



COMPUTER ENGINEERING

DLCA ODD SEM 2021-22/EXPERIMENT 7

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Experiment No:- 07

Aim: Synthesis of flip-flops.

Theory:-

→ What is Flip Flop?

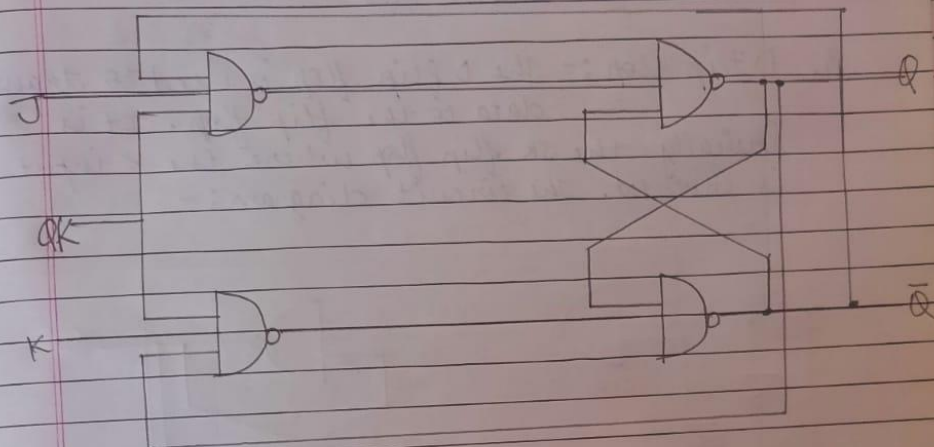
A flip flop is an electronic circuit with two stable states that can be used to store binary data. The stored data can be changed by applying varying inputs. Flip-Flops and latches are fundamental building blocks of digital electronics systems used in computers and many other systems.

Basic flip-flop:- A basic flip flop circuit can be constructed using two cross-coupled NAND/NOR gates. Each flip flop has two outputs, Q and Q' and two inputs set and reset.

Different kind of Flip-Flops.

1. Clocked RS Flip Flop:- The basic flip flop is modified by adding some gates to the inputs so that the flip flop changes state only when the clock pulse is 1. If R is high then reset state occurs and when $S=1$ then set state. However, if both inputs are 1 then it violates normal operation of flip-flops.
2. JK flip flop:- JK flip-flop is a refinement of RS flip flop where the indeterminate state of RS type is defined. Input J and K are respectively the set and reset inputs of the flip-flop. When both the inputs are high

then the output of the flip flop switches to its complemented state.



Truth Table :-

Q	J	K	Q(t+1)
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

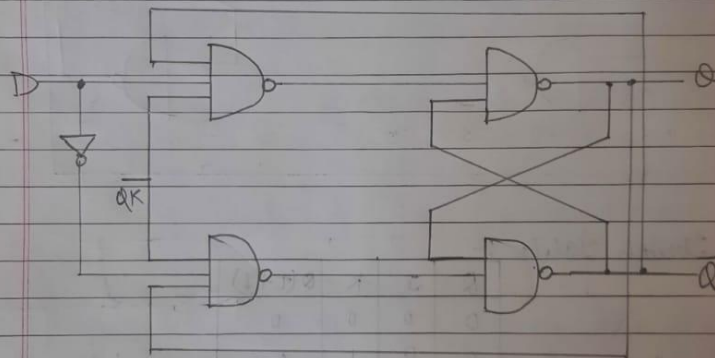
JR flip flop are universal flip flop because flip-flop like D flip flop, SR flip flop, T-flip flop can be derived from it.

$$S = J\bar{Q} \quad R = KQ$$

$$D = J\bar{Q} + \bar{R}Q$$

$$T = J\bar{Q} + KQ$$

3. D Flip Flop:- The D flip flop is used to transfer data to the flip flop. It is basically the JK flip flop where the K input is inverted. The circuit diagram:-

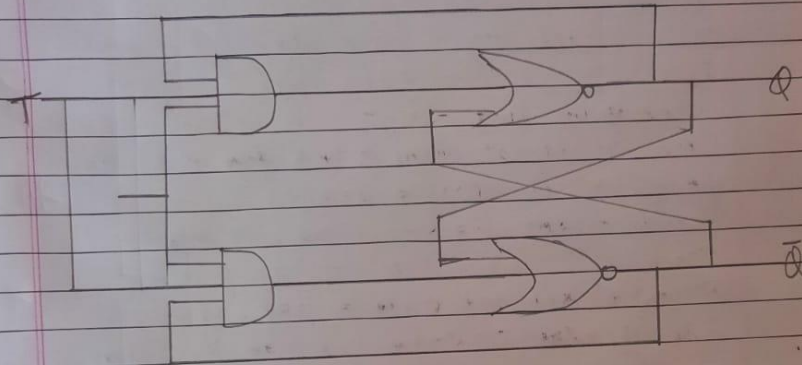


Truth Table:-

Q	D	Q(t+1)
0	0	0
0	1	1
1	0	0
1	1	1

4. T- flip flop:- Also known as Toggle flip flop. This can be constructed using J and K flip flop. If T=1, the flip flop output toggles.

If toggle pin is active, output will toggle at every rising edge of clock pulse.



Truth Table :-

C	T	Q _N	Q _{N+1}
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	0

No change no Toggle.

Conclusion :- we have studied different types of flip flops using IC.

OUTPUT:

Synthesis of Flip-Flops

