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S.E. S-2

SUBJECT : DLCA

ROLL.NO : 37

AIM : STUDY OF FLIP FLOP IC

OBJECTIVE :

1. Understanding Digital Memory: Flip-flops are the basic building blocks of digital memory elements. Studying flip-flops helps you comprehend how digital devices can store and manipulate binary information, which is the foundation of all digital systems.

2. Digital Circuit Timing: Studying flip-flops helps you grasp the concept of timing and propagation delays in digital circuits. You'll learn how these delays can affect the behavior of a circuit, especially in cases where signals transition through multiple flip-flops.

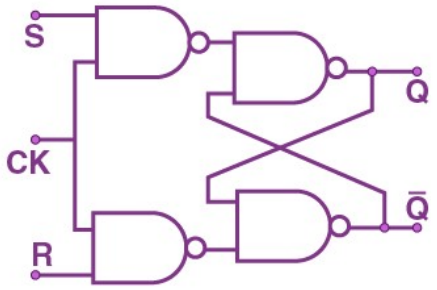
3. Solving Practical Problems: Many digital systems require memory elements to store intermediate results or maintain state information. By understanding flip-flops, you can effectively solve real-world problems by designing

appropriate digital circuits.

THEORY :

A flip-flop is a fundamental digital electronic circuit element used for storing binary information. It can be thought of as a simple memory cell that can store one bit of data. There are several types of flip-flop circuits, each with its own characteristics and applications. One of the most common ways to study flip-flop circuits is by examining the various types and their behavior.

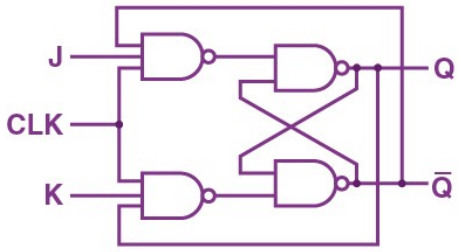
1. S-R Flip-Flop (Set-Reset Flip-Flop): This flip-flop has two inputs, the S (set) input and the R (reset) input. It stores one bit of data and can be in one of two stable states (set or reset). When S is asserted (set to 1) and R is deasserted (reset to 0), the flip-flop sets to the "1" state. When R is asserted and S is deasserted, the flip-flop resets to the "0" state.



Truth Table

S	R	Q_N	Q_{N+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	-
1	1	1	-

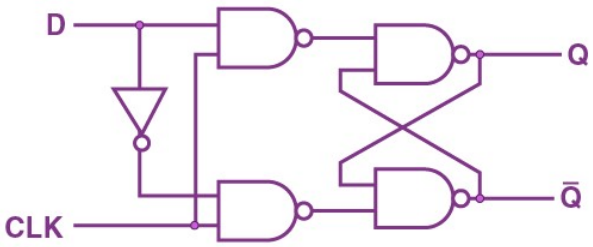
2. JK Flip-Flop: The JK flip-flop has three inputs: J (set), K (reset), and a clock input. It also stores one bit of data and has similar behavior to the SR flip-flop, with the addition of a "toggle" function. When both J and K are asserted, the flip-flop toggles its state on each clock edge.



Truth Table

J	K	Q_N	Q_{N+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

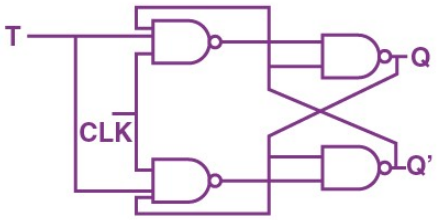
3. D Flip-Flop (Data Flip-Flop): The D flip-flop has a single data input (D) and a clock input. It stores the value of the D input at the moment of a clock edge transition (rising or falling). This type of flip-flop is often used for storing the output of combinational logic circuits.



Truth Table

Q	D	$Q_{(t+1)}$
0	0	0
0	1	1
1	0	0
1	1	1

4. T Flip-Flop (Toggle Flip-Flop): The T flip-flop has a single input, T (toggle), and a clock input. It toggles its state on each clock edge when the T input is asserted.



Truth Table

T	Q_N	Q_{N+1}
0	0	0
0	1	1
1	0	1
1	1	0

CONCLUSION :

In conclusion, studying flip-flop ICs is a foundational step toward mastering digital electronics. It provides the knowledge and skills necessary to design and analyze

digital systems, troubleshoot issues, and prepare for more advanced topics.