

* SR Flip Flop :

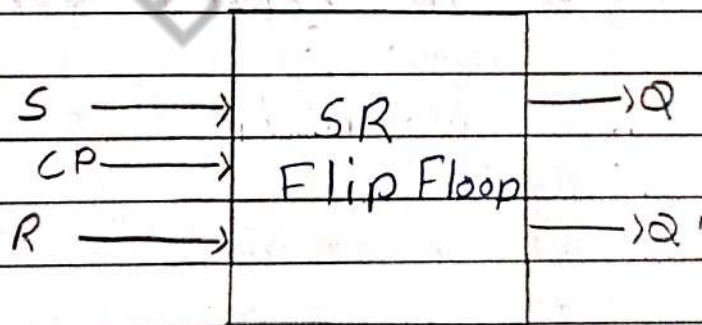
SR Flip Flop having two input and two output.

The SR Flip Flop stands for "Set-Reset" Flip Flop.

The set input 'S' set the produce the output 1.

The Reset input 'R' reset the produce the output 0.

- Block Diagram :



SR Flip Flop consist of a basic Flip Flop circuit and two additional NAND gates.

- Truth Table:

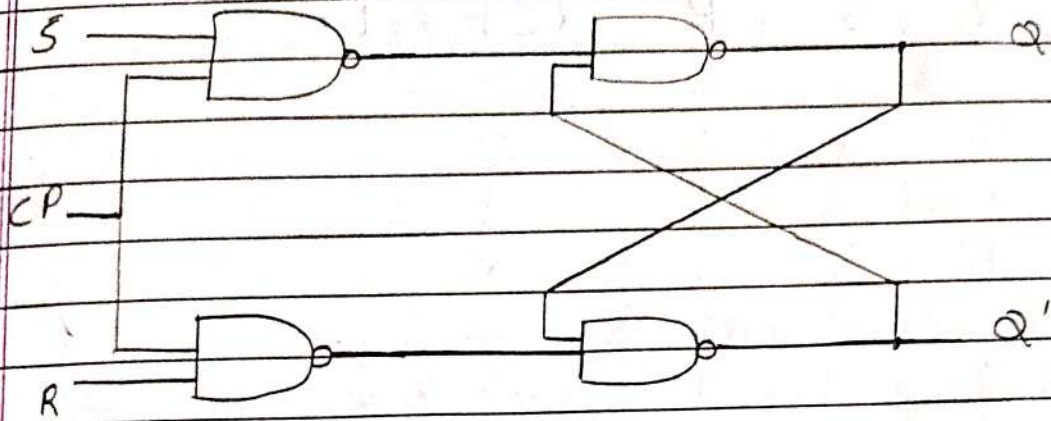
Q	S	R	Q(+1)
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	X
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	X

For Q(+1) K-Map:

Q \ SR	00	01	11	10
0			X	1
1	1		X	1

$$Q(+1) = S + R'Q'$$

- Logic Diagram:



- Advantages:

* SR Flip Floop is simple and produces certain outputs.

- Disadvantages:

The main disadvantage of the SR Flip Floop is invalid output when both inputs are high.

- Application:

- 1 SR Flip Floop is use in ConCounters.
- 2 SR Flip Floop is also used in Shift registers.

3 It is also used in Data storage and Data Transfer.

* D Flip Floop:

D Flip Floop is used to remove limitation of SR Flip Floop.

D Flip Floop stands for Delay Flip Floop.

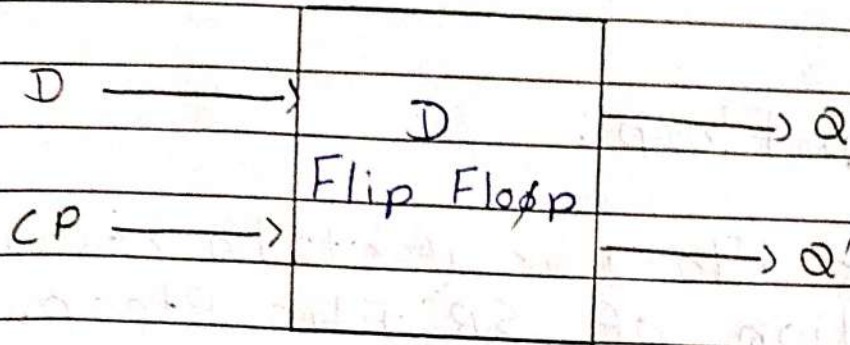
The D Flip Floop is the most important Flip Floop from other clocked types.

In D Flip Floop, It has only one input and two output.

In D Flip Floop, SR Flip Floop is used and In place of the set input and complementary input is used for reset.

In D Flip Floop, the single input D is referred to the Data input.

- Block Diagram:



In D Flip Flop, SR Flip Flop is used with one extra NAND Gate.

- Truth table:

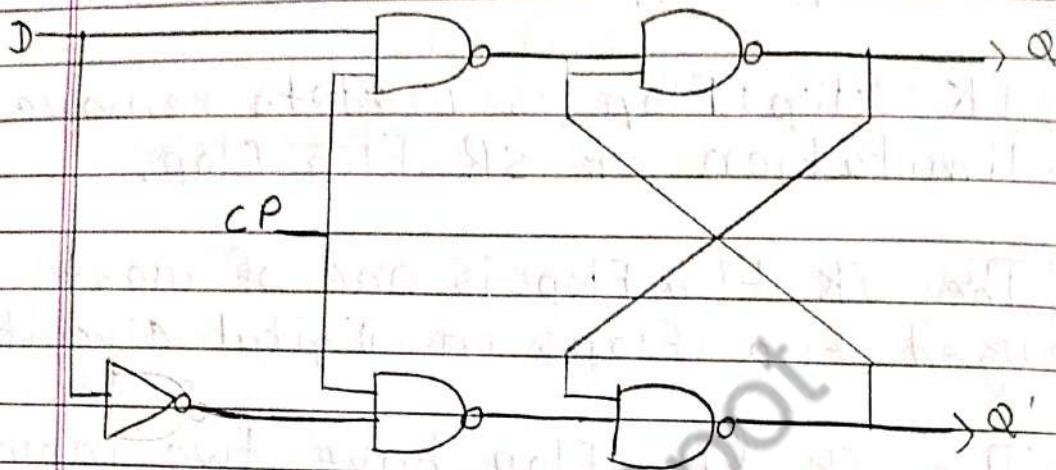
Q	D	$Q(t+1)$
0	0	0
0	1	1
1	0	0
1	1	1

For $Q(t+1)$ K-map:

Q/D	0	1
0		1
1		1

$$Q(t+1) = D$$

- Logic Diagram:



- Advantages:

In D Flip Flop only one input is used for setting and Resetting.

- Disadvantages:

A D Flip Flop is increase the circuit's size.

- Application:

- 1 D Flip Flop is also use in Counter.
- 2 It is used in shift register.

3) D Flip Flop is used in Data transfer and Data storage.

* JK Flip Flop:

JK Flip Flop is used to remove limitation of SR Flip Flop.

The JK Flip Flop is one of most used Flip Flops in Digital circuit.

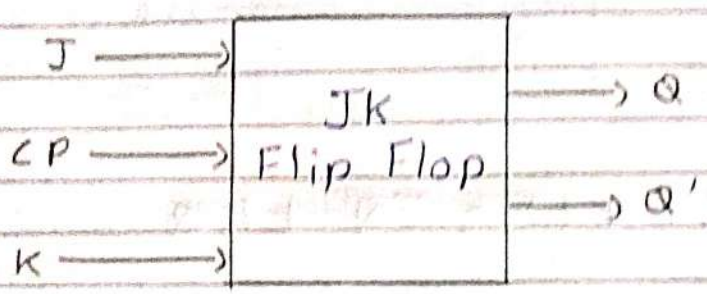
The JK Flip Flop have two input J and K and two output.

The JK Flip Flop is work like SR Flip Flop, but in SR Flip Flop both state are high then SR Flip Flop gives invalid state.

The JK Flip Flop does not gives invalid state. If Both state are high then JK Flip Flops are set to 1.

This is limitation remove by the JK Flip Flop.

- Block Diagram:



In JK Flip Flop, Both inputs are high then output will come to 1.

- Truth Table:

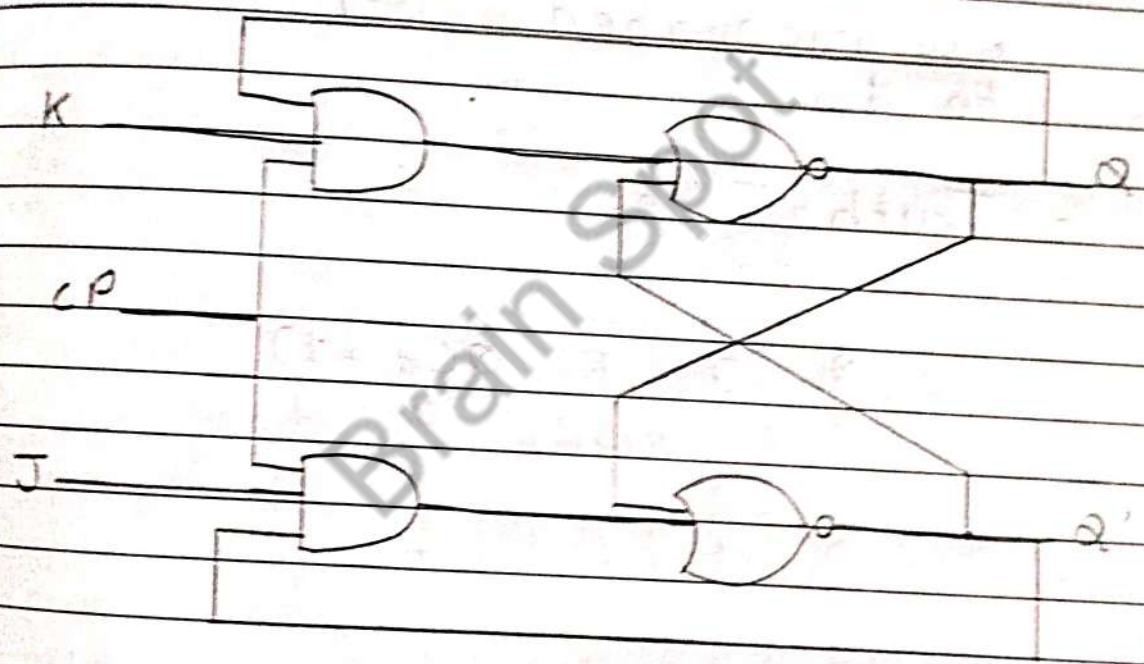
Q	J	K	$Q_{(t+1)}$
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

For $Q_{(t+1)}$ K-Map:

JK		Q			
		00	01	11	10
Q	0			1	1
	1	1			1

$$Q(t+1) = JQ' + K'Q$$

- Logic Diagram:



- Advantages:

The JK Flip Flop is much faster and this Flip Flop does not have an invalid state.

- Disadvantages:

The JK Flip Flop has Race Around Condition.

- Application:

- 1 JK Flip Flop is use in counter.
- 2 It is also used in shift register.
- 3 The JK Flip Flop is use in data Transfer and Data storage.

* T Flip Flop:

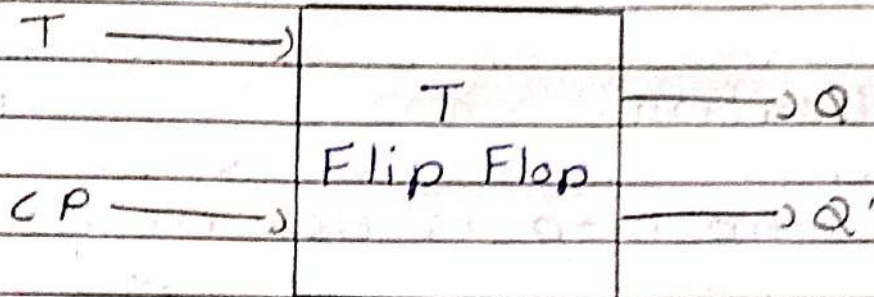
T Flip Flop is made by using JK Flip Flop.

T Flip Flop stands stands the terms "Toggle".

In T Flip Flop, there is only one input and two output.

T Flip Flop works as a Toggle switch.

- Block Diagram:



In T Flip Flop, next output is changed with the complement of the present state output.

- Truth table:

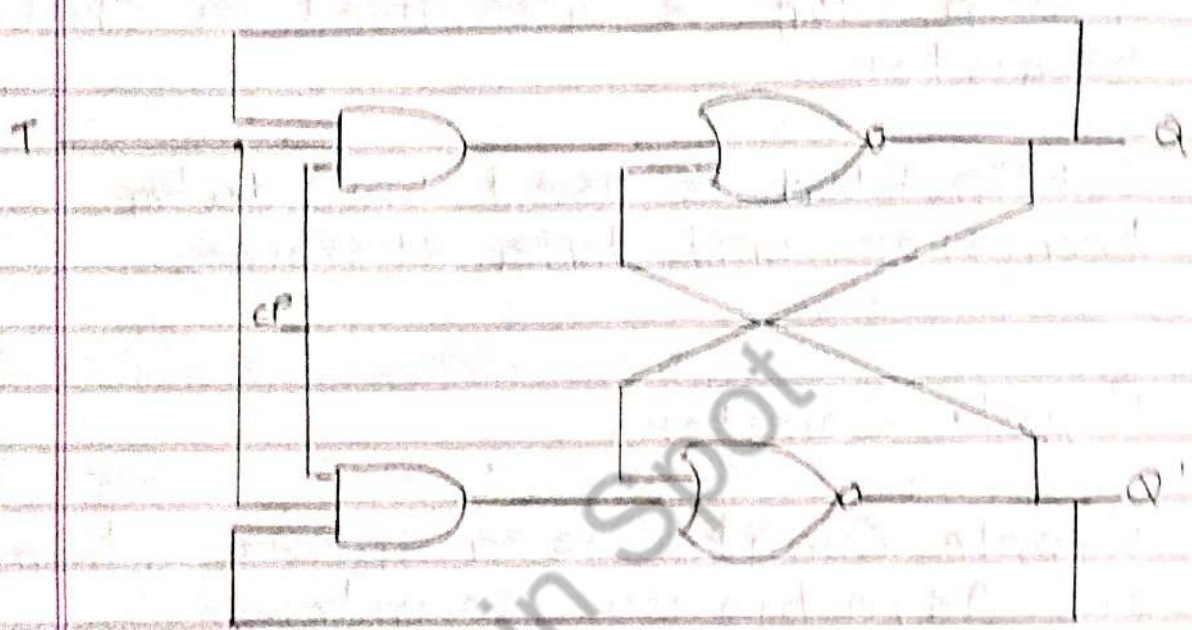
Q	T	$Q(t+1)$
0	0	0
0	1	1
1	0	1
1	1	0

For $Q(t+1)$ k map:

	T	0	1
Q	0		1
	1	1	

$$Q(t+1) = Q'T + QT'$$

- Logic Diagram:



- Advantages:

T Flip Flop has a toggle input and a clock.

- Disadvantages:

Flip Flop is trigger if only when the previous state is known.

- Application:

- 1 T Flip Flop is used in counter.
- 2 T Flip Flop is also used in Shift register.
- 3 T Flip Flop is used for data transfer and data storage.

* Ripple Counter:

Ripple Counter is a special types of Asynchronous Counter.

In Ripple Counter different types of Flip Flops are used.

In Ripple Counter, Flip Flops are used in toggle mode.

There

There are three types of Ripple Counter.

- 1) Up Counter
- 2) Down Counter
- 3) Up-Down Counter.

1 Up Counter :

In Up counter counts the state in ascending order.

2 Down Counter :

In Down counter, counts the state in descending order.

3 Up-down Counter :

In Up-down counter, counts the state either forward direction or reverse direction.

-> Block Diagram :

Draw the Binary Ripple Counter Block Diagram.

(Next Que.

Block Diagram)

-> Application :

1 Counter is used to measuring Time.

2 Counter is used to measuring Frequency.

* Binary Ripple Counter:

Binary Ripple Counter is a type of Asynchronous counter.

In Binary Ripple Counter JK and T Flip Flops are use.

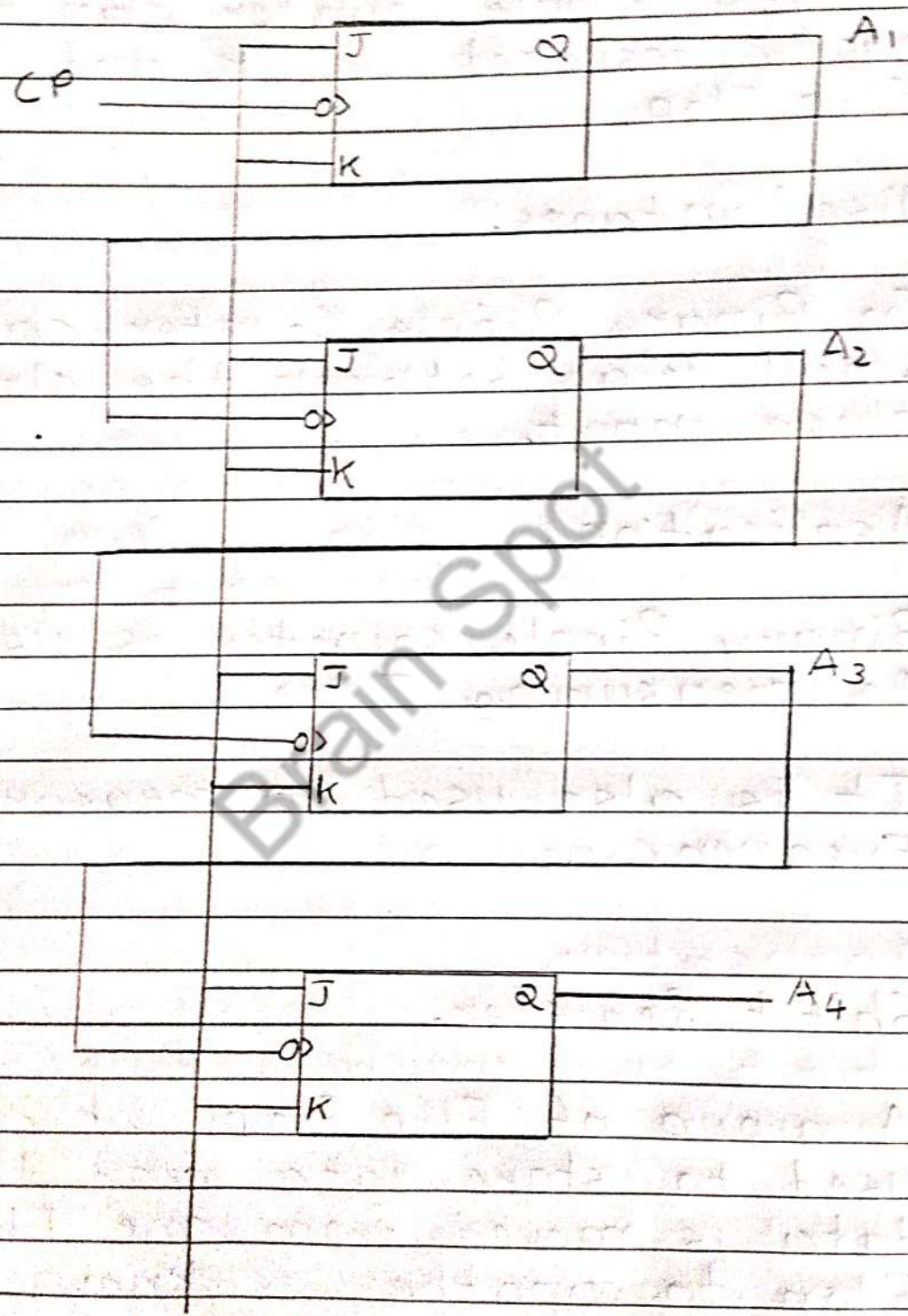
A Binary Ripple Counter consist series connection of JK or T Flip Flops.

The output of each Flip Flop connected to the CP input to the next Flip Flop.

In this Binary Ripple Counter we use the JK Flip Flop.

A Binary Ripple Counter consist series connection of JK Flip Flops.

- Block Diagram:



Logic-1

- Advantages:

Binary Ripple Counter can be easily designed by JK and T Flip Flop.

- Disadvantages:

In Binary Ripple Counter can be small delay between the clock pulse input.

- Application:

- 1 Binary Ripple counter is used to measuring Time.
- 2 It is also used to measuring Frequency.

* Shift Register:

A group of Flip Flops which is used to store data and that data is moved from one Flip Flop to another is known as Shift Register.

Shift Register is used to data transfer from one Flip Flop to another Flip Flop.

If we connect n bit Shift Register then we have n bit Flip Flop.

In Shift Register, Flip Flop are connected in such way that the first Flip Flop's output becomes the input of the next Flip Flop.

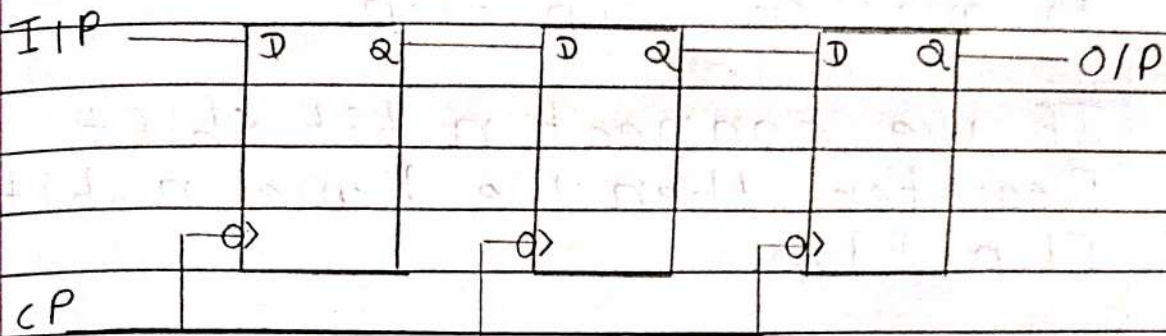
A Shift Register can be shift from left to right or Right to left.

Shift Register consists a chain of Flip Flop.

Shift Register's all the Flip Flop receive common clock pulse.

In this Block Diagram we use D Flip Flop.

- Block Diagram:



- Advantages:

Shift Register can be perform multiple operation at a one time.

- Disadvantages:

We have refresh shift Register for time to time.

- Application:

1. Shift Register used as a Parallel Converter.
2. Shift Register used as a Serial converter.