*Sohag University*
*Faculty of Engineering*

*4th year Communication Dept.*
*Embedded Laboratory*

# LAB 1

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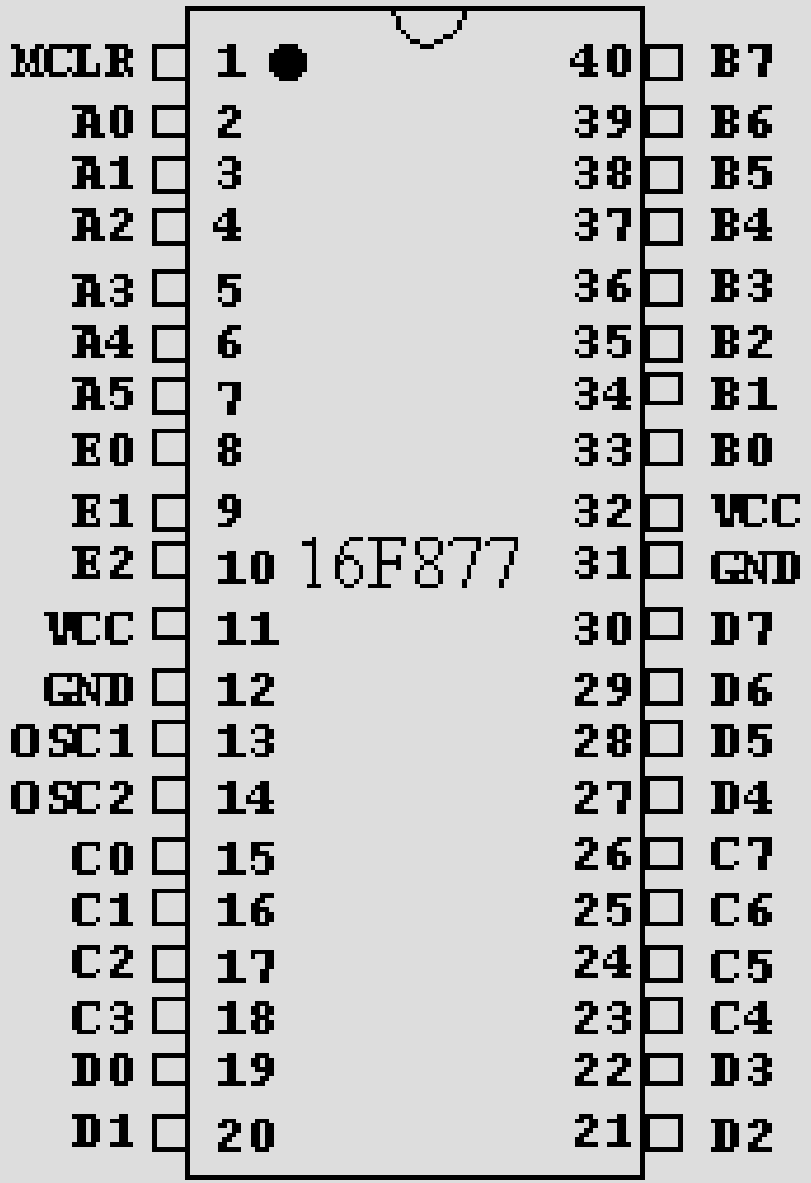
# PIC

- Peripheral Interface Controller.
- Is a Microntroller (NOT microprocessor).
- Is a Family of microcontrollers made by Microchip Technology.
  - PIC10 (10FXXX)
  - PIC12 (PIC12FXXX)
  - PIC16 (16FXXX)
  - PIC 17/18 (18FXXX)
- Each family has a variety of components along with built in special features(memory sizes and pin packages and different clock ratings ...etc).

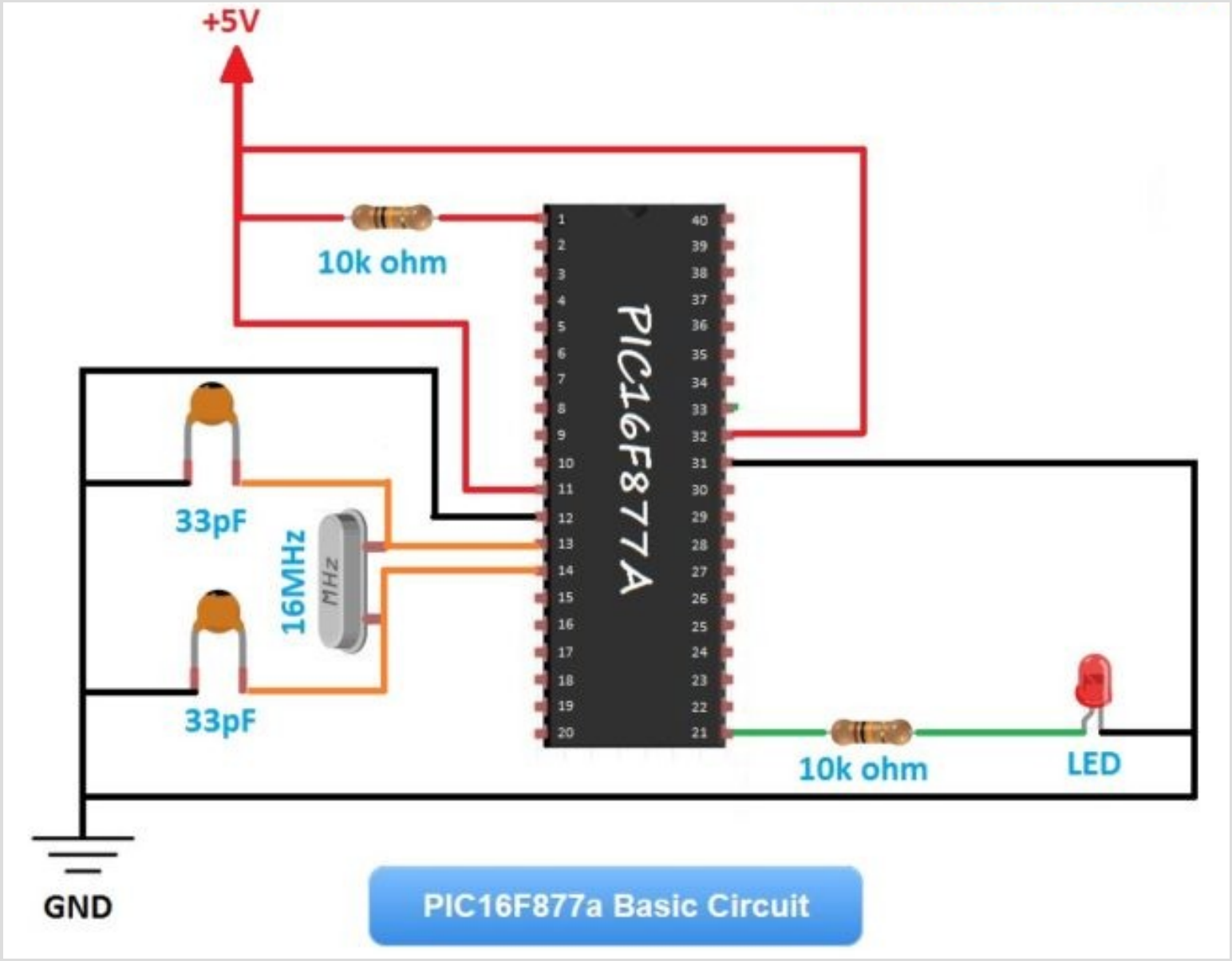
# PIC 16F877A

- 40-pin PIC Microcontroller.
- It has five Ports on it starting from Port A to Port E


MCLR 1
A0 2
A1 3
A2 4
A3 5
A4 6
A5 7
E0 8
E1 9
E2 10
VCC 11
GND 12
OSC1 13
OSC2 14
C0 15
C1 16
C2 17
C3 18
D0 19
D1 20
16F877
40 B7
39 B6
38 B5
37 B4
36 B3
35 B2
34 B1
33 B0
32 VCC
31 GND
30 D7
29 D6
28 D5
27 D4
26 C7
25 C6
24 C5
23 C4
22 D3
21 D2

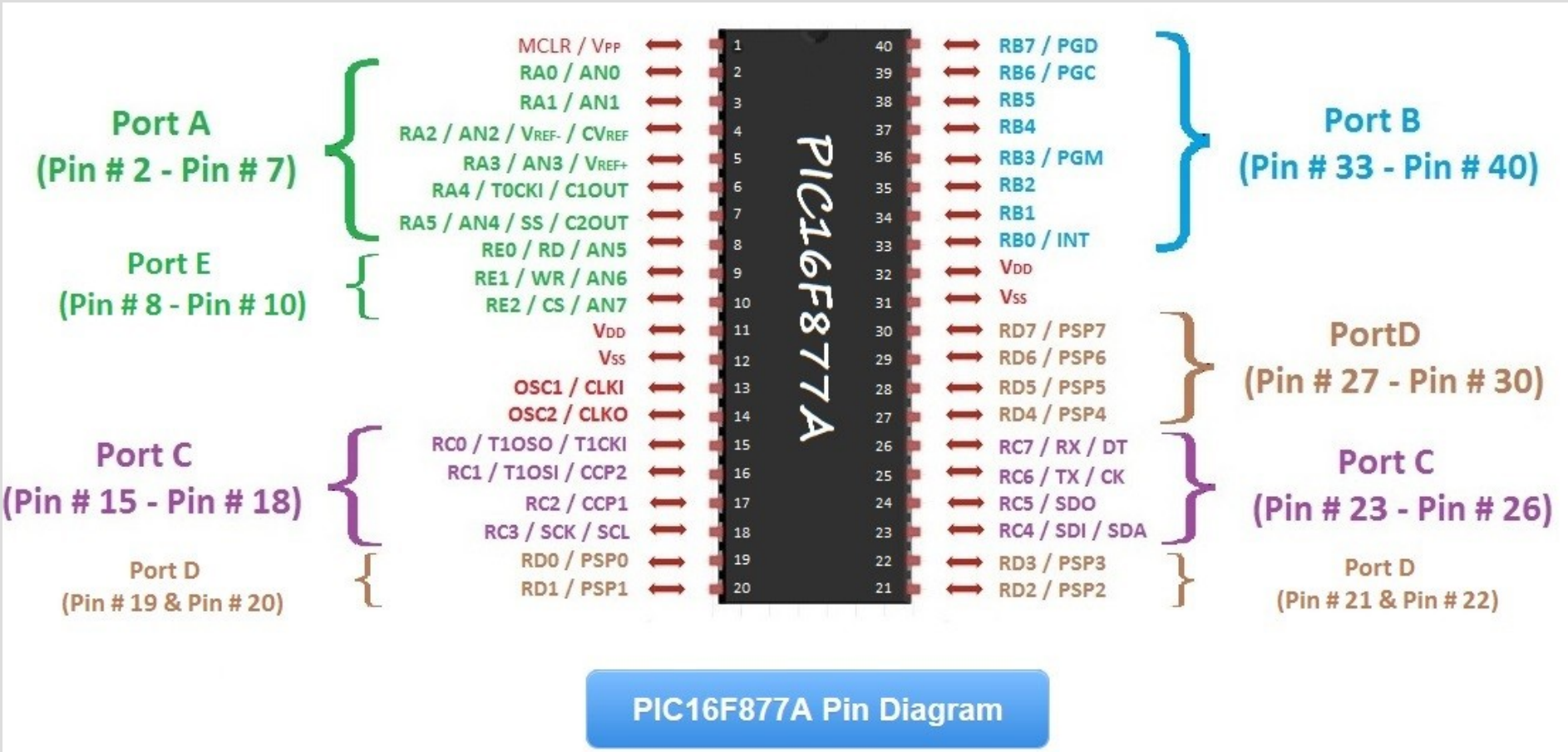
# Basic Circuit

- Pin #1:MCLR (Master Clear), provide 5V to this pin through a 10k-ohm resistance.
- Pin #11 & #32:**VDD,** provide it 5V.
- Pin #12 & #31: **GND**, provided Ground at this pins.
- Pin #13 & #14: OSC1 (Oscillator 1) and OSC2 (Oscillator 2), attach our Crystal Oscillator at these pins(4MHz to 40MHz).


+5V
10k ohm
PIC16F877A
33pF
16MHz
MHz
33pF
GND
10k ohm
LED
PIC16F877a Basic Circuit

# 16F877A Ports

- PIC16F877a has 5 Ports in total which are:
- Port A: It has 6 Pins in total starting from Pin #2 to #7, labeled from RA0 to RA5.
- Port B: It has 8 Pins in total starting from Pin #33 to #40. Port B Pins are labeled from RB0 to RB7.
- Port C: It has 8 Pins in total. It’s pins are not aligned together. First four Pins of Port C are located at Pin # 15 – Pin # 18, while the last four are located at Pin # 23 – Pin # 26.
- Port D: It has 8 Pins in total, located at Pin #19 – Pin #22, and at Pin #27 – Pin #30.
- Port E: It has 3 Pins in total starting from Pin #8 to #10, labeled from RE0 to RE2.




PIC16F877A Pin Diagram

# Communication Ports

- Serial communication
  - Pin #25 is acting as TX, sending the serial data.
  - Pin #26 is acting as RX, receiving the serial data.
- I2C Communication
  - Pin #18: It is acting as SCL, Serial Clock Line.
  - Pin #23: It is acting as SDA,, Serial Data Line.

# Input/Output pins

- Each port has three registers for its operation. These registers are

  1) **TRIS** register (data direction register)
  2) **PORT** register (read and assign the levels on the pins of the device)

- TRISB=0; //making port as output port (write)
- TRISB = 0x00;
- TRISB = 0b00000000;
- TRISA=1 ; //making port as input port (read)
- TRISA.F2 = 1; // A2 configured as input
- TRISB = 0b00000010; // All PORTB pins except B1 are configured as outputs

- TRISA=0 //making port as output port (write)
- PORTA=0x03; //Assigning high logic to the RA0 and RA1

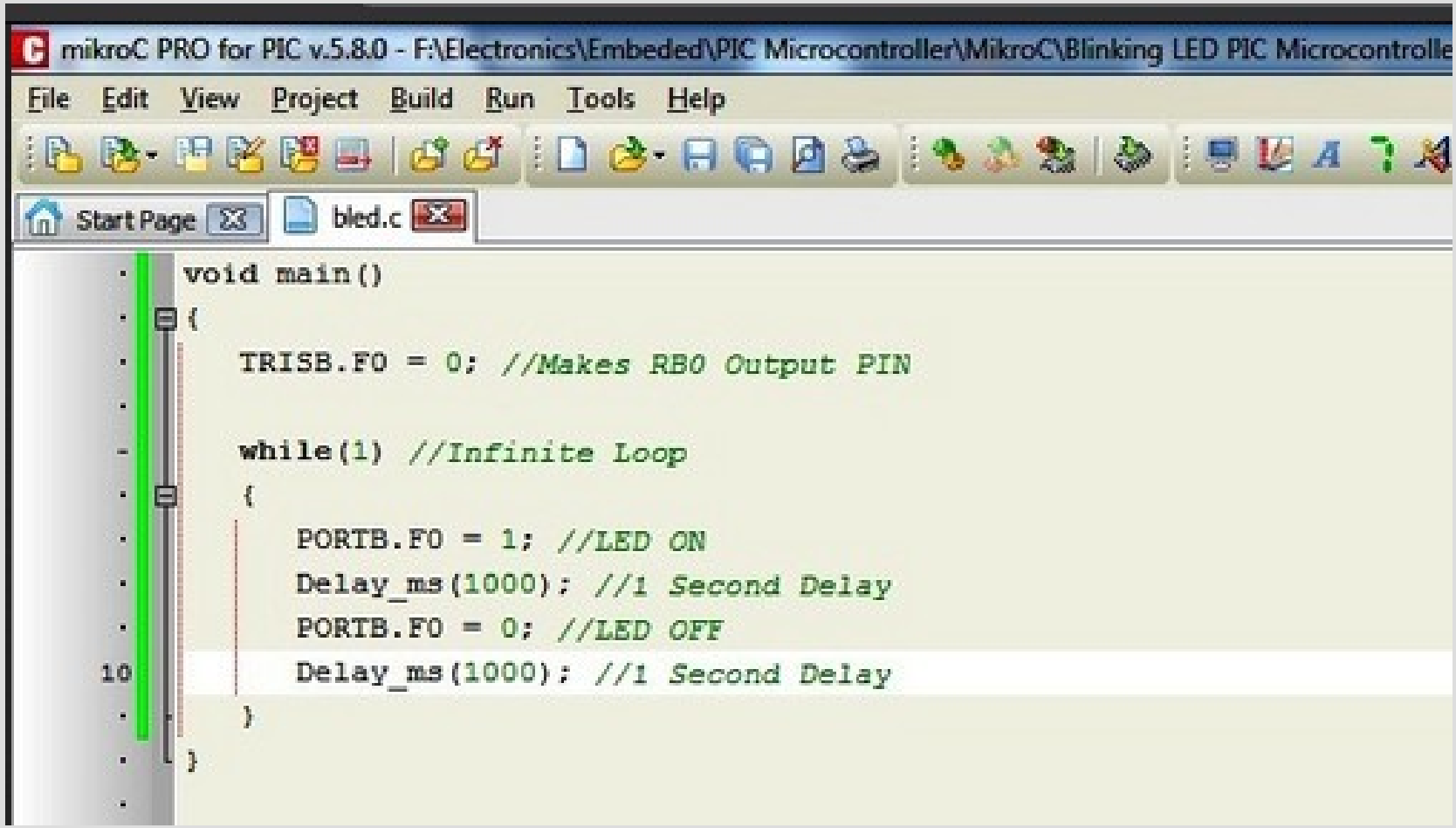
# How to Start?

- **Programming language**: BASIC, **C**, Pascal …  etc
- **Compiler**: translate the original BASIC code into HEX code that can be fed to microcontroller(**Mickro c**).
- **Programmer**: to transfer our HEX files from computer to

microcontroller memory

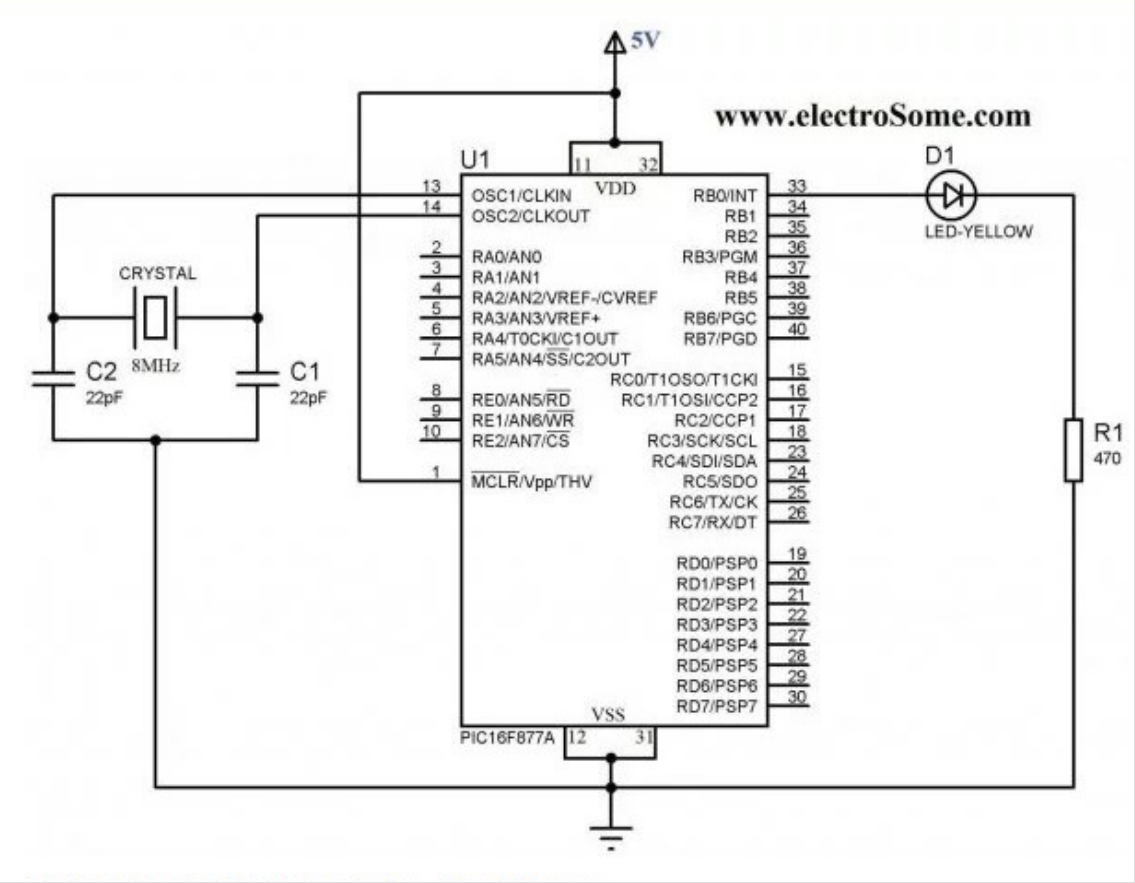
# Example: Blinking LED

- MikroC



# Example: Blinking LED

- Proteus



# To Do:

1. Blinking Led.
2. Traffic Light System.
3. Led controlled bu push button