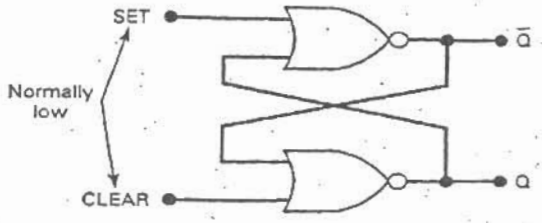
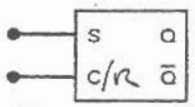
FLIP-FLOPS

NOR Latch

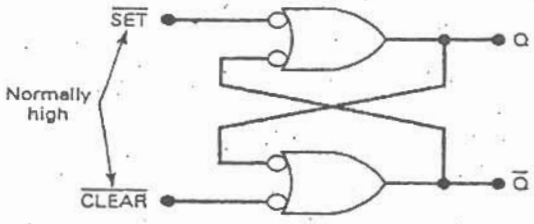


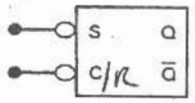


(Alternate symbol)

S	C	Q
0	0	No change
1	0	Q = 1
0	1	Q = 0
1	1	Invalid

NAND Latch



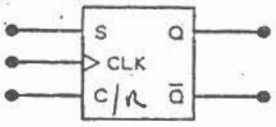


(Alternate symbol)

S	C	Q
0	0	Invalid
1	0	Q = 0
0	1	Q = 1
1	1	No change

Clocked S-C

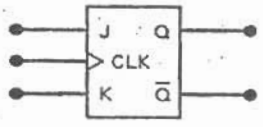
S-R



S	C	CLK	Q
0	0	↑	Q_0 (no change)
1	0	↑	1
0	1	↑	0
1	1	↑	Ambiguous

↓ of CLK has no effect on Q

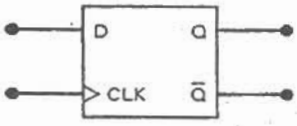
Clocked J-K



J	K	CLK	Q
0	0	↑	Q_0 (no change)
1	0	↑	1
0	1	↑	0
1	1	↑	$\overline{Q_0}$ (toggles)

↓ of CLK has no effect on Q

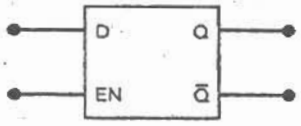
Clocked D



D	CLK	Q
0	↑	0
1	↑	1

↓ of CLK has no effect on Q

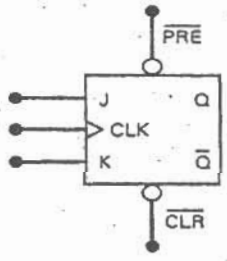
D Latch



EN	D	Q*
0	X	No change
1	0	0
1	1	1

*Q follows D input while EN is HIGH

Asynchronous Inputs



PRE	CLR	Q*
1	1	No effect; FF can respond to J, K and CLK
1	0	Q = 0 independent of J, K, CLK
0	1	Q = 1 independent of J, K, CLK
0	0	Ambiguous (not used)

*CLK can be in any state

Rules J K

0 → 0 0 X
0 → 1 1 X
1 → 0 X 1
1 → 1 X 0