Lab Report: 6

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Experiment 6: Decade counter and Shift register

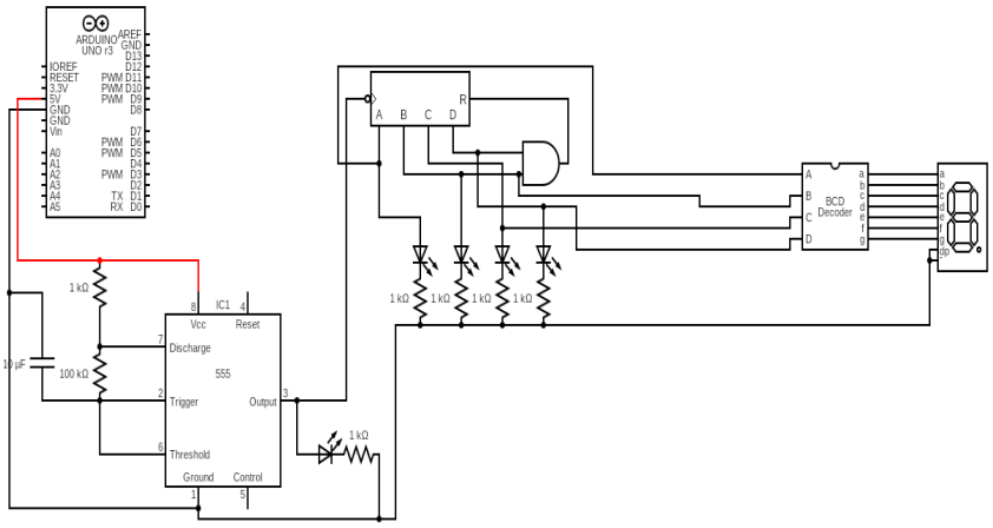
PART – 1: Decade counter

Aim/Objective: To build a circuit for a decade counter and understand its usage. The experiment involves creating a sequential circuit that counts from 0 to 9 and then resets to 0 in a continuous loop.

Electronic Components Used:

1. 7 Segment Decoder
2. 4-Bit Binary Counter
3. Jumper Wires
4. LED
5. Arduino Uno R3
6. Digital test Kit
7. Resistors
8. 1uf capacitor

Reference Circuit



Procedure

Hardware:

1. Place the 74HC595 IC on the breadboard.
2. Connect the VCC and GND pins of the 74HC595 IC to the positive and ground lines of the breadboard.
3. Connect the Output Enable (OE) pin of the IC to GND to enable the output.
4. Connect the Clock (SRCLK) and Latch (RCLK) pins of the IC to specified pins on the Arduino:
5. SRCLK to a digital pin (e.g., 2).
6. RCLK to another digital pin (e.g., 3).
7. Connect the Data (SER) pin of the IC to a third digital pin (e.g., 4).

LED Connections:

1. Connect the eight LEDs to the Q0 to Q7 outputs of the 74HC595 IC.
2. Connect the anode (longer lead) of each LED to a resistor.
3. Connect the other end of each resistor to the respective Q0 to Q7 outputs.
4. Connect the cathode (shorter lead) of each LED to the ground line of the breadboard.
5. Power up the circuit by connecting the power source to the Arduino.

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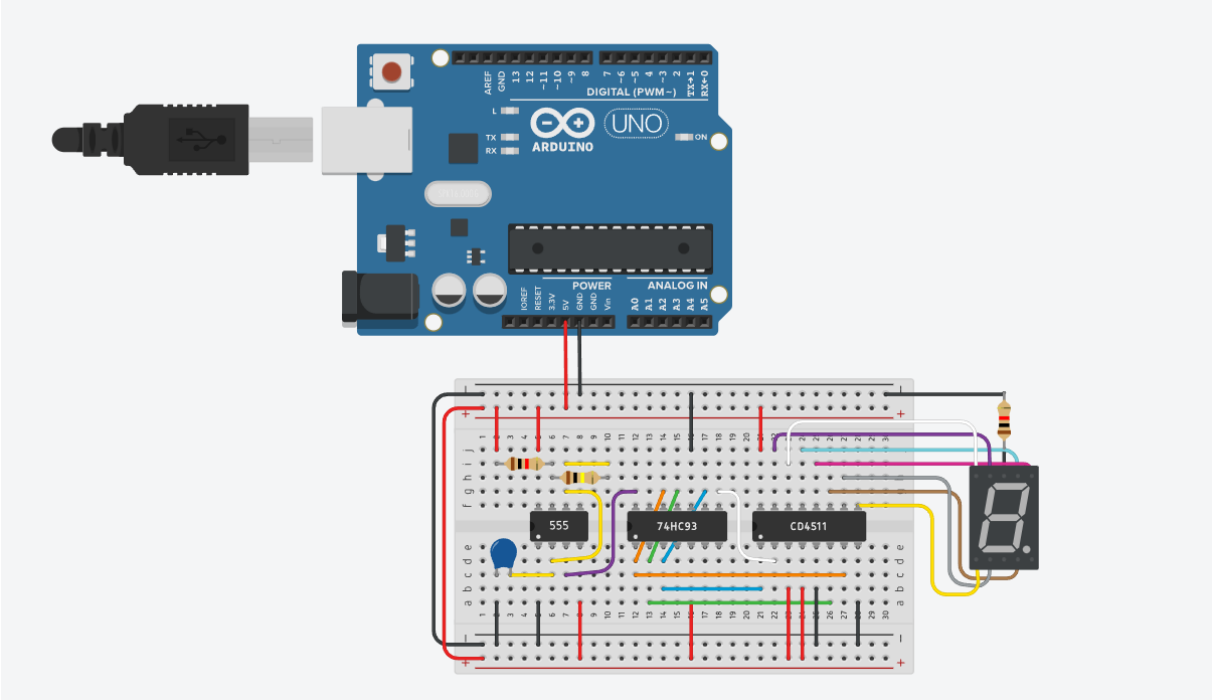
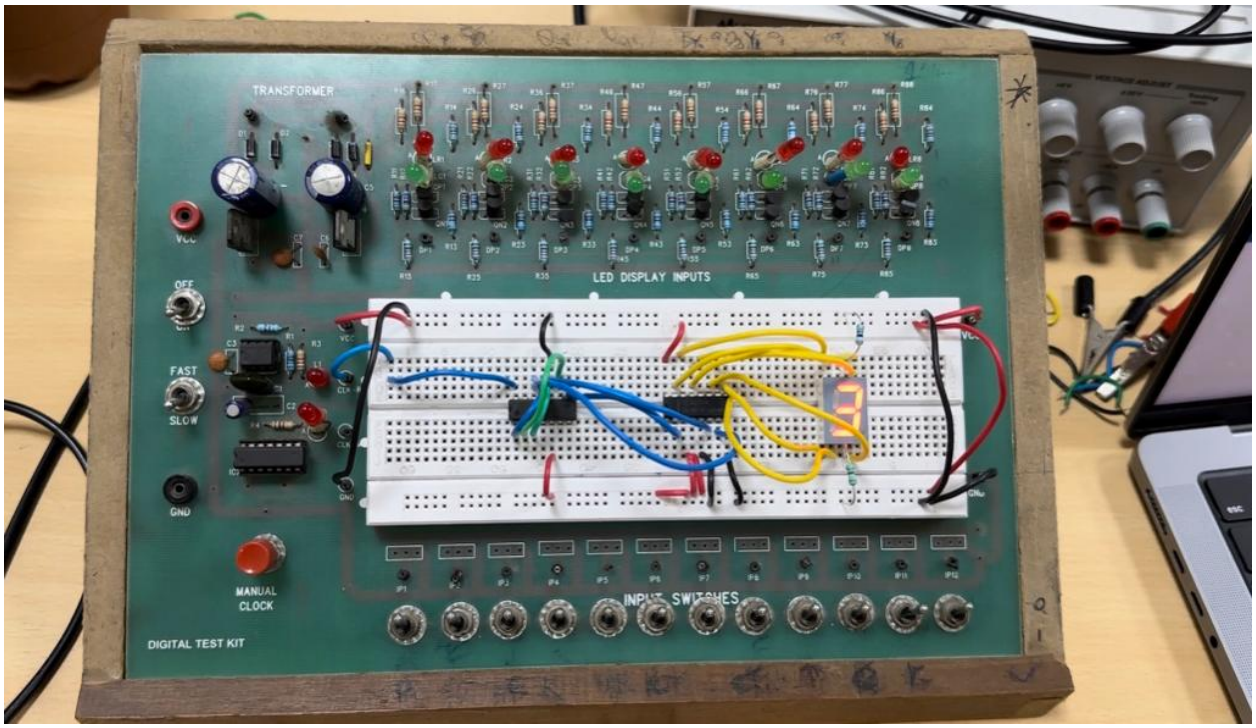


https://www.tinkercad.com/things/kHfyyQKXK5B-lab-6-decade-counter/editel?sharecode=vpanZEw5GuZngXAfhpnbCPz77sk67SfMhkKzQUNGp7A

Video of Decade Counter

https://drive.google.com/file/d/1UQEYrsKAbL6vES-jYlTGiBcfPMF7ObBH/view?usp=sharing

Images



Observation:

The decade counter counts in a sequence of ten and then returns to zero after the count of nine. All the numbers are displayed on the 7-segment display.

Conclusion

The decade counter circuit successfully counts from 0 to 9 and resets to 0, demonstrating its functionality.

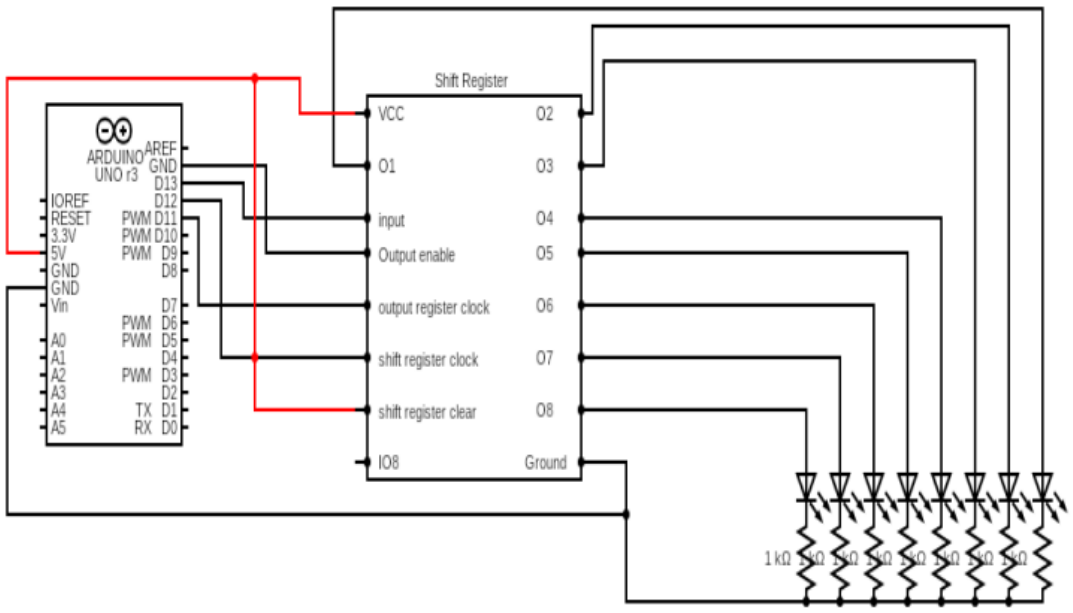
PART – 2A: Shift Register (Automatic)

Aim/Objective: To design a shift register that displays the numbers 0 to 255 as 8-bit binary digits.

Electronic Components Used:

1. 8-Bit Shift Register
2. Jumper Wires
3. LEDs
4. Arduino Uno R3
5. Digital test Kit
6. Resistors

Reference Circuit



Procedure

Hardware Setup:

1. Place the 74HC595 IC on the breadboard.

2. Connect the VCC and GND pins of the 74HC595 IC to the positive and ground lines of the breadboard, respectively.
3. Connect the Output Enable (OE) pin of the IC to the ground (GND) to enable the output.

Connections to Arduino:

1. Connect the Clock (SRCLK), Latch (RCLK), and Data (SER) pins of the 74HC595 IC to specified pins on the Arduino:
2. SRCLK to a digital pin (e.g., 2).
3. RCLK to another digital pin (e.g., 3).
4. SER to a third digital pin (e.g., 4).

LED Connections:

1. Connect eight LEDs to the Q0 to Q7 outputs of the 74HC595 IC. Each LED represents one digit.
2. Connect the anode (longer lead) of each LED to a resistor.
3. Connect the other end of each resistor to the respective Q0 to Q7 outputs on the 74HC595 IC.
4. Connect the cathode (shorter lead) of each LED to the ground line of the breadboard.

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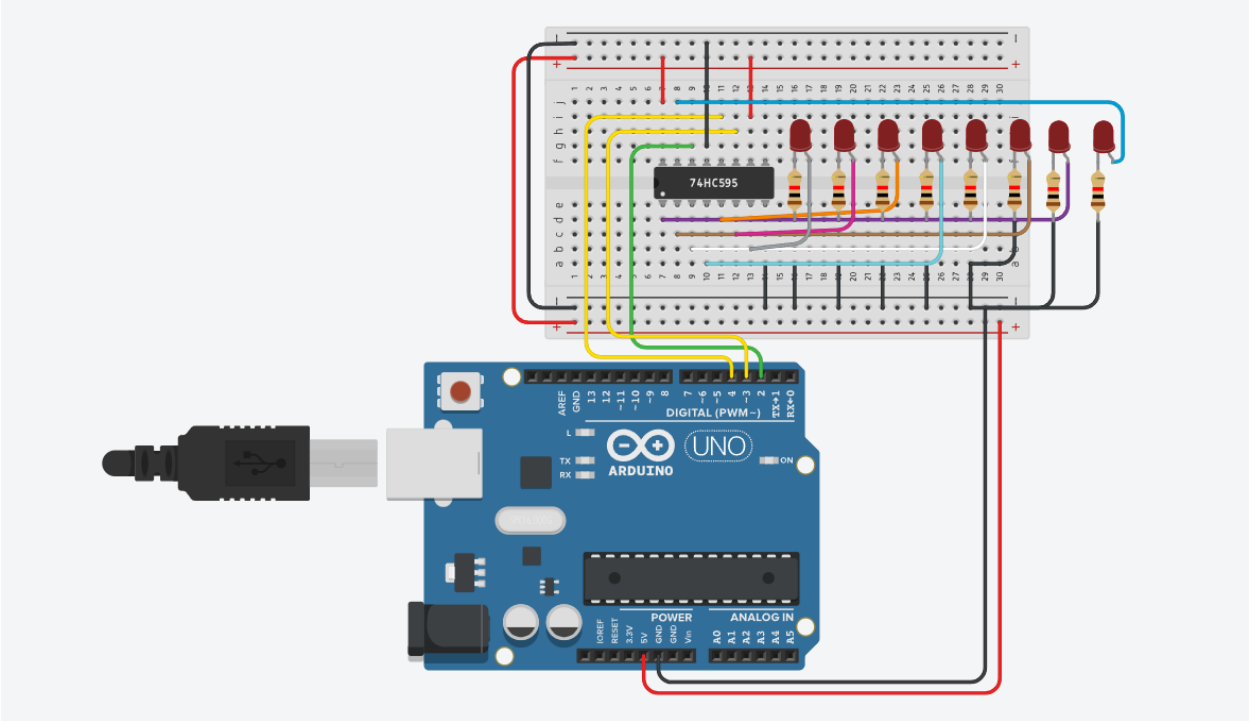
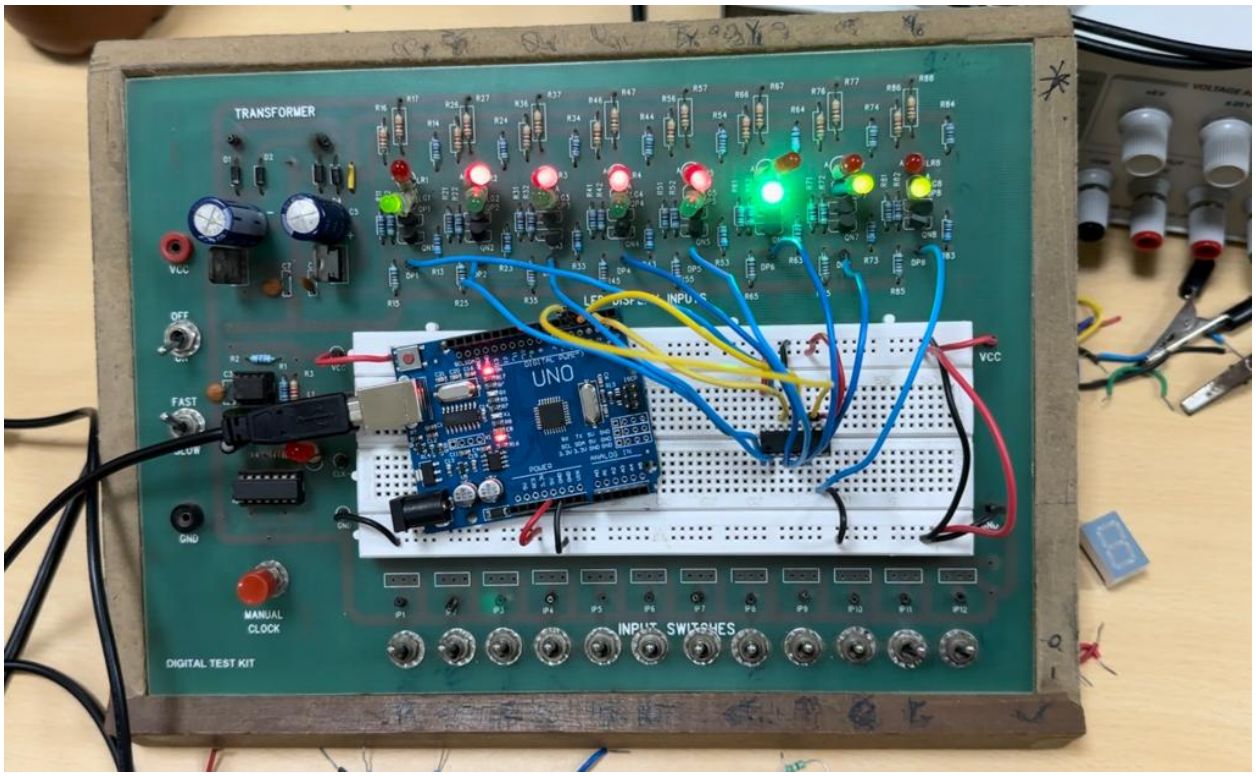


https://www.tinkercad.com/things/eo7XhCyrRQj-lab-6-shift-register/editel?sharecode=xEiAkUJkPcKDW1neEFNzMj4WTFAXOH8QjM2ZqCH0PXc

Video of Shift Register

https://drive.google.com/file/d/1mOlKh4sPlzC0A8ADD1G5HaIRPmOgBXUG/view?usp=sharing

Images



Conclusion

We developed a circuit that counts from 0 to 255 and then falls to 0 using a shift register. All eight LEDs illuminate in the expected sequence.

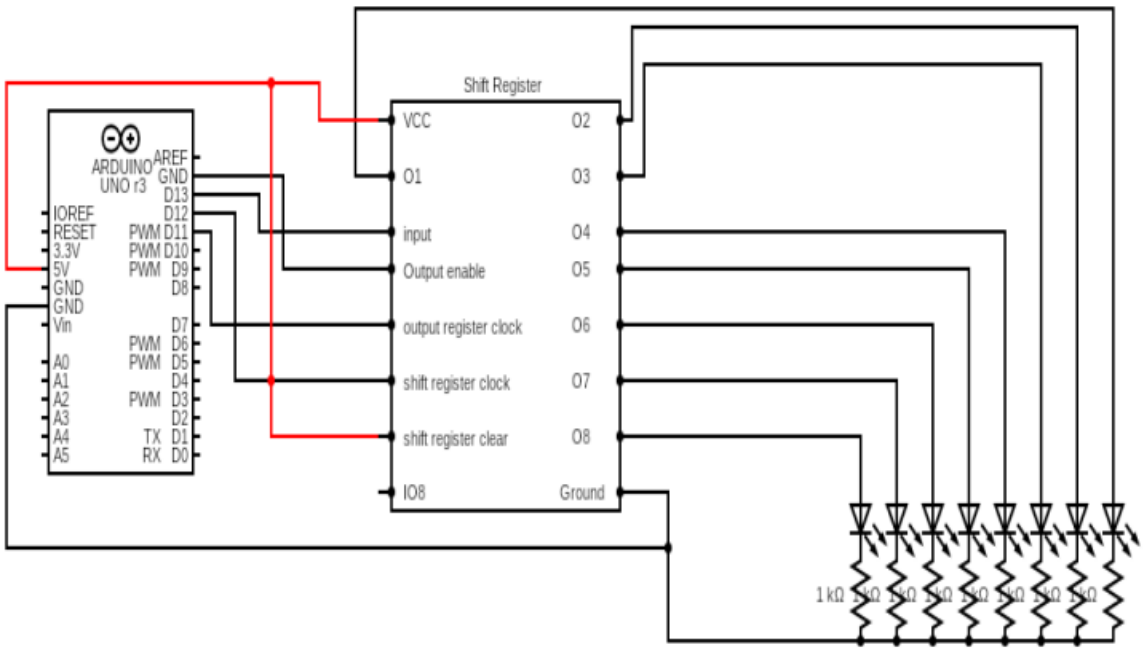
PART – 2B: Shift Register (Interactive)

Aim/Objective: To build upon the shift register circuit created in Part 2A and develop a program that allows the user to input a value in the range of 0-7 and light up the corresponding LED using the Arduino.

Electronic Components Used:

1. Jumper Wires
2. Arduino Uno R3
3. LEDs
4. Digital test Kit
5. Resistors (1 Kohm)
6. 8 Bit shift register

Reference Circuit



Procedure

1. Make a circuit on the breadboard as shown in the figure.
2. Power the Breadboard using 5 Volts and the ground pins of Arduino.
3. Ensure pin connections are proper and inputs and outputs to the shift register are correct.
4. Upload the code to Arduino and simulate the circuit.
5. Manually enter the numbers as inputs.

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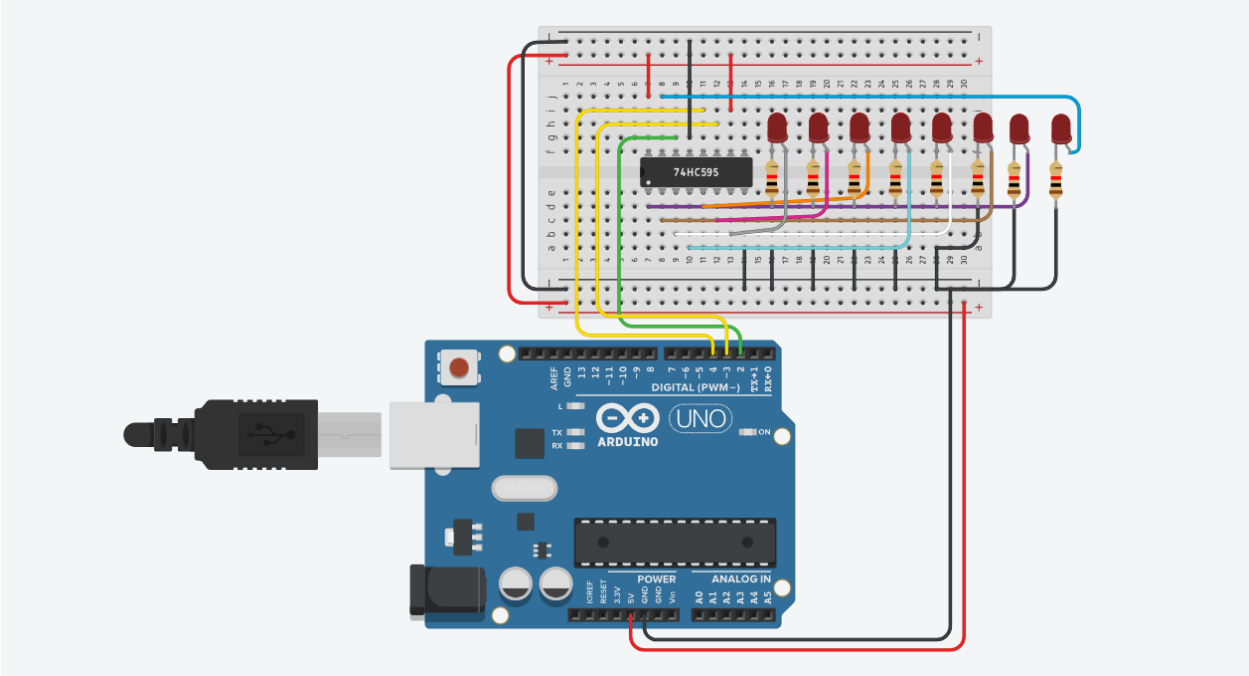
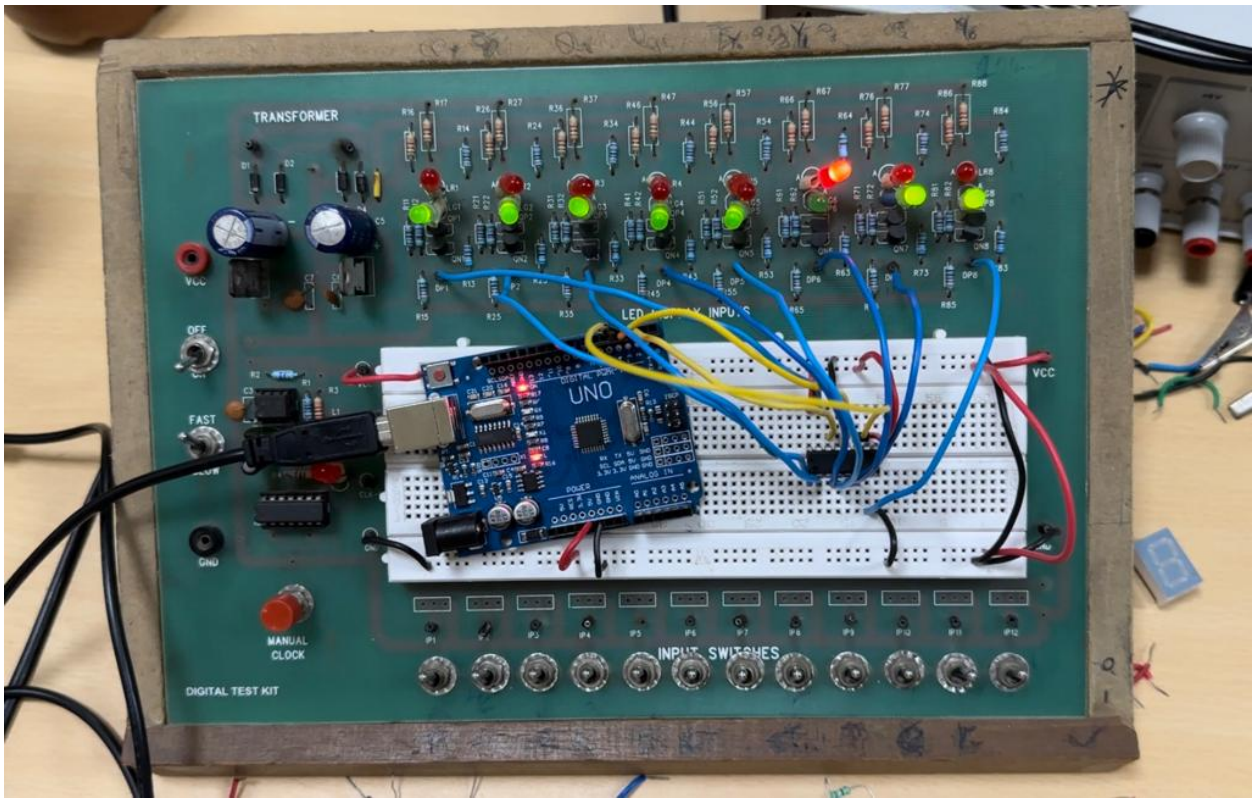


https://www.tinkercad.com/things/0TWcOeEbfqC-lab-6-shift-register-part-b/editel?sharecode=UtuxYRfo0Q6eeMresGzPKHV-Q5Rc2OM_cUPl793QL48

Video of Shift Register

https://drive.google.com/file/d/1hMk7zDVgPoINDlxtevLX1S_7kznVXfZJ/view?usp=sharing

Images



Conclusion

The user can input a value within the range of 0-7, which in turn lights up the corresponding LED, which means the the shift register circuit is successfully implemented.