## DIGITAL CIRCUITS

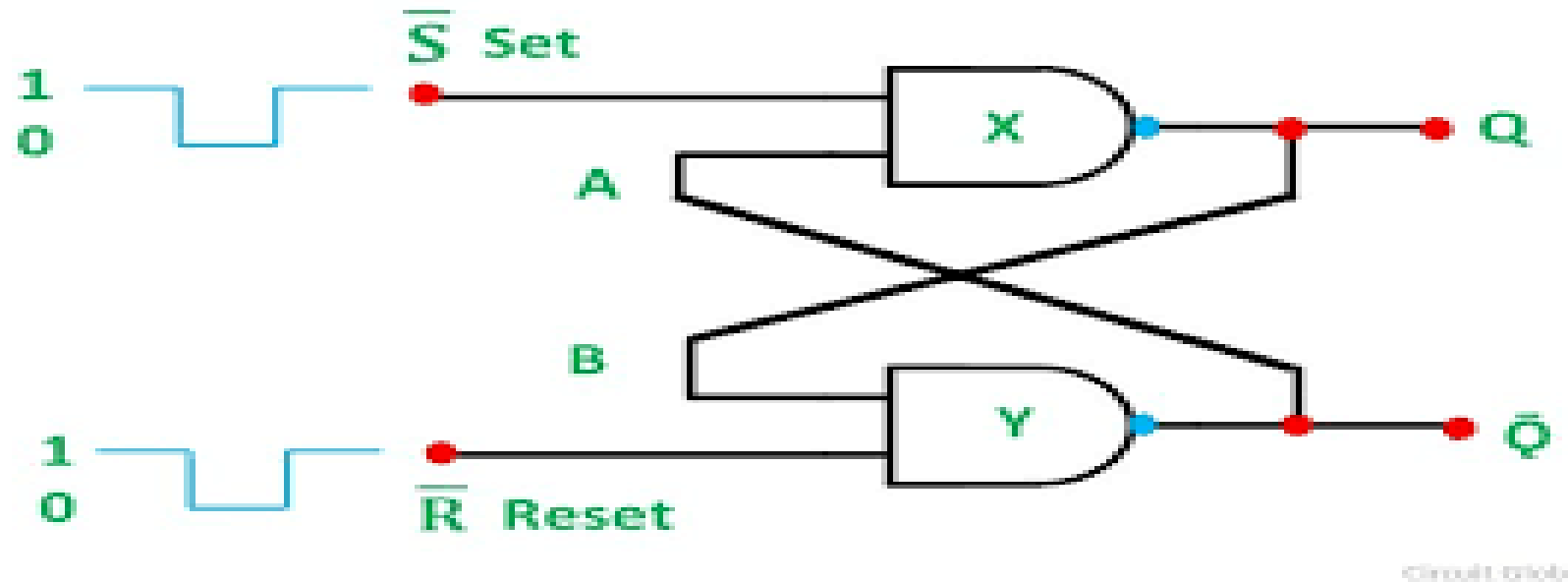## Guess Today's Topic????

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## What is Flip flop

>>In digital circuits, the flip-flop, is a kind of bi-stable multivibrator.

>>It is a Sequential Circuits / an electronic circuit which has two stable states and thereby is capable of serving as one bit of memory , bit 1 or bit 0
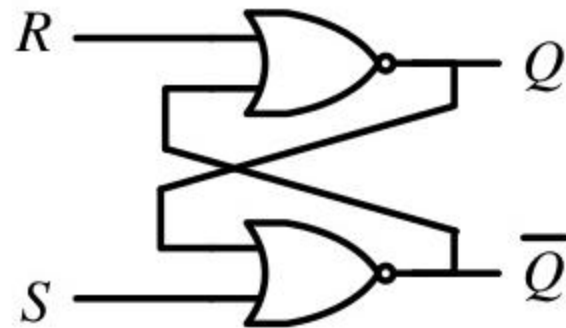
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## Introduction : Types Of Flip Flop

1. SR Flip Flop
    a. SR Flip Flop Active Low = NAND gates
    b. SR Flip Flop Active High = NOR gates

2. Clocked SR Flip Flop
3. JK Flip Flop
4. T Flip Flop
5. D Flip Flop
6. Master-Slave Edge-Triggered Flip-Flop

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## SR Flip Flop - NOR GATE LATCH

| S R | Q | |
|-----|-----|------|
| 0 0 | $Q_0$ | No change |
| 0 1 | 0 | Reset |
| 1 0 | 1 | Set |
| 1 1 | $Q=Q'=0$ | Invalid |

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# SR Flip Flop - NAND GATE LATCH
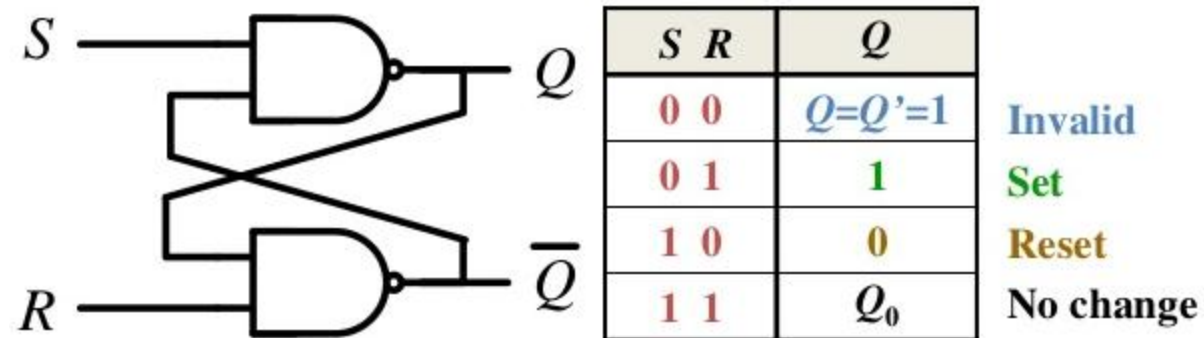


| S R | Q | |
|-----|-----|-----|
| 0 0 | $Q=Q'=1$ | Invalid |
| 0 1 | 1 | Set |
| 1 0 | 0 | Reset |
| 1 1 | $Q_0$ | No change |

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## Clocked SR Flip Flop



| C S R | Q | |
|-------|-----|-----------|
| 0 x x | $Q_0$ | No change |
| 1 0 0 | $Q_0$ | No change |
| 1 0 1 | 0 | Reset |
| 1 1 0 | 1 | Set |
| 1 1 1 | $Q=Q'$ | Invalid |

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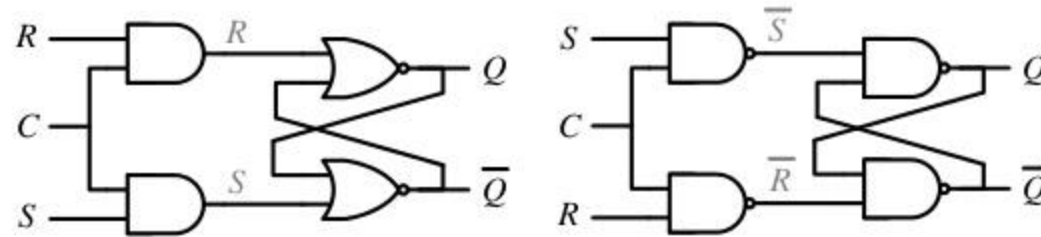
## SR Flip Flop - NOR GATE LATCH

| S | R | Q | $\bar{Q}$ | STATUS |
|---|---|---|-----------|--------|
| 0 | 0 | Q | $\bar{Q}$ | HOLD (NoChange) |
| 0 | 1 | 0 | 1 | RESET |
| 1 | 0 | 1 | 0 | SET |
| 1 | 1 | 0 | 0 | INVALID |

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# Clocked SR Flip Flop

► Additional clock input is added to change the SR flip- flop from an element used in asynchronous sequential circuits to one, which can be used in synchronous circuits.

► The clocked SR flip flop logic symbol that is triggered by the PGT is shown in Figure.

► Its means that the flip flop can change the output states only when clock signal makes a transition from LOW to HIGH.
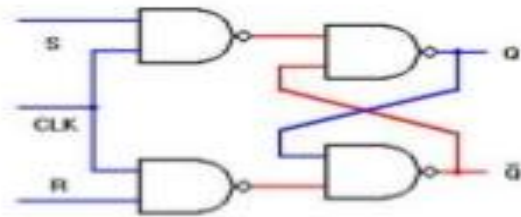
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# Clocked RS Flip Flop

| clock | S | R | Q | $\overline{Q}$ | STATUS |
|-------|---|---|---|----------------|--------|
| ↑ | 0 | 0 | Q | $\overline{Q}$ | HOLD (NoChange) |
| ↑ | 0 | 1 | 0 | 1 | RESET |
| ↑ | 1 | 0 | 1 | 0 | SET |
| ↑ | 1 | 1 | 0 | 0 | INVALID |

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## Clocked SR Flip Flop

► CLOCKED SR FLIP FLOP LOGIC CIRCUIT

If used NOR Gate NOR Gate NOR Gate NOR Gate, must used AND Gate in front

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