# INDIAN INSTITUTE OF TECHNOLOGY PATNA

## EC3101: MICROCONTROLLER AND EMBEDDED SYSTEM LAB


## Experiment No: 03

**Submitted by :**

**Name:** Shaurya Aggarwal
**Roll No:** 2301EE56
**Group No:** 02(Thursday)

**Aim:**

To show the rotation of stepper motor using PIC16F84A Microcontroller.

**Apparatus :**

Proteus Simulator software , MicroC ,PIC16F84A (Microcontroller),

ULN2003A(Driver), Stepper Motor.

**THEORY :**

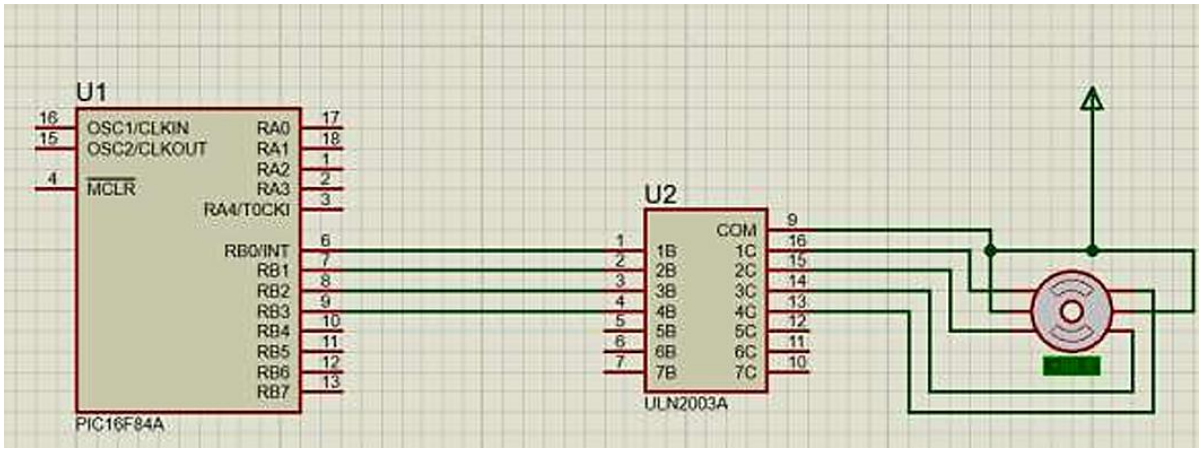
This circuit is a stepper motor control system using a PIC16F84A microcontroller and a ULN2003A driver IC. The PIC16F84A is an 8-bit microcontroller that provides digital outputs to control external devices. In this circuit, it is used to generate the required sequence of pulses to drive a stepper motor. Stepper motors require a specific sequence of energizing their coils to rotate in steps, and the microcontroller handles this logic. Since the PIC's I/O pins cannot directly drive the higher current needed by the motor, a ULN2003A driver IC is used. The ULN2003A is a Darlington transistor array that works as a current amplifier, allowing low-power signals from the microcontroller to control higher-power loads like motors.

1) The RB0–RB3 pins of the PIC are connected to the inputs of the ULN2003A (pins 1B–4B).
2) The corresponding outputs (1C–4C) of the ULN2003A are connected to the stepper motor windings.
3) The COM pin of ULN2003A is tied to the motor's supply voltage to handle the back EMF generated by the coils.
When the microcontroller sends a logic HIGH on one of its output pins, the ULN2003A sinks current through the motor winding, energizing it. By sending a proper sequence of signals (full-step, half-

step, or wave drive), the motor shaft rotates step by step.

**Working**:

1. The PIC16F84A executes a program that generates the step (0001 → 0010 → 0100 → 1000), The signals are passed to ULN2003A, which amplifies them to drive the stepper motor.
2. The motor rotates by discrete steps, and the direction/speed depends on the pulse sequence and frequency from the microcontroller.



## Code B:

```
void main() {
TRISB = 0x00;  // Set PORTB as output
PORTB = 0x00;  // Initialize PORTB
while(1) {
PORTB = 0b0001;  // For sequence 0001
Delay_ms(200); // Delay of 200 ms
PORTB = 0b0010;  // For sequence 0010
Delay_ms(200); // Delay of 200 ms
PORTB = 0b0100; // For sequence 0100
Delay_ms(200); // Delay of 200 ms
PORTB = 0b1000; // For sequence 1000
Delay_ms(200); // Delay of 200 ms
}
}
```

## Results:

The stepper motor was successfully interfaced with the PIC16F84A microcontroller through the ULN2003A driver IC. By applying the programmed sequence, the motor rotated in discrete steps.

---