INDIAN INSTITUTE OF TECHNOLOGY PATNA

EC3101: Microcontroller & Embedded Systems Lab

EXPERIMENT NO: 04

Display Numbers using Keypad

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Group No.	2 (Thursday)

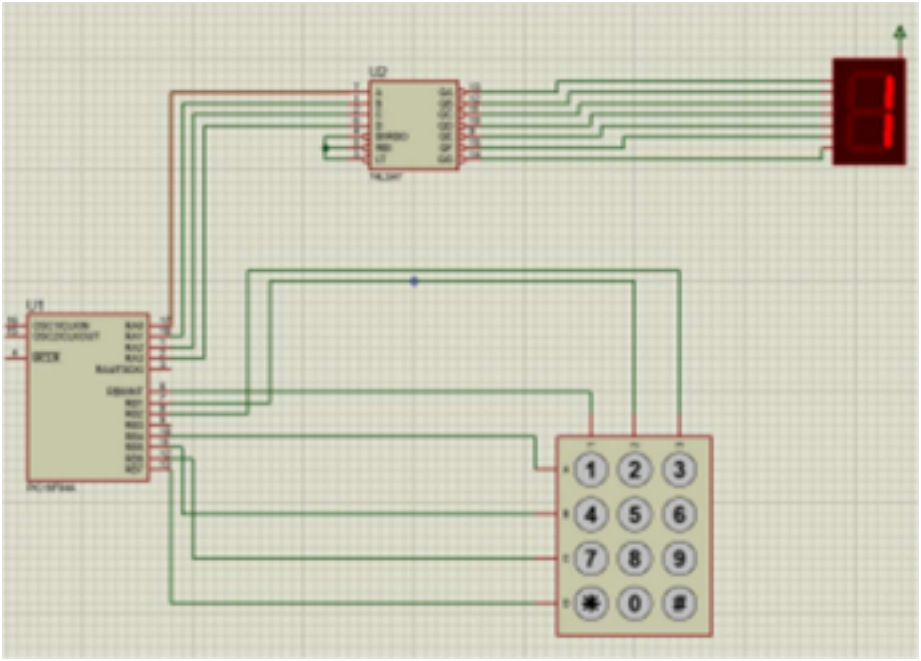
Aim:

Display digits on segment display using PIC microcontroller using PIC Microcontroller

Software used:

1. MikroC Pro for PIC for writing and compiling the embedded C code.
2. Proteus Design Suite for circuit design and simulation.
3. Common Cathode 7 segment display, LM016L (LCD1).

Circuit Diagram:



Theory:

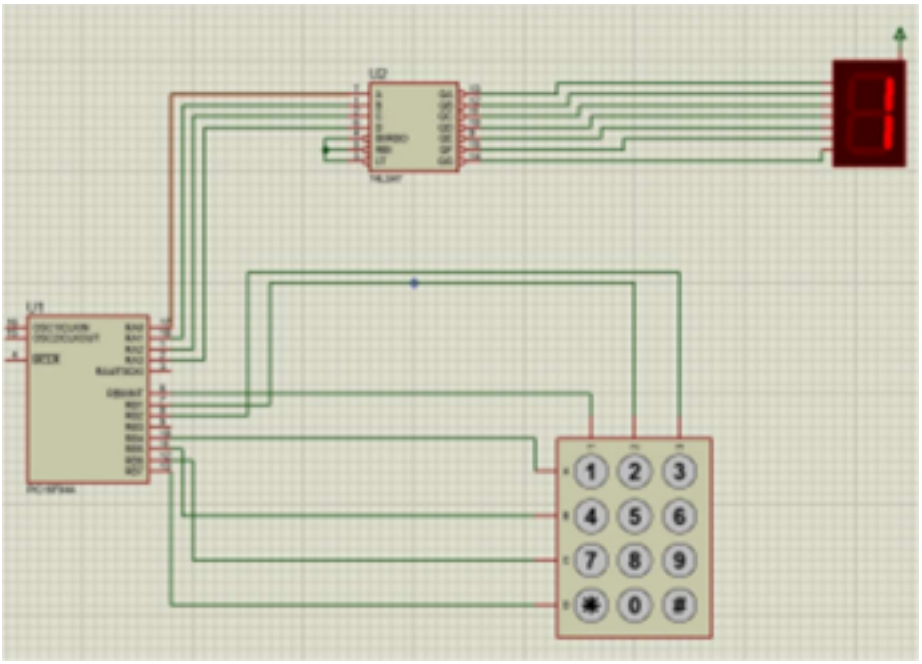
A keypad is one of the most commonly used input devices in embedded systems for entering numeric or character data. It is typically arranged in a matrix form consisting of rows and columns. When a key is pressed, it connects a specific row to a column, and the microcontroller detects this connection to identify the pressed key .In this experiment, a 4×3 matrix keypad is interfaced with the PIC16F84A microcontroller. The rows and columns of the keypad are connected to PORTB pins of the PIC. The microcontroller continuously scans the keypad by sending logic signals to the row lines and checking the status of the column lines. When a key is pressed, the corresponding row-column intersection is detected,

and the key value is identified. The detected key value is then processed by the microcontroller and displayed on a 7segment display through a 74LS47 BCD-to-7-segment decoder/driver IC. This provides a simple way of showing the pressed key in real time. Keypad interfacing is widely used in applications like calculators, digital locks, and password based entry systems.

Code:

```
unsigned short kp = 0;
char keypadPort at PORTB;
void main()
{
  TRISA = 0;
  PORTA = 0;
  Keypad_Init();
  while(1){
    do{
      kp = Keypad_Key_Press();
    }
    while(!kp);
    if(kp &lt;= 3) {
      PORTA = kp;
    }
    else if (kp &gt; 3 &amp;&amp; kp &lt;= 7) {
      PORTA = kp - 1;
    }
    else if (kp &gt; 8 &amp;&amp; kp &lt;= 11) {
      PORTA = kp - 2;
    }
  }
}
```

Observation:



The number we press on the keypad the same number gets displayed on the display.

Result:

The 4×3 matrix keypad was successfully interfaced with the PIC16F84A microcontroller. The microcontroller was able to detect the pressed key by scanning the keypad rows and columns. The corresponding key value was displayed correctly on the 7-segment display through the 74LS47 decoder IC. Thus, the experiment verified the working principle of matrix keypad scanning and its practical use for user input in embedded systems.