Experiment No. 4
Study of flip flop IC
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Date of Performance:
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Aim - Study of flip flop IC

Objective -

1. Understand the function of different types of flip-flops (SR, JK, D, and T flip-flops).
2. Learn how to implement and test flip-flops using ICs.
3. Analyze the behavior of flip-flops with different input conditions, including their role in memory storage and sequential circuits.

Components required - Flip-Flop ICs (e.g., 7473, 7474, 4013, 4027)

- SR Flip-Flop IC: 7473
- D Flip-Flop IC: 7474
- JK Flip-Flop IC: 7476
- T Flip-Flop IC: 4013

Breadboard for circuit assembly
Connecting Wires for circuit connections
Power Supply (5V DC)
Oscilloscope for observing timing diagrams
Logic Probe or **LEDs** to indicate output states
Switches for manual input control
Resistors and **Capacitors**(for optional timing and filtering)
Clock Generator (if not using an internal clock source)

Theory -

Flip-flops are basic building blocks in digital electronics used for storage and synchronization of data. They are bistable devices, meaning they have two stable states, 0 and 1, and can be used to store a single bit of data. The different types of flip-flops include:

1. **SR Flip-Flop (Set-Reset):** The SR flip-flop has two inputs, Set (S) and Reset (R), and two outputs, Q and Q'. When Set is high, the output Q becomes 1, and when Reset is high, the output Q becomes 0.

2. **JK Flip-Flop:** The JK flip-flop is an improvement over the SR flip-flop, where the invalid state is eliminated. It has two inputs, J and K. When both inputs are high, the output toggles between 1 and 0.

3. **D Flip-Flop (Data or Delay Flip-Flop):** The D flip-flop has a single input, D. The output Q takes the value of D on the triggering edge of the clock signal, effectively "locking" the data at that moment.

4. **T Flip-Flop (Toggle Flip-Flop):** The T flip-flop is a simplified version of the JK flip-flop where both inputs are tied together. It toggles its output on every clock pulse when the input is high.

Conclusion -

The experiment examined the operation of different flip-flop ICs, such as SR, JK, D, and T flip-flops, showcasing their significance in memory and sequential circuits. Each flip-flop was evaluated under various input scenarios to understand how they store data and handle state transitions in digital systems. The findings emphasized their essential role in managing data flow and maintaining system states, which are vital for the development of more advanced circuits like counters and registers.