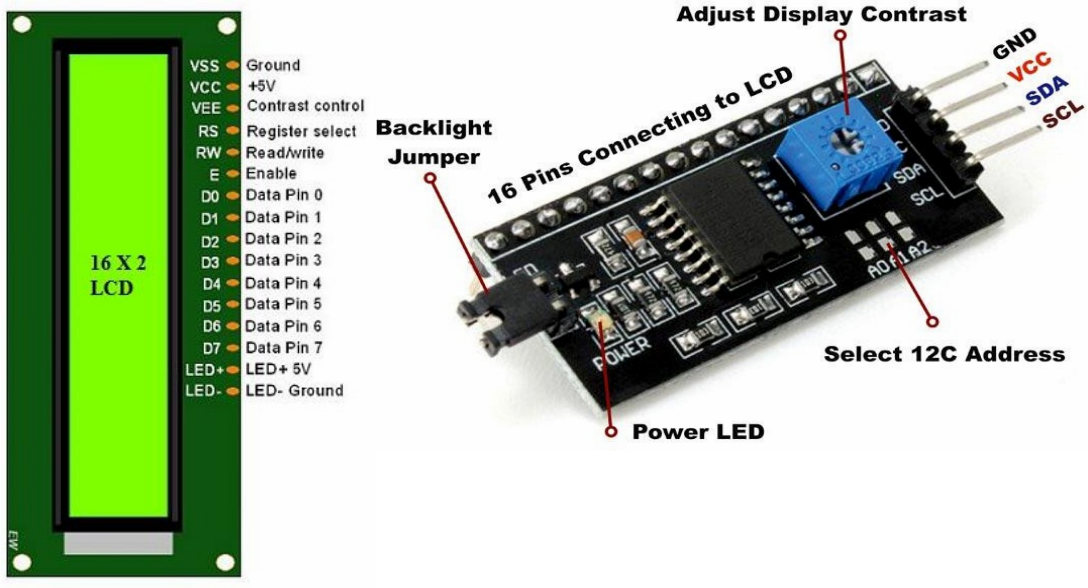
Experiment No.3

Aim: To implement Inter-Integrated Circuit (I²C) protocol for serial communication between Arduino and liquid crystal display (LCD) modules, enabling alphanumeric data visualization.

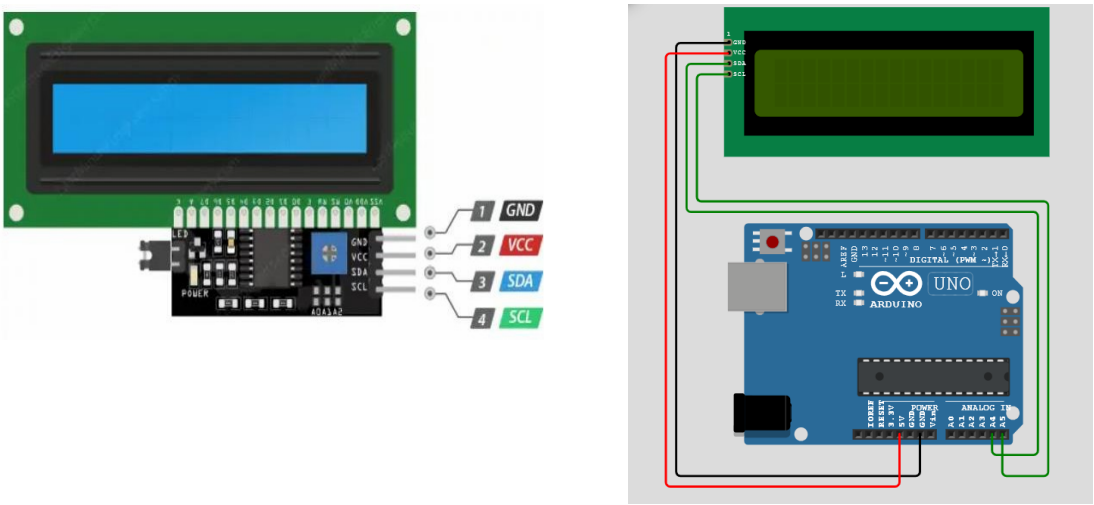
Simulator used: Wokwi Simulator

Circuit Layout:



(a) (b)

Figure 1: (a) Pin Description of LCD (b) I2C Serial Interface Adapter Module Pinout



(a) (b)

Figure 2: (a) I2C LCD Display Pinout (b) Interfacing I2C LCD with Arduino Uno

Theory:

LCD:

An LCD (Liquid Crystal Display) is a simple screen that displays text and numbers. One of the most commonly used LCDs in electronics projects is the 16x2 LCD, which means it has 2 rows and 16 columns – enough to display 32 characters at a time.
By default, this type of LCD uses 16 pins – out of which 8 pins are just for data, and the rest are for power, ground, and control. That's a lot of pins if you're using a small microcontroller like an Arduino Uno which only has a limited number of input/output pins.

I2C:

I²C (Inter-Integrated Circuit) is a two-wire communication protocol used to connect multiple devices (like sensors, displays, etc.) to a microcontroller. It uses:

- SDA (Serial Data Line) – for data transfer
- SCL (Serial Clock Line) – to sync the communication

Each device connected over I²C has a unique address, so the microcontroller can talk to multiple devices using the same two lines.

Why Use I²C with an LCD?

To reduce the number of wires, we can use a special **I²C module** (or **backpack**) with the LCD. This small board fits on the back of the LCD and uses a chip (like **PCF8574**) that allows the LCD to work over I²C.

So, instead of 16 wires, we only need **4 connections**:

- VCC (Power)
- GND (Ground)
- SDA (Data)
- SCL (Clock)

This makes the wiring much simpler and frees up I/O pins on the Arduino for other tasks.

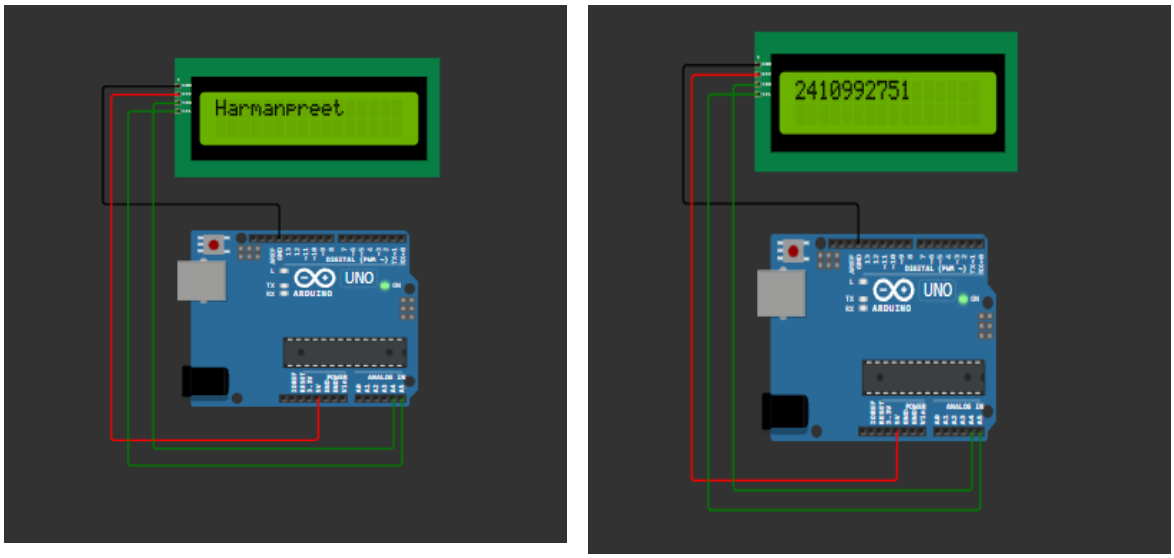
Code Used:

For writing Name and Roll No. :-

```
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,16,2);
void setup() {
  lcd.init();
  lcd.backlight();
  lcd.print("2410992751");
}
void loop() {
```

```
  // put your main code here, to run repeatedly:
}
```

Simulation Outcome:



(a) (b)

Figure 3: (a) Name and (b) Roll Number

Result:

The Inter-Integrated Circuit (I²C) protocol was successfully implemented for serial communication between the Arduino and the LCD module. The LCD was able to display alphanumeric characters correctly with reduced wiring complexity. The experiment demonstrates efficient data transmission using the I²C protocol and validates its utility in embedded systems for communication with peripheral devices like LCDs.