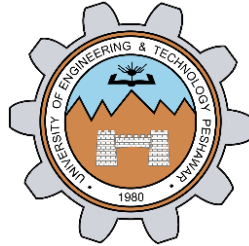# LAB # 10

Fall 2020

Submitted by: **FAWAD ALI, JAMAL KAHN**

Registration No: **19PWCSE1845, 19PECSR1850**

Semester: **3rd**

Class Section: **C**

Date: **Feb 07 2021**

"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: _____

Submitted to:

Engr. Rehmat Ullah

DEPARTMENT OF COMPUTER SYSTEMS ENGINEERING

AIM:

Verification of state tables of J-K flip-flop and T flip-flop using AND and NOR gates.

OBJECTIVES:

After completing this experiment, you will be able to:

- We know about the latch and its type.
- We know about the flip flop and its type.
- We can explain difference between the latch and flip flop.We can verify the truth table in experimental.

EQUIPMENT:

- Dc power supply
- Breadboard

COMPONENTS:

- IC 7402 quad 2-input NOR gate
- IC 7411 quad 3-input AND gate
- LEDs
- DIP switch
- Wires

THEORY:

In case of sequential circuits the effect of all previous inputs on the outputs is represented by a state of the circuit. Thus, the output of the circuit at any time depends upon its current state and the input. These also determine the next state of the circuit. The relationship that exists among the inputs, outputs, present and next states can be specified by either the state table or the state diagram. The state table representation of a sequential circuit consists of three sections labelled present state, next state and output. The present state designates the state of flip-flops before the occurrence of a clock pulse. The next state shows the states of flip-flops after the clock pulse, and the output section lists the value of the output variables during the present state.

FLIP-FLOP:

Flip flops are essential in data storage. They are electronic circuits with two stable states used to store binary data. Such a circuit has one or more control inputs and one or two outputs. By applying varying input, the data stored can be changed. In sequential logic, the flip flop is the basic storage element. They are fundamental building blocks of electronics systems such as computers and communication devices.

A flip flop stores a single bit or binary digit of data. The two states of a flip flop represent "one" and "zero." The output and the next state of a flip flop depend on its current input and current state when used in a finite-state machine. Used for counting of pulses and synchronizing variably-timed input signals to some reference timing signal, a flip flop can be level-triggered or edge-triggered. Level-triggered flip flops can be asynchronous, transparent, or opaque, while edge-triggered flip flops can be synchronous or clocked.

LATCH VS FLIP-FLOP:
The circuit is similar to latch except enable signal is replaced by clock pulse.
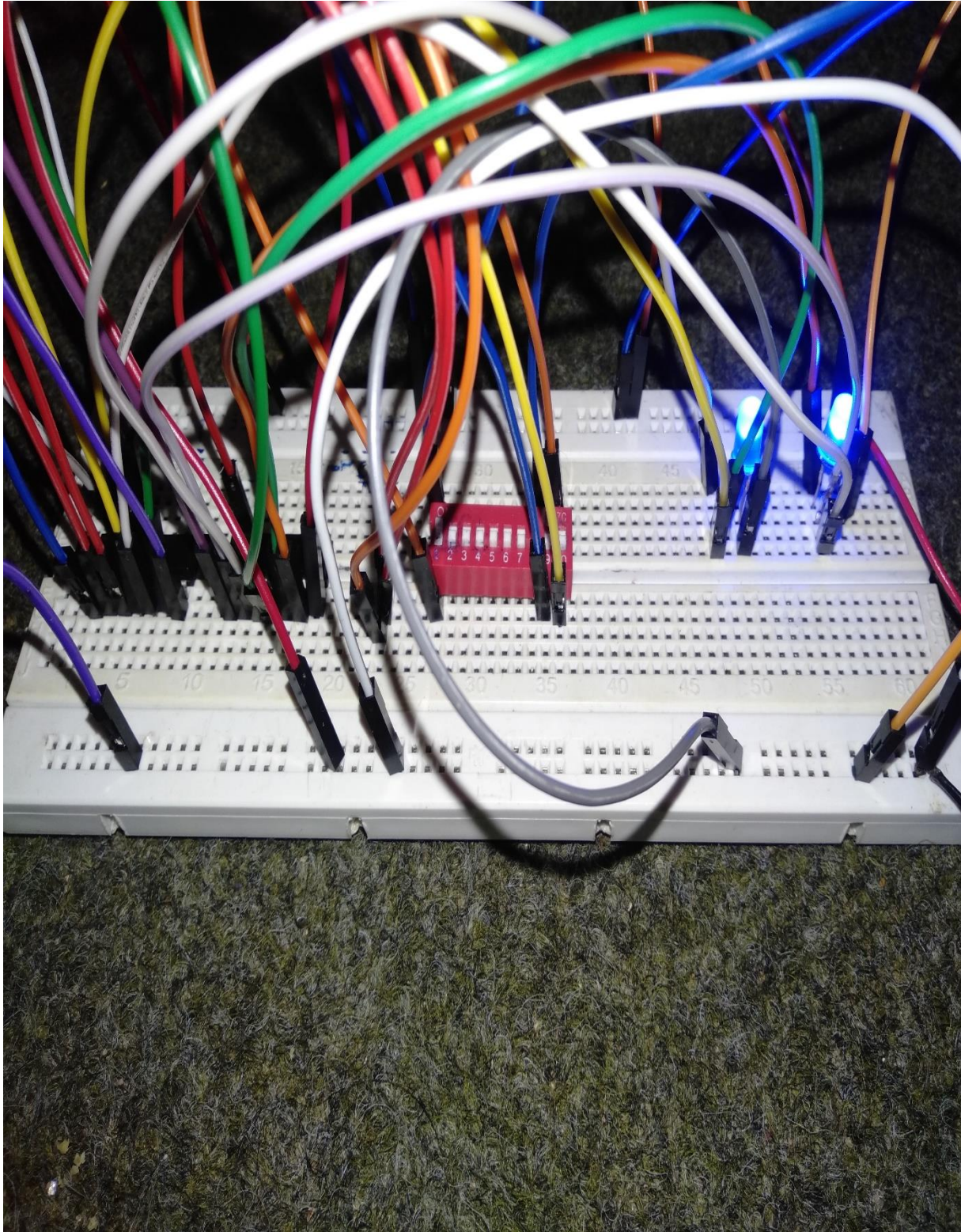
J-K Flip-Flop:

The modified version of an SR flip flop, the JK flip flop, operates only with positive clock transitions or negative clock transitions. This type of flip flop has two inputs; J and K. The J input of a JK flip flop is like the SET input of an SR flip flop. Likewise, the K input of a JK flip flop is like the RESET input of an SR flip flop. In an SR flip flop, the SET and the RESET inputs cannot be both high. In a JK flip flop, both the J and K inputs can be high. When that happens, the Q input is toggled, meaning the output alternates between high and low.
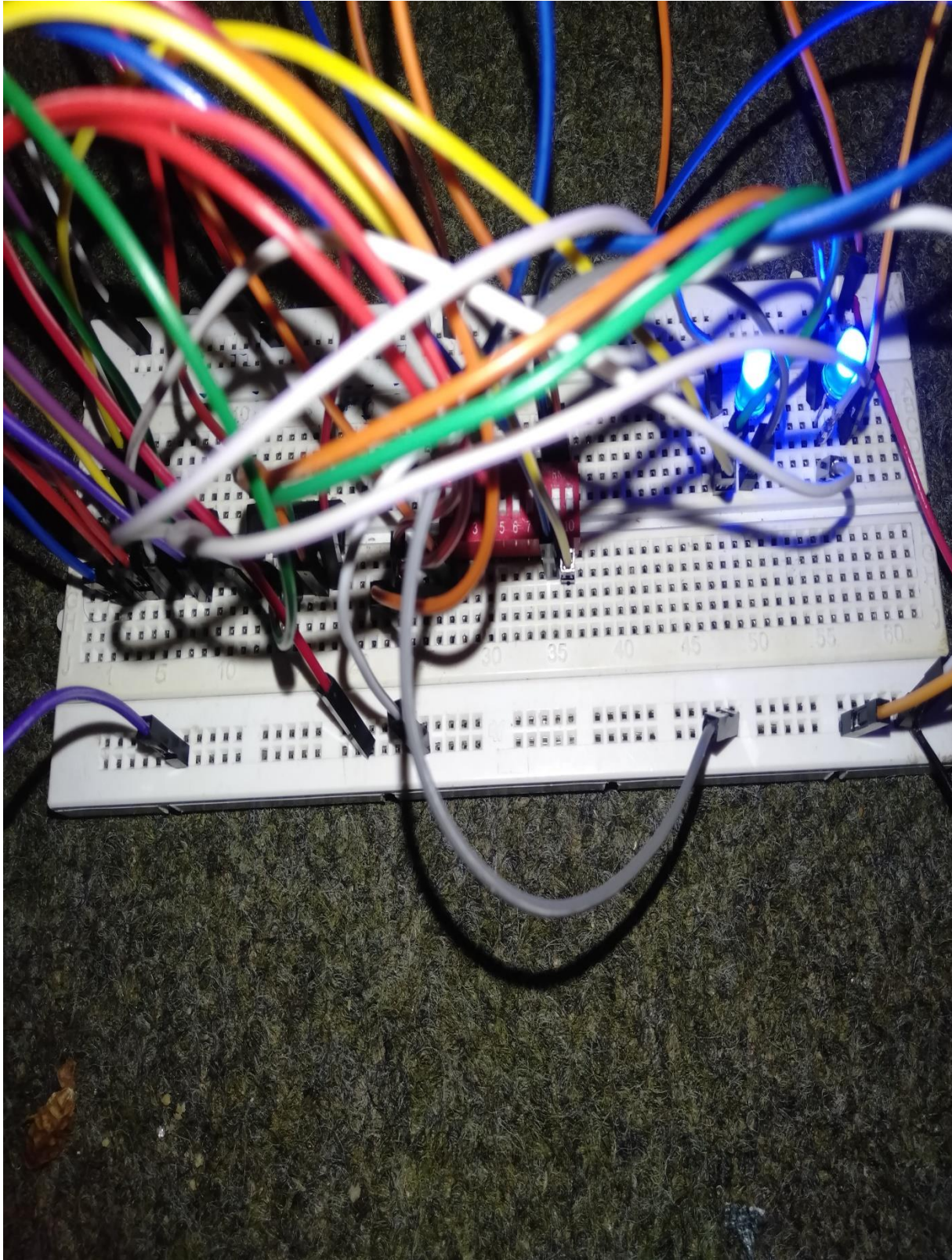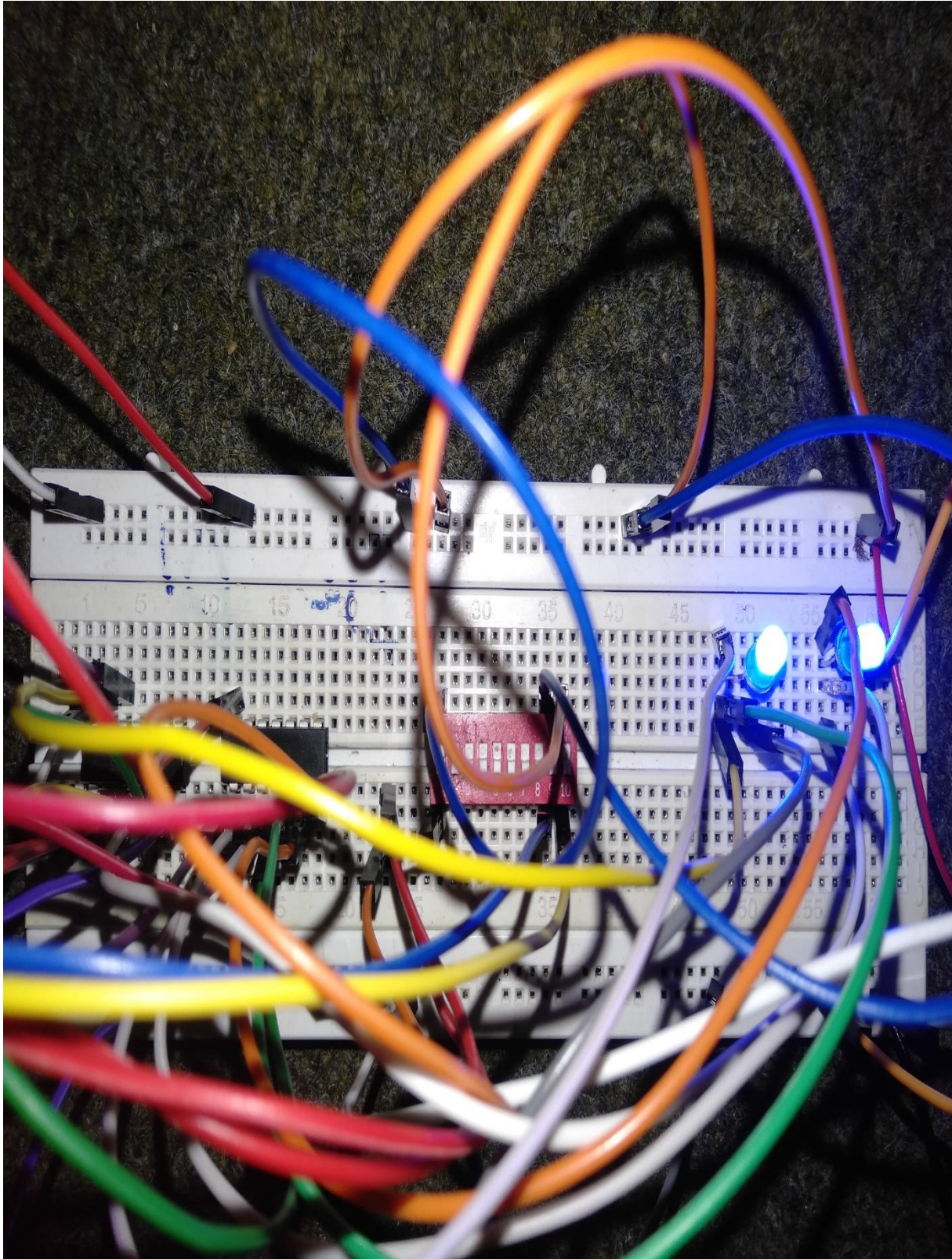
LOGIC DIAGRAM:
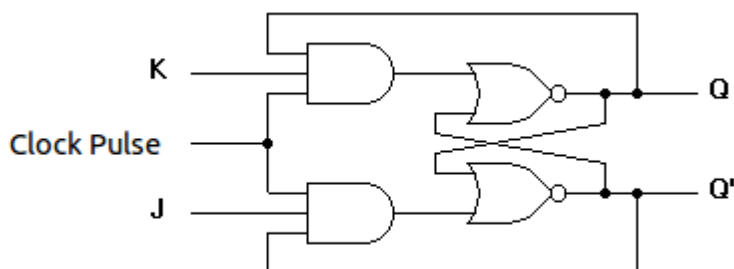
TRUTH TABLE:

| CP	J	K	Q (t+1)
0	X	X	Qt (NC)
1	0	0	Qt (NC)
1	0	1	0 (Reset)
1	1	0	1 (Set)
1	1	1	Qt; (Toggle)

T FLIP-FLOP:

T flip-flop is known as toggle flip-flop. The T flip-flop is modification of the J-K flip-flop. Both the J-K inputs of the J-K flip-flop are held at logic 1 and the clock signal continuous to change.

This type of flip flop is not commercially available. However, you can make one out of a JK flip flop or a D flip flop. This is similar to a JK flip flop—the output alternates between high and low with each clock pulse. Toggles are combined to form a counting circuit. The current state of the Q output is inverted when a clock pulse is received. This is then fed back to the D input. Such operation causes the output to alternate between high and low. As mentioned above, when the J and K inputs are high, the JK flip flop acts as a toggle.

LOGIC DIAGRAM:
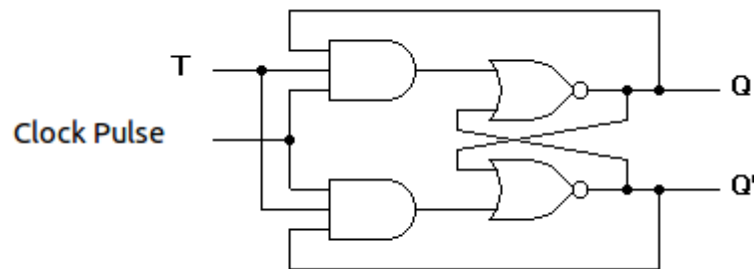
TRUTH TABLE:

CP	T	Q(t+1)
0	X	Qt (NC)
1	0	Qt (NC)
1	1	Qt; (Toggle)
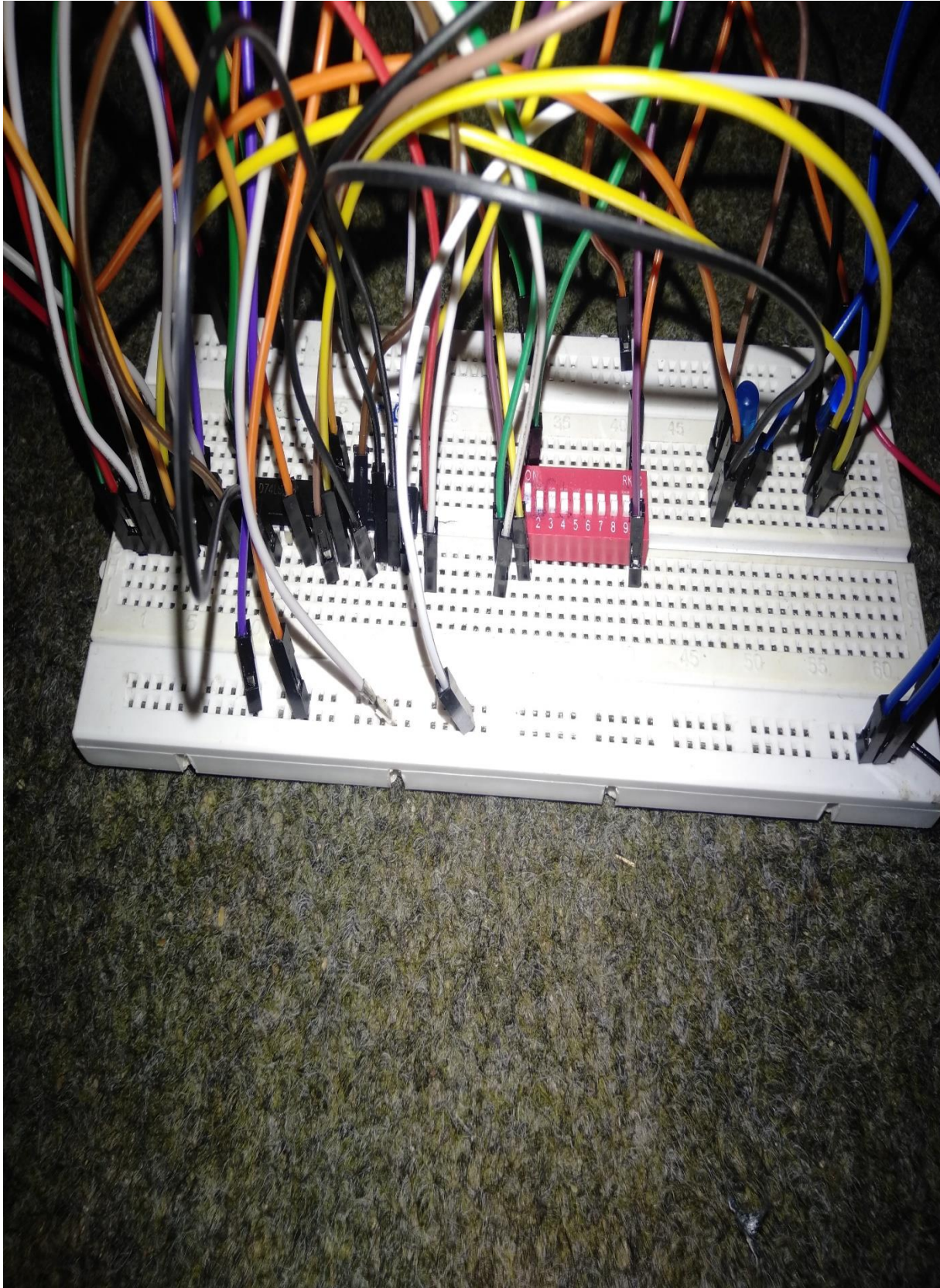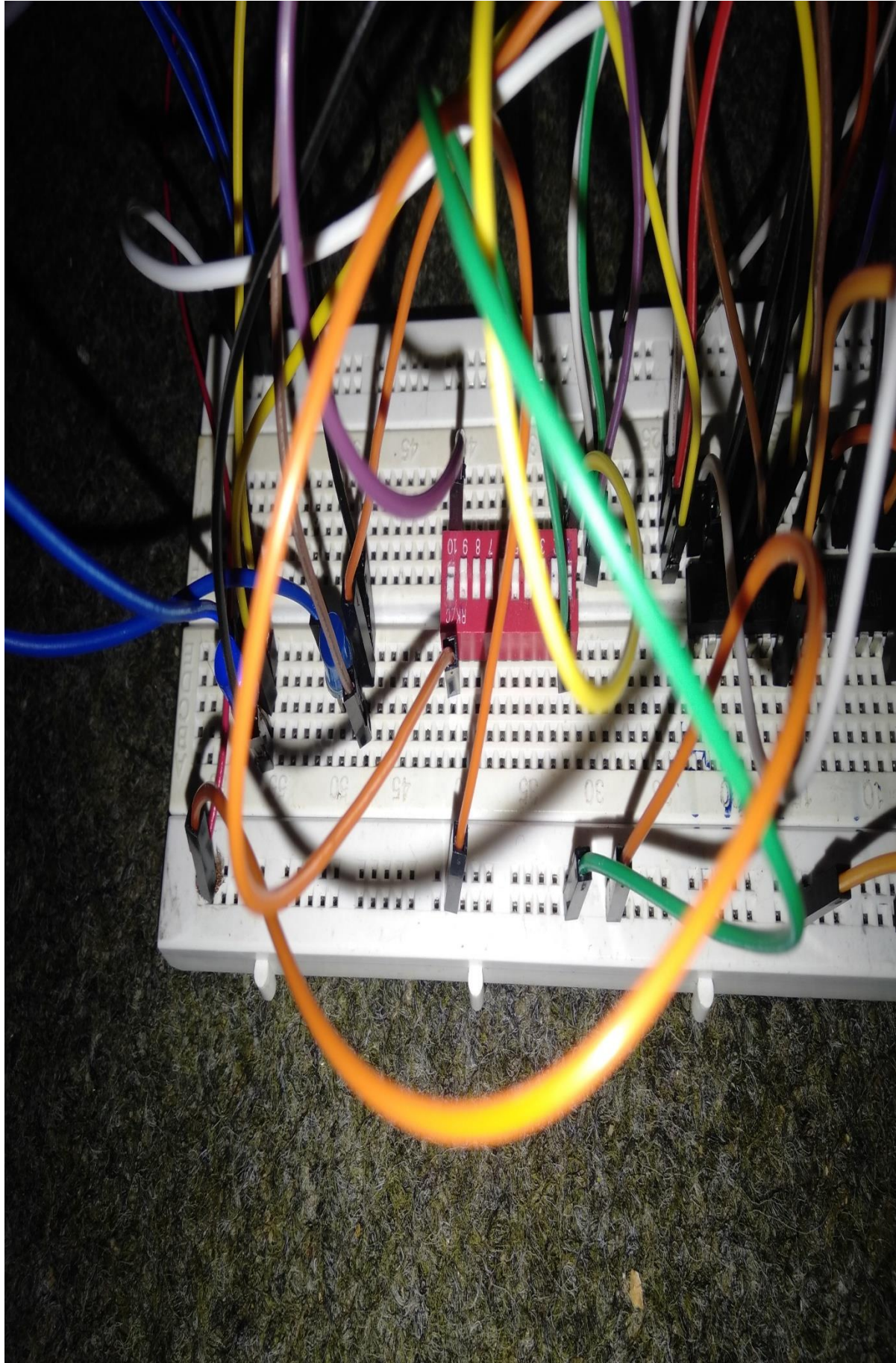
PROCEDURE:

1.Connections are made as per circuit diagram.

2.Verify truth- tables for various combinations of input.

PRECAUTION:

1.All the ICs should be checked before using the apparatus.

2.All LEDs should be checked.

3.All connections should be tight.

4.Always connect GROUND first and then VCC.

5.The circuit should be off before changing the connections.

6.After completing the experiment switch off the supply to apparatus.

Pre Lab Questions:

1)Differentiate between combinational and sequential circuits.

Ans. A circuit whose output is dependent only on the inputs at that instant is called combinational circuit. And a circuit whose output is dependent on present and past history of the inputs is called sequential circuit.

2)What is a latch?

Ans. Storage elements that operate with signal levels are referred to as latches.

3)What is a flip-flop?

Ans. Storage elements controlled by clock transitions are called flip-flops.

CONCLUSION:

Thus latch, flip flop and its type are studied. We can perfome these circuit in breadboard in verify

the truth table in experimental.