Lab Report 7

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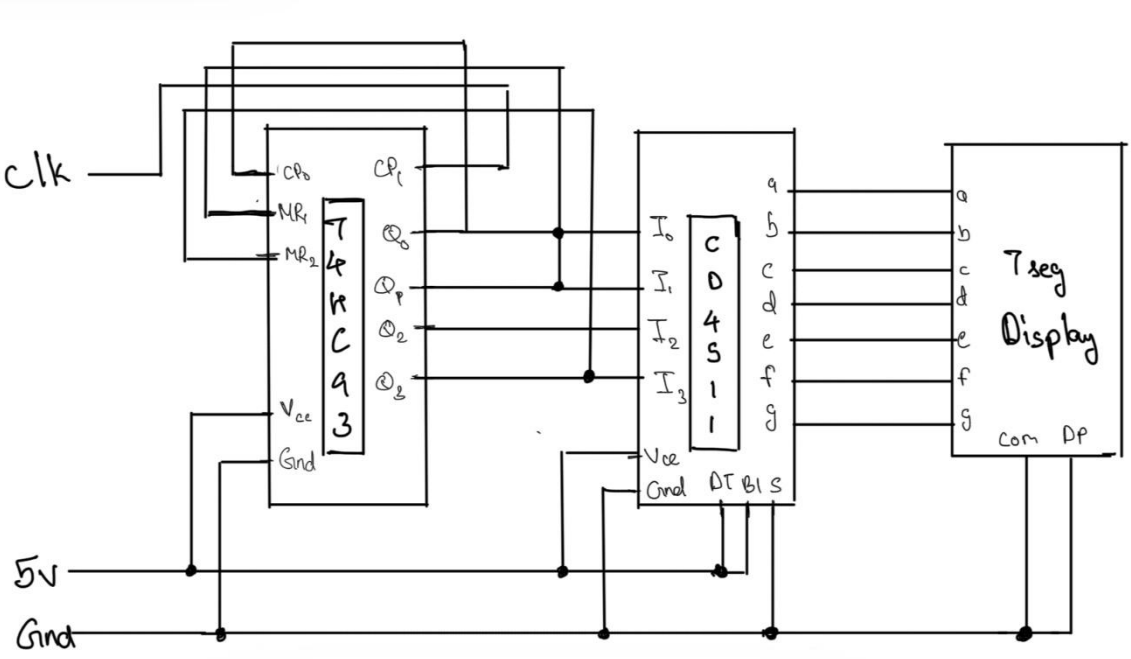
Experiment 1:

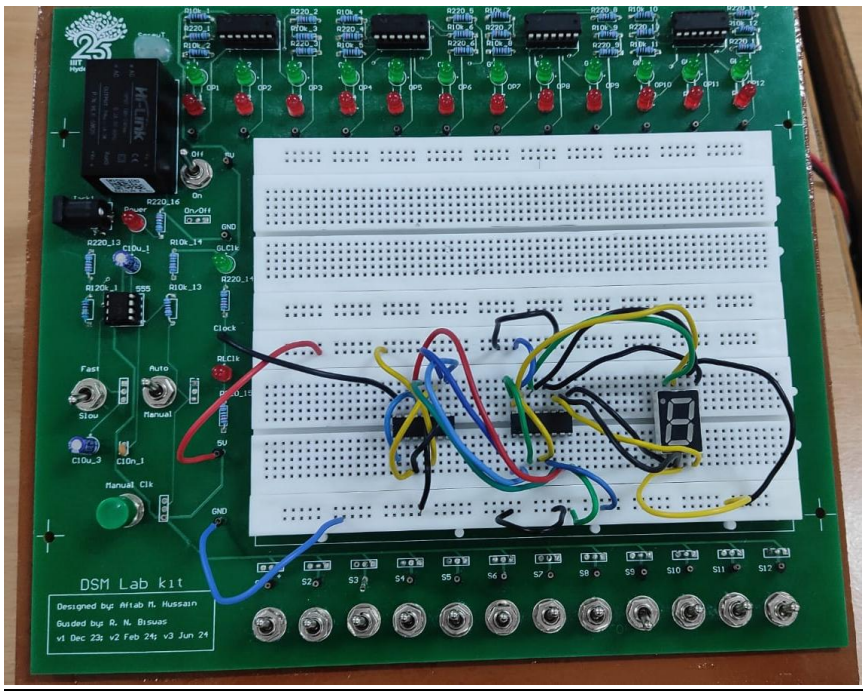
- Objective:

  To build a decade counter that outputs to a 7-segment display through a decoder.

- Electronic Components Required:
  - 74HC93 4-bit Ripple counter.
  - CD4511 7-segment decoder.
  - 7 Segment display.
  - Jumper Wires
  - Digital Test Kit

- Reference Circuit:





- Procedure:
  - Ensure that the input pins IP1-12 and output LEDs LG1-12 and LR1-12 are working.
  - Assemble the circuit as per the given circuit diagram.

- Connect the MR pins of the counter to the pins Q1 and Q3, in order to make it a decade counter.
- If the 7-segment display is a common anode display, connect the COM pins to 5v.
- Observe the working of the circuit.

- Observation:

  The display counts from 0 to 9 and resets to 0 after.

- Conclusion:

  A decade counter has been successfully assembled and its output has been displayed through a 7-segment display.

- TinkerCAD Simulation:

  https://www.tinkercad.com/things/7GNzbMAkc1p-dsm-lab-7-exp-1?sharecode=cnToxFEB3oL78ULj9MRzZgUXNnU9QHGX1-qMk3TNbGE

Experiment 2:

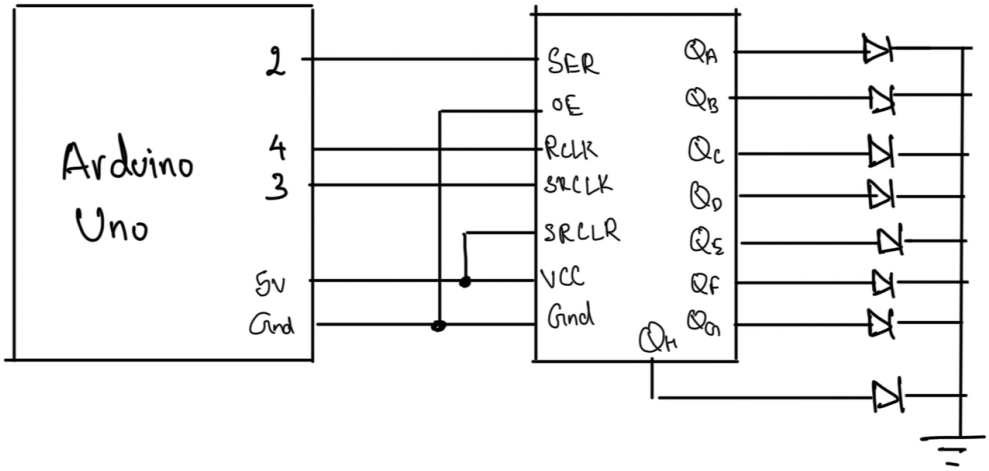
- Objective:

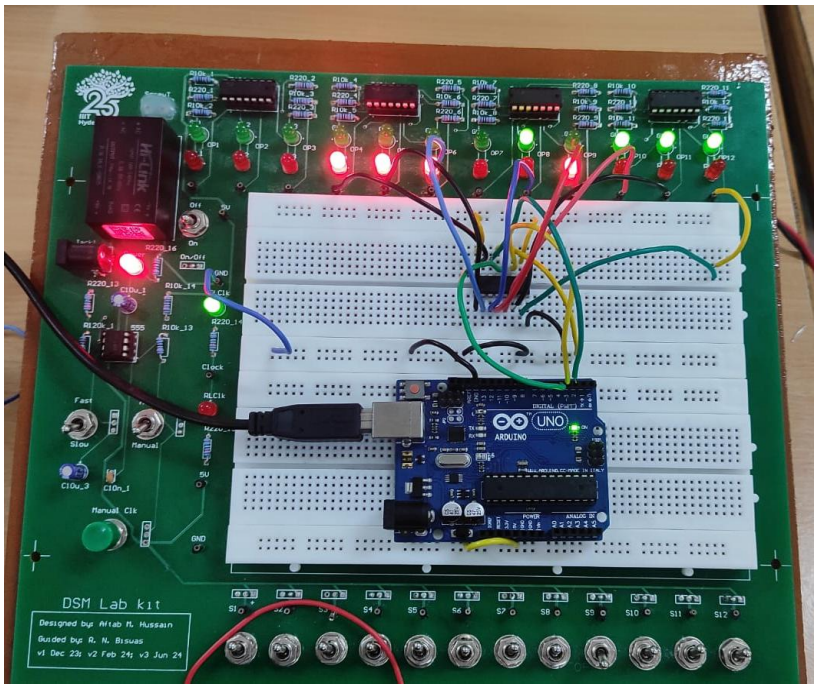
  To understand the working of an 8-bit serial register using an Arduino.

- Electronic Components Required:

  1. 74HC595 8-bit serial register.
  2. Arduino Uno
  3. Jumper Wires
  4. Digital Test Kit

- Reference Circuit:





- Procedure:

1. Ensure that the input pins IP1-12 and output LEDs LG1-12 and LR1-12 are working.
2. Assemble the circuit as per the given circuit diagram.
3. For Part A

1) Program the Arduino to count from 0 to 255 without hardwiring the outputs.

4. For Part B
    1) Program the Arduino to get a user input of 0-8 and light up the corresponding output LED.

- Observation:

The circuit counts from 0-255 for part A and displays the corresponding LED as per the user input for part B.

- Arduino Code Of Part A:

```
// Pin connections for 74HC595
const int dataPin = 11;   // DS (Data pin)
const int latchPin = 10;  // ST_CP (Latch pin)
const int clockPin = 13;  // SH_CP (Clock pin)

byte counter = 0;  // 8-bit counter variable

void setup() {
  // Set pins as output
  pinMode(dataPin, OUTPUT);
  pinMode(latchPin, OUTPUT);
  pinMode(clockPin, OUTPUT);
}

void loop() {
  // Update counter
  counter++;

  // Send data to shift register
  digitalWrite(latchPin, LOW);         // Prepare
shift register for data
  shiftOut(dataPin, clockPin, MSBFIRST, counter); //
Shift out the 8-bit counter value
```

```
  digitalWrite(latchPin, HIGH);        // Output the
shifted data to Q0-Q7

  delay(500);  // Delay for visualization
(adjust as needed)
}
```

- Arduino Code For Part B:

```
const int dataPin = 2;
const int latchPin = 4;
const int clockPin = 3;

void setup() {
  pinMode(dataPin, OUTPUT);
  pinMode(latchPin, OUTPUT);
  pinMode(clockPin, OUTPUT);

  Serial.begin(9600);
  Serial.println("Enter a number between 1 and 8:");
}

void loop() {
  if (Serial.available() > 0) {
    int number = Serial.parseInt();

    if (number >= 1 && number <= 8) {
      byte ledPattern = 1 << (number - 1);

      digitalWrite(latchPin, LOW);
      shiftOut(dataPin, clockPin, MSBFIRST,
ledPattern);
      digitalWrite(latchPin, HIGH);
```

```
      Serial.print("Glowing LED: ");
      Serial.println(number);
    }

    while (Serial.available()) {
      Serial.read();
    }
  }
}
```

- Conclusion:

  The working of the 8bit register has been understood.

- TinkerCAD Simulation:
  - Part A: https://www.tinkercad.com/things/e5qW1fkyNfp-dsm-lab-7-exp-2a?sharecode=oBvgx6qVsIfQbjAjNkwVuWAqkKev7xNXGZqXvQt7kRE
  - Part B: https://www.tinkercad.com/things/5BhLj11jMlr-dsm-lab-7-exp-2b?sharecode=LDRh5xVt8UJaUiXaM2Nwps0jkgeCjVZoEWFFzySpMv4