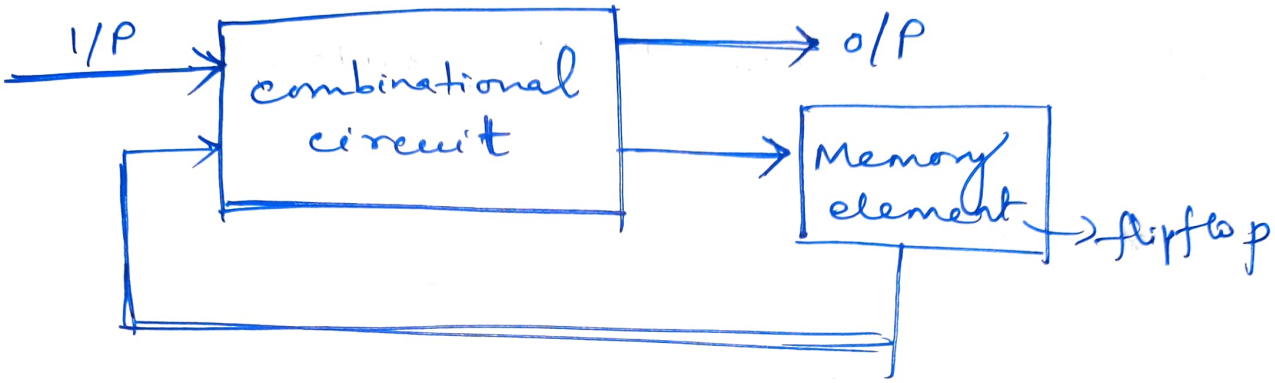
SEQUENTIAL circuit:

- present output depends on present input as well as previous output.



types of sequential circuit:

I) Asynchronous : O/P changes at any instance of time.
There is no clock.
- used in LATCHES.

II) Synchronous : O/P changes only on clock pulse.
- used in Flip flop.

LATCHES:

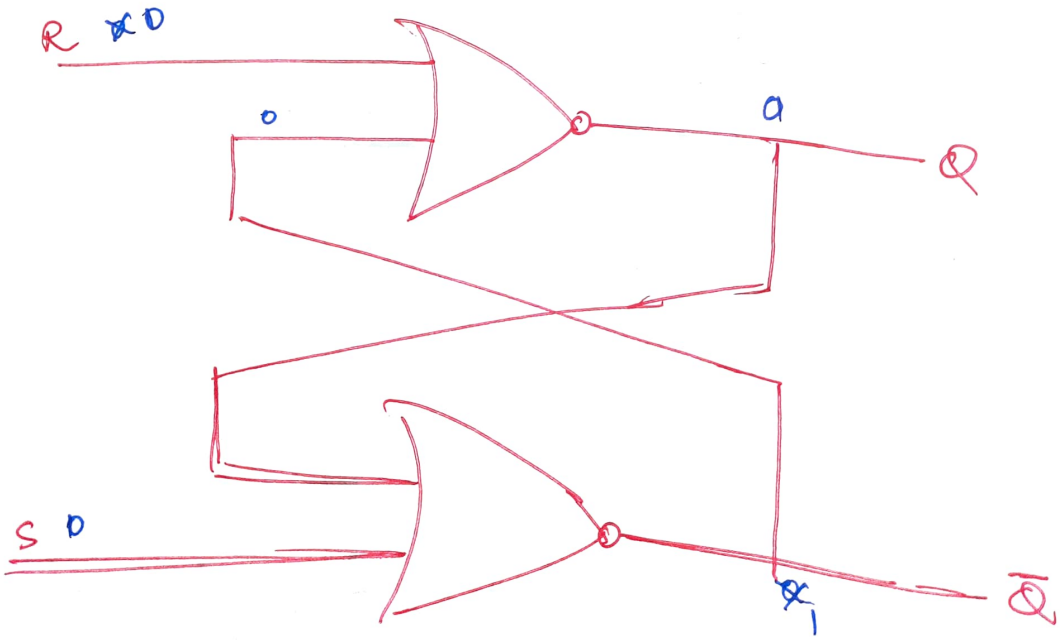
S - set → (Q = 1)
R - reset → (Q = 0)

* SR latch using NOR gate:

x	y	F
0	0	1
0	1	0
1	0	0
1	1	0

if either I/P = 1 then
O/P = 0

else
O/P = 1



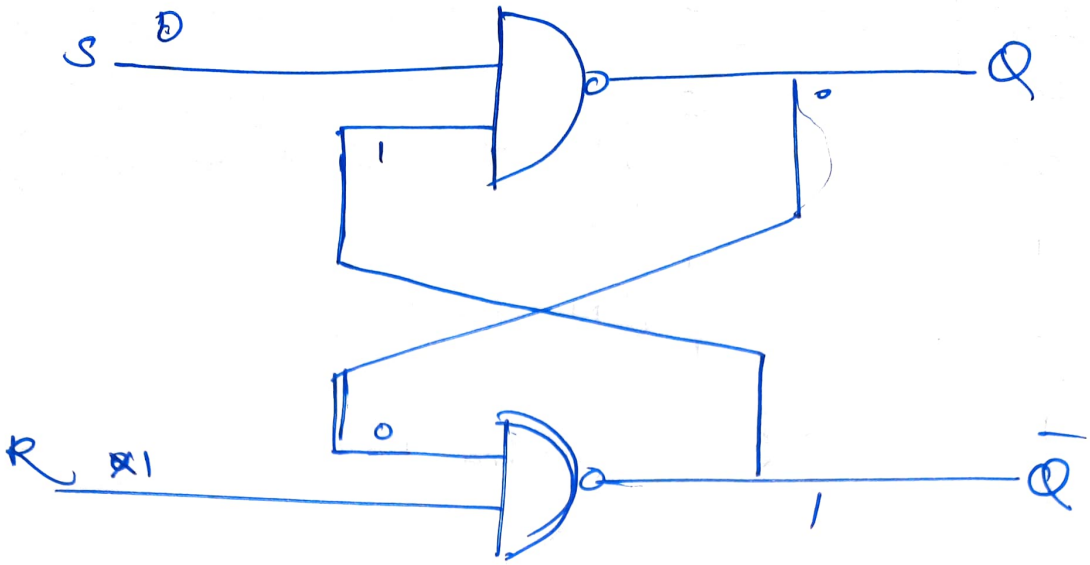
S	R	Q	$\bar{Q}$	
1	0	1	0	
0	0	1	0	↓ No change ‖ Q = 1 (prev. state)
0	1	0	1	↓ Reset
0	0	0	1	↓ No change
1	1	X		Invalid / Forbidden.

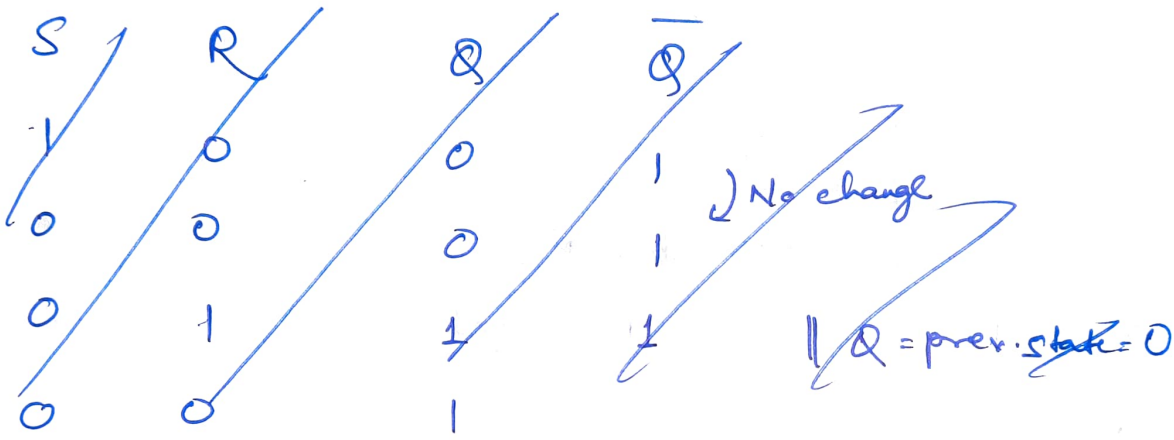
↓

S	R	Q	$\bar{Q}$	
0	0	No change		
0	1	0	1	Reset (Q = 0)
1	0	1	0	set (Q = 1)
1	1	Invalid.		

* SR - Latch using NAND gate:

x	y	F
0	0	1
0	1	1
1	0	1
1	1	0



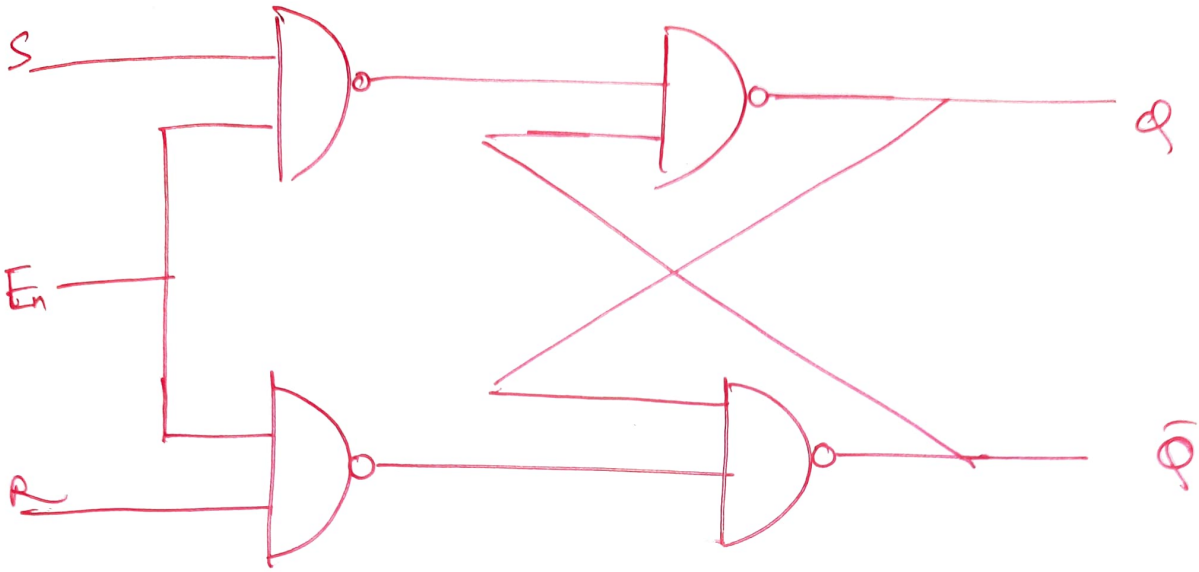


S	R	Q	$\bar{Q}$
0	0	Invalid	
0	1	Set	
1	0	Reset	
1	1	No change (Q_n)	

opp. of NOR

FLIP-FLOP:

SR-Latch with controlled inputs:



E_n	S	R	Q	$\bar{Q}$
0	X	X	No change	
1	0	0	No change	
1	0	1	0	1
1	1	0	1	0
1	1	1	Invalid	