Exp. No: 06
30.10.2023

CHARACTERISTICS OF FILP FLOP

Aim:

To Study informations about Flip Flop and its types.

Theary:

A flip flop is a memory element that is capable of storing one bit informations.
A flip flop can maintain a binary state for an unlimited period of time as long as,

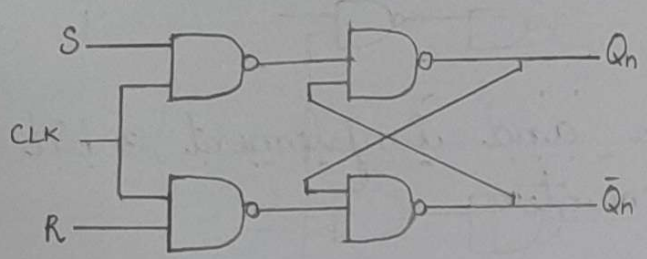
- Power is supplied to circuit
- Or until it is directly by an Input Signal to Switch States.

Types:

(i) SR Flip Flop
(ii) JK Flip Flop
(iii) D Flip Flop
(iv) T Flip Flop

SR - FLIP FLOP

Circuit Diagram



Characteristic Table

C	S	R	Q_n	Q_{n+1}
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	
1	1	1	1	

Characteristic Flip Flop:

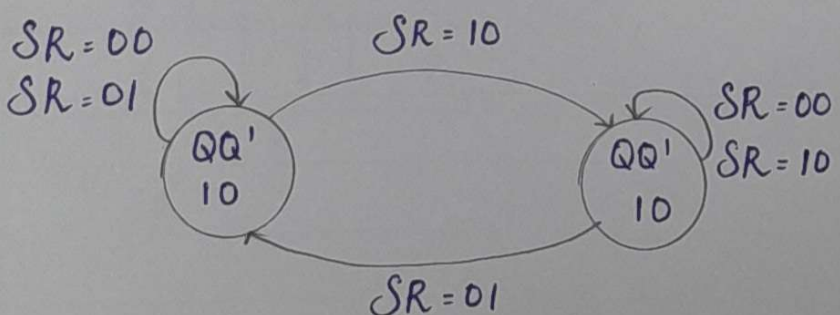
Q_n \ SR	$\bar{S}\bar{R}$	$\bar{S}R$	SR	$S\bar{R}$
Q_n'			x	1
Q_n	1		x	1

$$Q_{n+1} = S + Q_n R$$

Excitation Table:

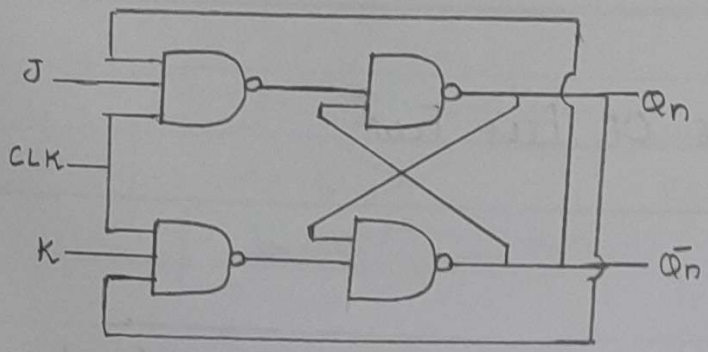
Q_n	Q_{n+1}	S	R
0	0	0	x
0	1	1	0
1	0	0	1
1	1	x	0

State Diagram:



JK FLIP FLOP:

CIRCUIT DIAGRAM:



CHARACTERISTIC TABLE:

C	J	K	Q_n	Q_{n+1}
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

CHARACTERISTIC EQAUTION:

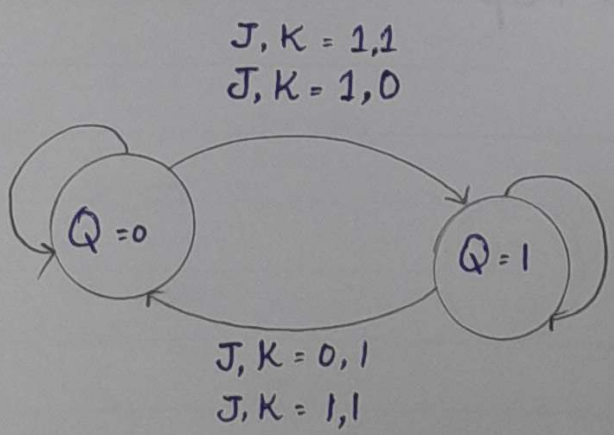
Q_n \ JK	$J\bar{K}$	$\bar{J}\bar{K}$	$\bar{J}K$	JK
$\bar{Q}_n$			1	1
Q_n	1			1

$$Q_{n+1} = Q_n'J + Q_nK'$$

EXCITATION TABLE:

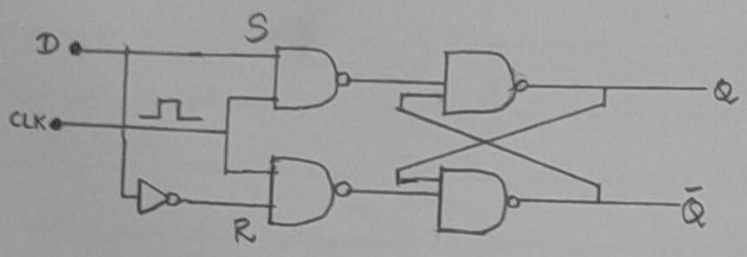
Q_n	Q_{n+1}	J	K
0	0	0	x
0	1	1	x
1	0	x	1
1	1	x	0

STATE DIAGRAM:



D- FLIP FLOP:

CIRCUIT DIAGRAM:



CHARACTERISTIC TABLE:

C	D	Q_n	Q_{n+1}
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

EXCITATION TABLE:

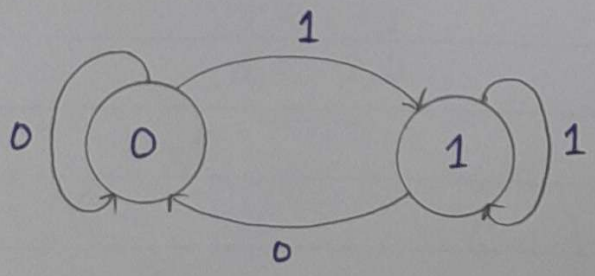
Q_n	Q_{n+1}	D
0	0	0
0	1	1
1	0	0
1	1	1

CHARACTERISTIC EQUATION:

D	Q_n'	Q_n
D'	0	0
D	1	1

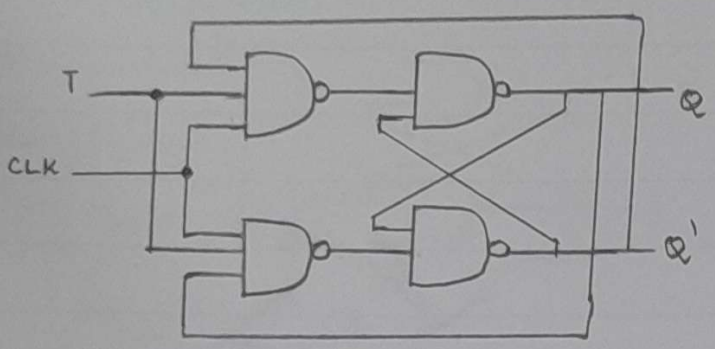
$$Q_{n+1} = D$$

STATE DIAGRAM:



T- Flip Flop:

Circuit Diagram:



Characteristic Table:

	Previous		Next	
T	Q_{Prev}	Q'_{Prev}	Q_{Next}	Q'_{Next}
0	0	1	0	1
0	1	0	1	0
1	0	1	1	0
1	1	0	0	1

Characteristic Equation:

Q_P \ T	0	1
0		(1)
1	(1)	

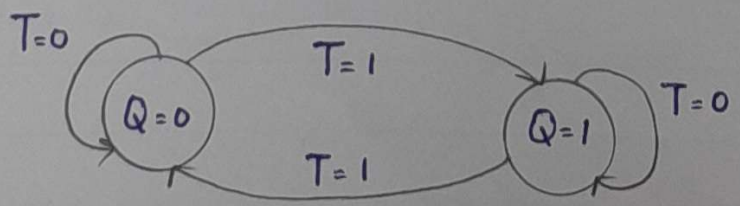
$Q = TQ_P' + T'Q_P$

$\boxed{Q = T \text{ XOR } Q_P}$

Excitation Table:

Q	Q^+	T
0	0	0
0	1	1
1	0	1
1	1	0

State Diagram:



RESULT:

Thus, with the help of circuit diagram, characteristic table and equation with help of state diagram able to understand characteristics of Flip Flop.