Lab Report: 7

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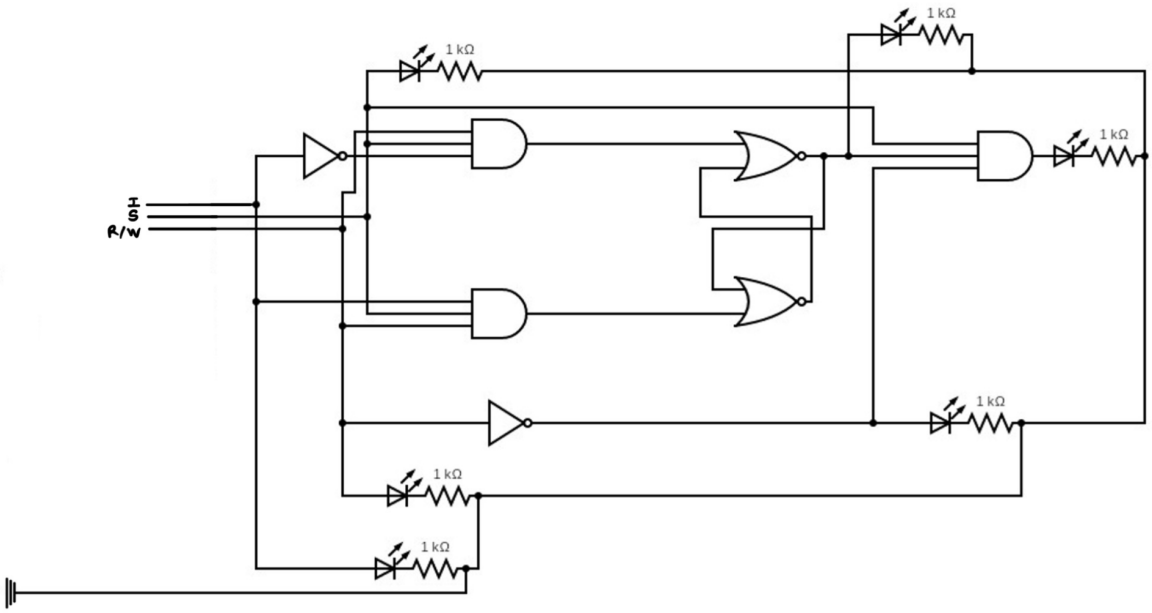
Experiment 7: Binary cell for RAM

Aim/Objective: The objective of this experiment is to implement and verify the operation of a Binary Cell for RAM using RS flip-flops.

Electronic Components Used:

1. 3 Input AND Gate
2. Quad NOR Gate
3. Hex Inverter
4. Arduino Uno R3
5. LED
6. Digital Test Kit

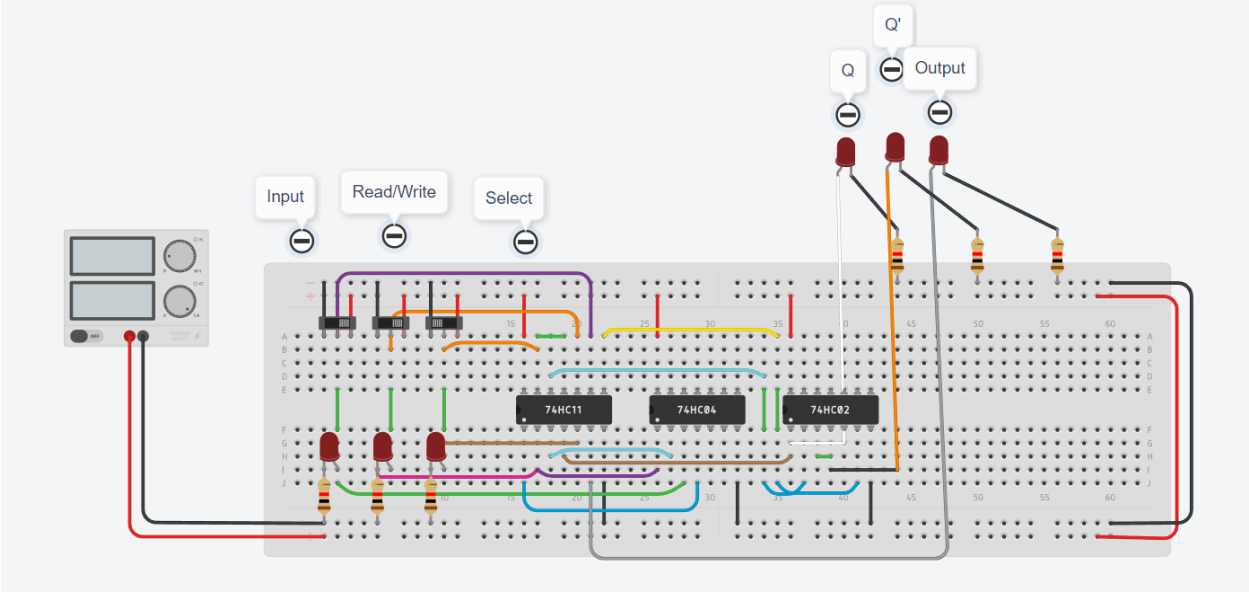
Reference Circuit



Procedure

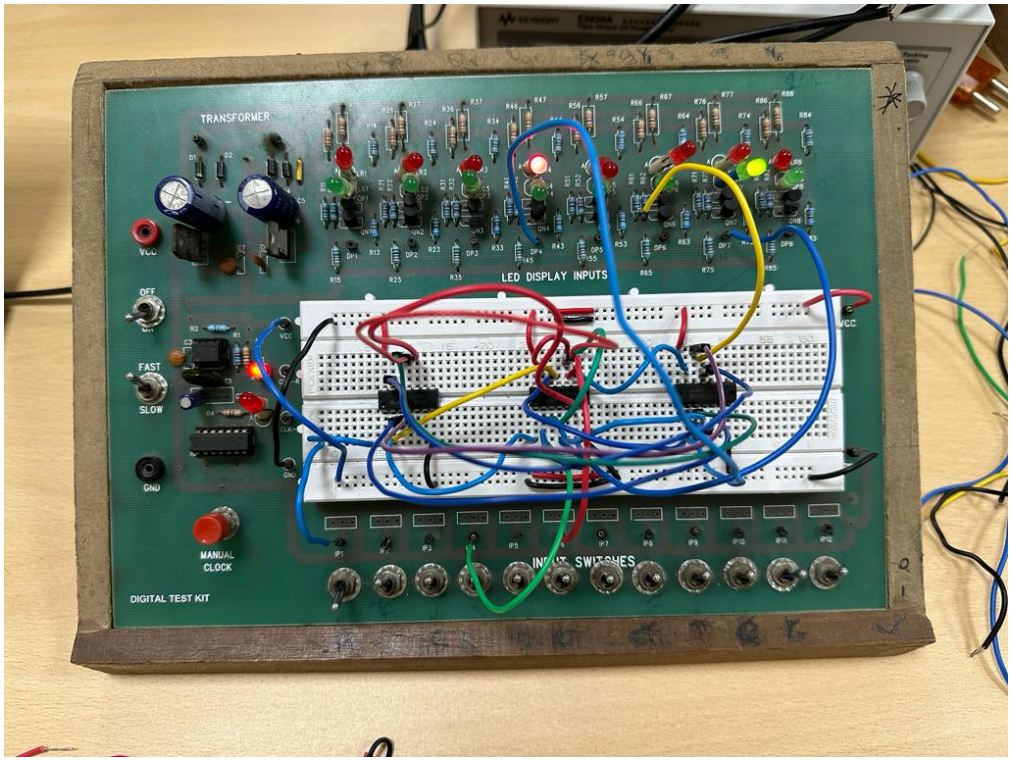
1. Power the breadboard using an Arduino Uno R3.
2. The Binary Cell requires three inputs: INPUT, SELECT, and READ/WRITE.
3. Construct an SR Latch using NOT and OR Gates.
4. Assemble the circuit according to the schematic diagram.
5. Connect the SELECT, INPUT, and READ/WRITE outputs from the Arduino (input lines to the breadboard) to pins 12, 13, and 11 of the Arduino, respectively.
6. Attach LEDs to the circuit's output and the Q output of the SR Latch.
7. Upload the code to the Arduino for operation.

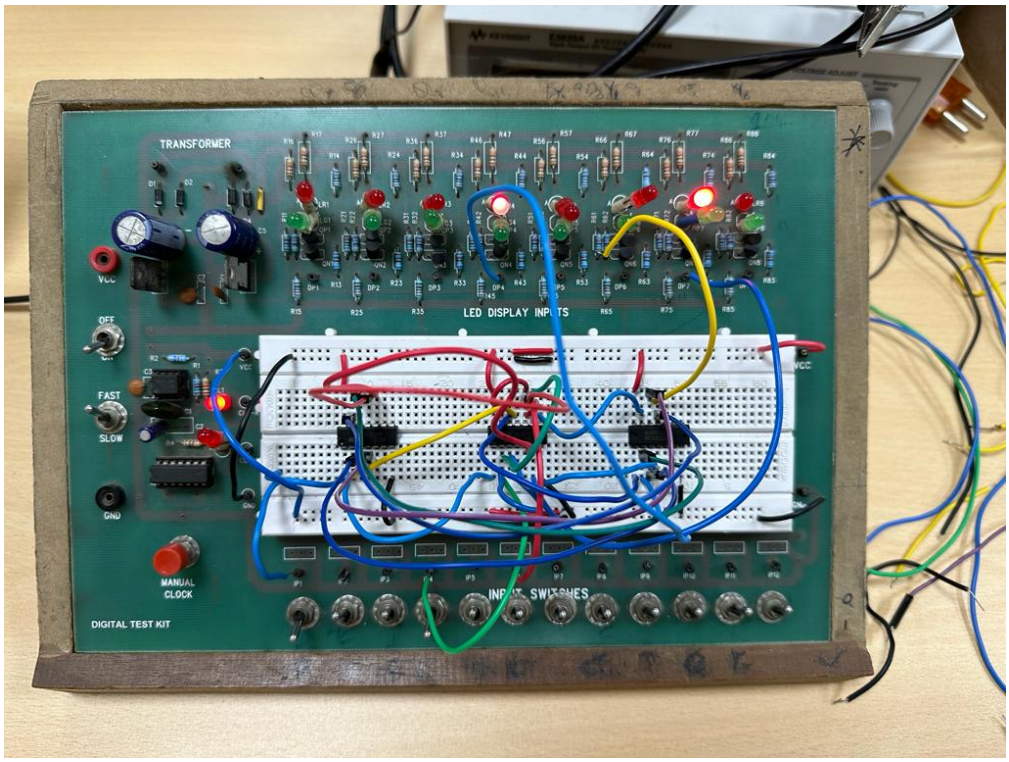
Tinkercad



https://www.tinkercad.com/things/bFrrqalm4th-lab-7-binary-cell/editel?returnTo=%2Fclassrooms%2F65dBoBuNJYW%2Factivities%2F27lGVlQXiql%3Ftype%3Dcircuits&sharecode=eeZUM4bSWnK4-V9IwlDYaVia2EuwwPc7TEGBs6SEqVU

Images


TRANSFORMER
LED DISPLAY INPUTS
VCC
OFF
FAST
SLOW
GND
MANUAL
CLOCK
DIGITAL TEST KIT


TRANSFORMER
LED DISPLAY INPUTS
VCC
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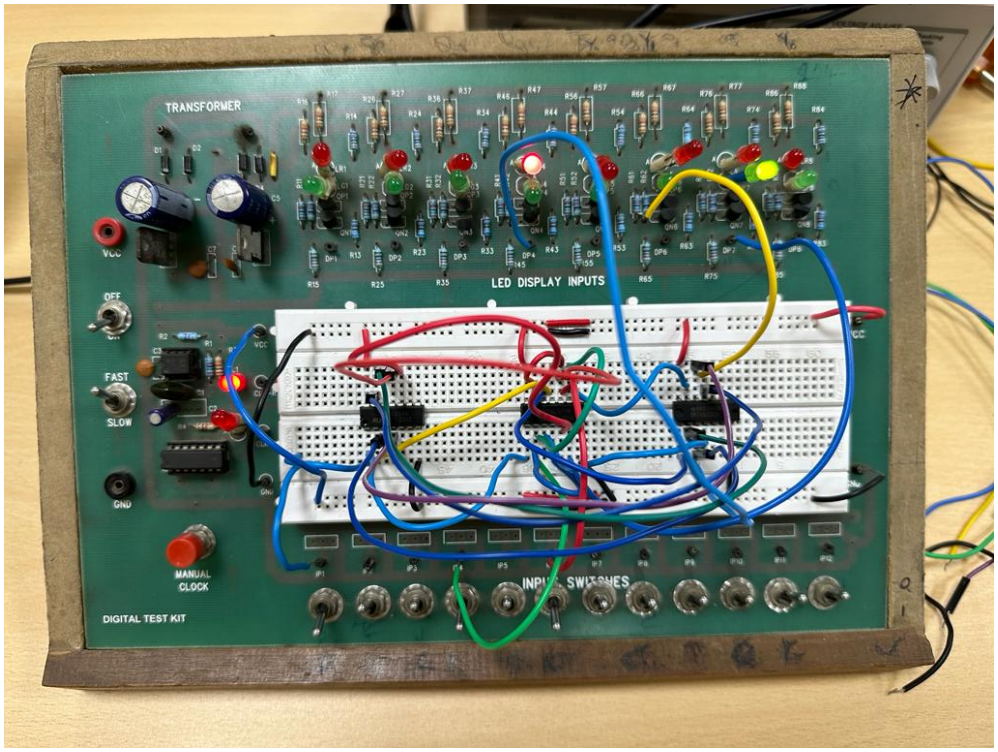
CLOCK
DIGITAL TEST KIT


TRANSFORMER
LED DISPLAY INPUTS
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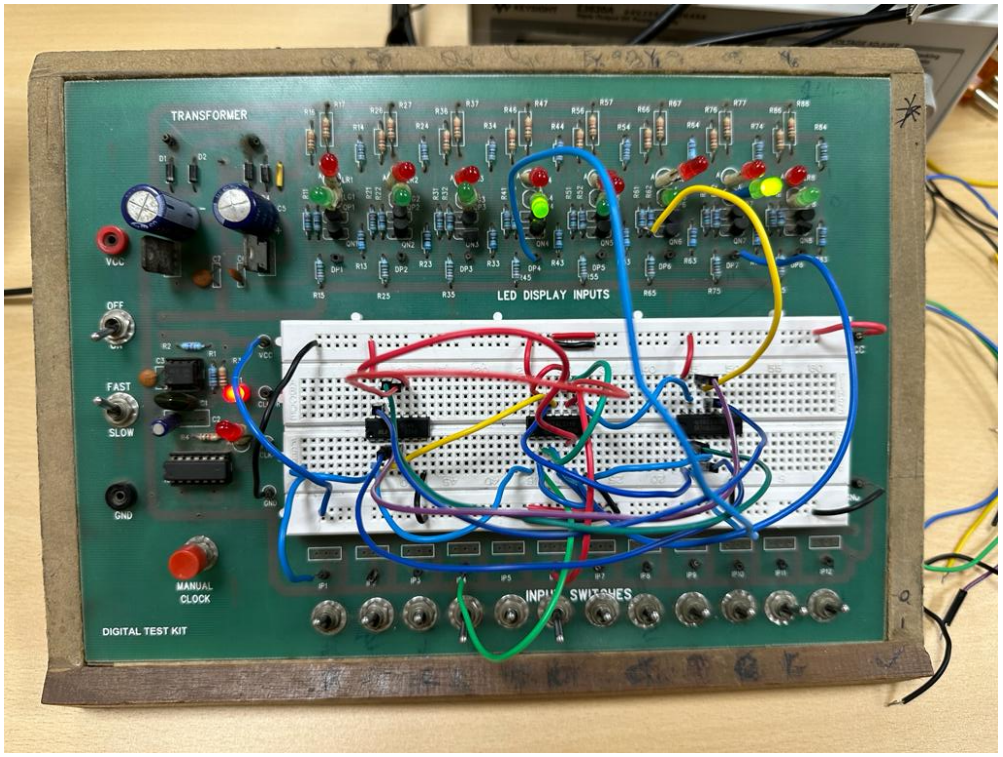
TRANSFORMER
LED DISPLAY INPUTS
OFF
FAST
SLOW
GND
MANUAL
CLOCK
DIGITAL TEST KIT

Observation:

- When the SELECT line is low (0), the output of the Binary Cell remains low, regardless of the states of the INPUT and READ/WRITE lines.
- When the SELECT line is high (1) and the READ/WRITE line is low (0), a "read" operation is performed, and the output depends on the value of the Q output of the SR Latch. The state of the INPUT line does not influence the output.
- When the SELECT line is high (1) and the READ/WRITE line is high (1), a "write" operation is performed, and the output is set to 0, while Q takes on the value of the INPUT.

Truth Table

Select	**Read/Write**	**Input**	**Output**	**Qt+1**
0	X	X	0	Qt
1	0	X	Qt	Qt
1	1	0	0	0
1	1	1	1	1

Conclusion

The Binary Cell operates as intended. When SELECT is high, it allows either read or write operations. For read, the output depends on the stored value, and for write, it stores the INPUT value. The provided truth table illustrates these conditions.