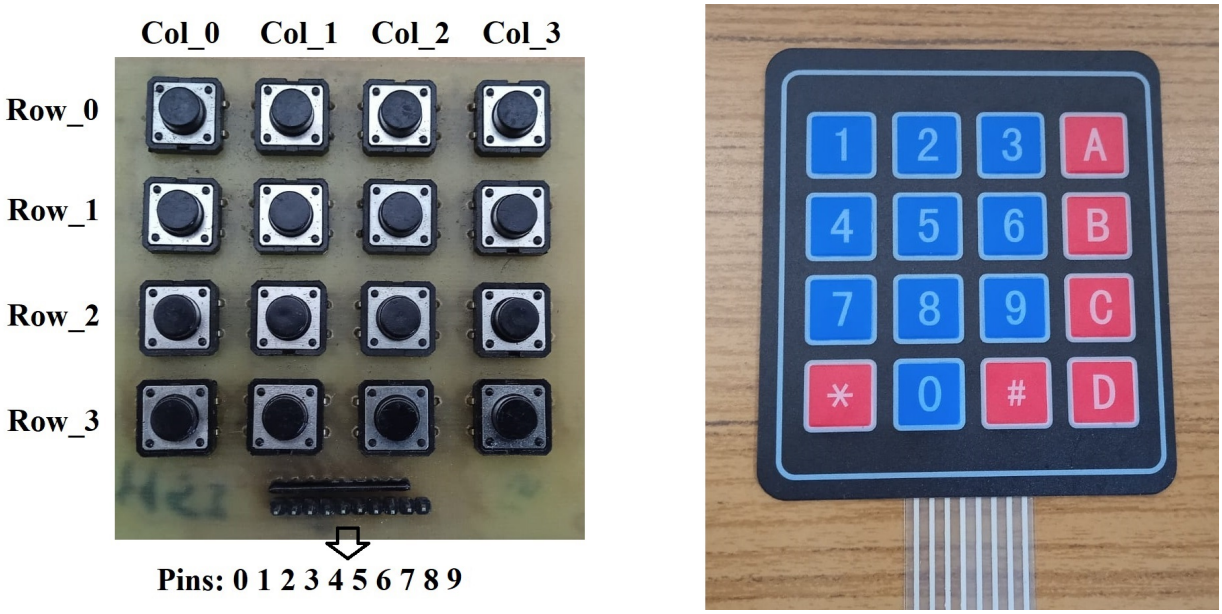

Figure 3: Keypad Mapping

The image on the right describes which key corresponds to which character. For example, the key at Row 0, Column 0 corresponds to the character '1'.

Refer to the following table for pin mapping.

Pins	Mapping	Pt-51
Pin0	Row 3	P3.7
Pin1	Row 2	P3.6
Pin2	Row 1	P3.5
Pin3	Row 0	P3.4
Pin4	Column 0	P3.3
Pin5	Column 1	P3.2
Pin6	Column 2	P3.1
Pin7	Column 3	P3.0
Pin8	Pull-up resistance	$5V$ on board
Pin9	Not connected	-

Table 1: Pin mapping

Note : For $5V$ connect to the on board power supply pin near USB attach/detach switch.

Task procedure-

- The correct password is - "15A8*D6#". Store this as a string in your program.
- Print "Enter Password:" in the first row of LCD.
- Use the flowchart in Figure 1, the images in Figure 2 and Table 1 to write code to read an input from the keypad.
- Create a loop that iterates 8 times and reads a character from the key-pad in each iteration. As a new character is read, it should be displayed on the second row of the LCD. Also store each of these characters in a string.
- After all 8 characters are read, compare the entered password to the correct password.
  - If the password is correct, display - "Correct Password" in the first row and "Access Granted" in the second row.
  - If the password is wrong, display - "Wrong Password" in the first row and "Access Denied" in the second row.
- Before trying on board with the keypad verify the correctness of the code by using debug session on Keil with breakpoints using I/O peripherals → Port3 to give inputs. **When key is pressed the output given to the row value gets reflected on the corresponding column value**.
- For verifying that all the keys in the keypad are working, you can use the hex file provided here : Keypad_Test