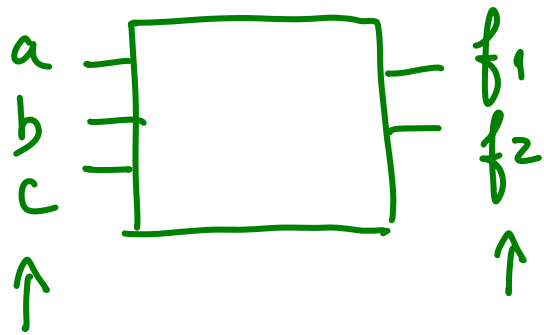
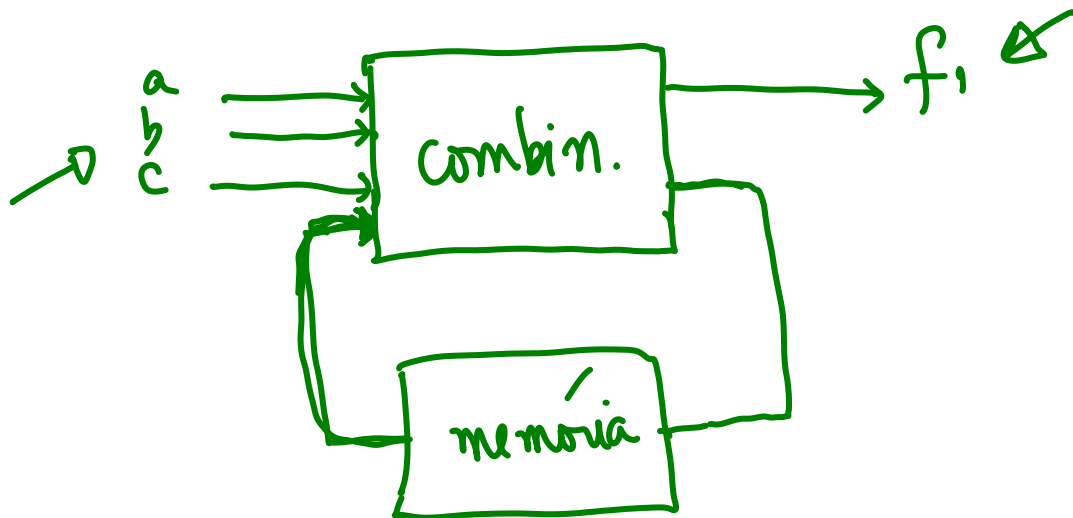


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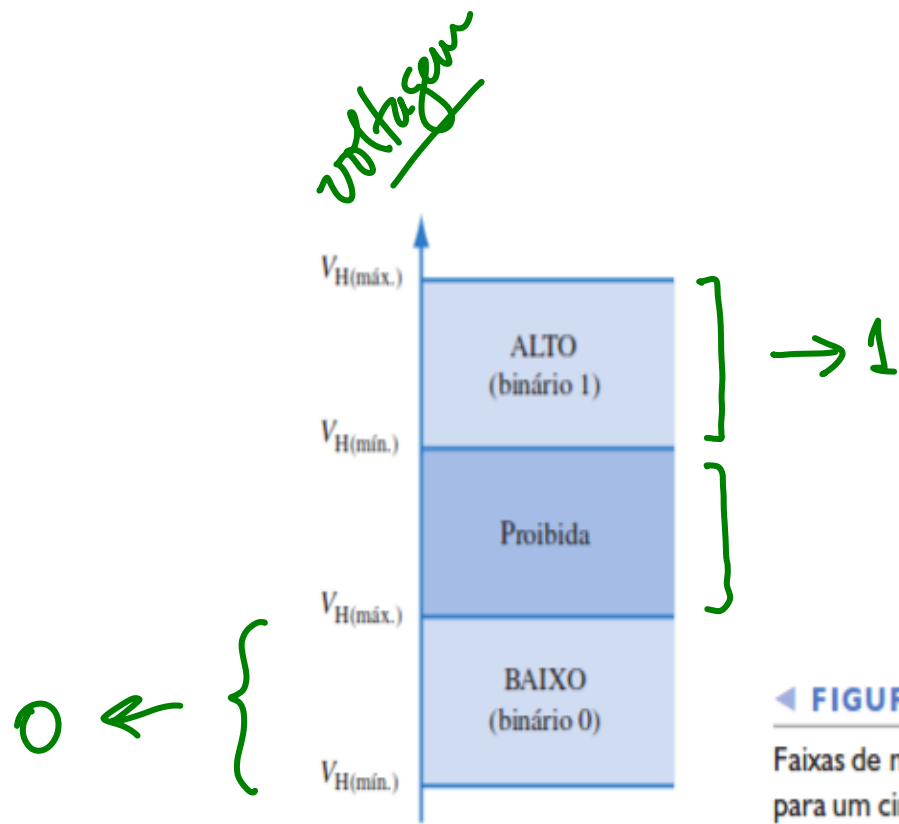
Flip-Flops



combinacional



Sequenciais

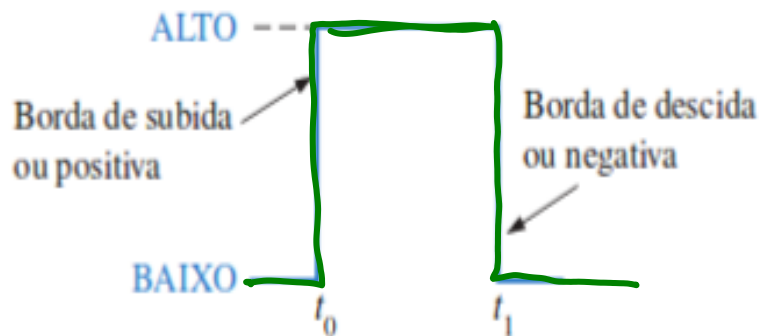


◀ **FIGURA 1-5**

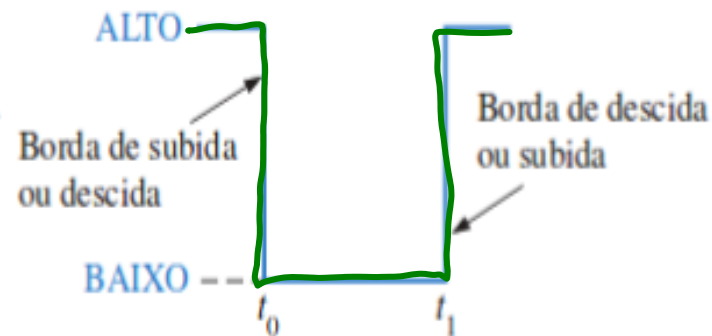
Faixas de níveis lógicos de tensão para um circuito digital.

Formas de Onda Digitais

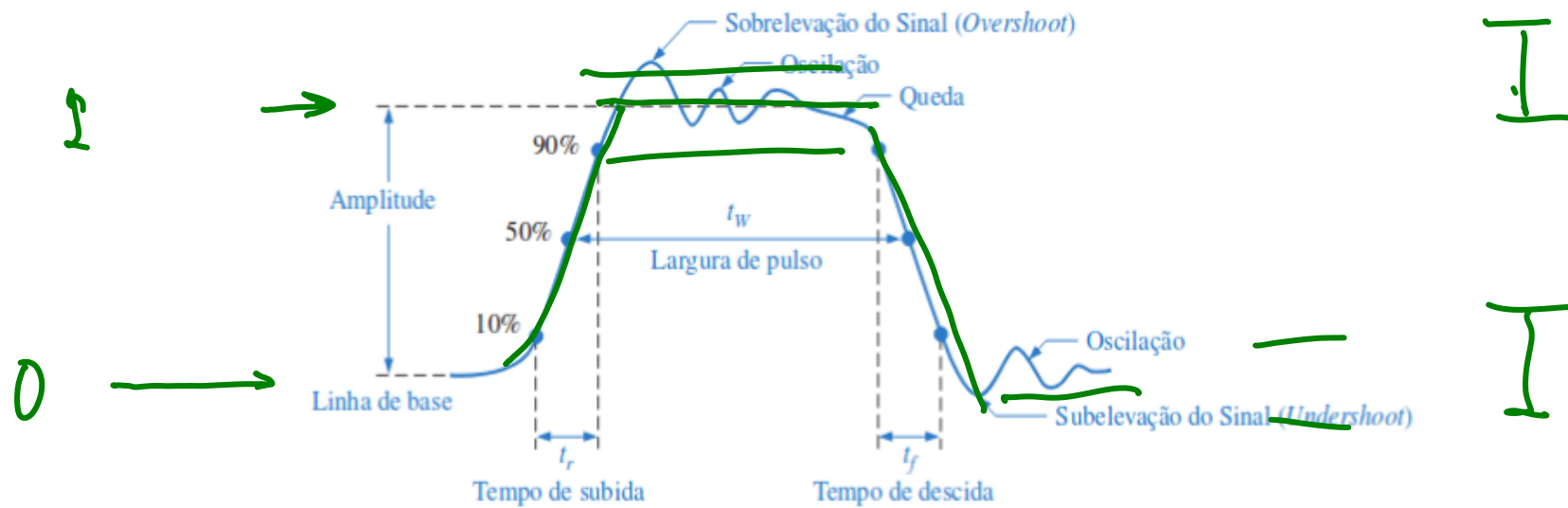
Formas de onda digitais consistem em níveis de tensão que comutam entre os níveis, ou estados, lógicos ALTO e BAIXO. A Figura 1-6(a) mostra que um único **pulso** positivo é gerado quando a tensão (ou corrente) passa do nível BAIXO normal para o nível ALTO e em seguida retorna para o nível BAIXO. O pulso negativo, visto na Figura 1-6(b), é gerado quando a tensão passa do nível ALTO normal para o nível BAIXO e retorna para o nível ALTO. Uma forma de onda digital é constituída de uma série de pulsos.

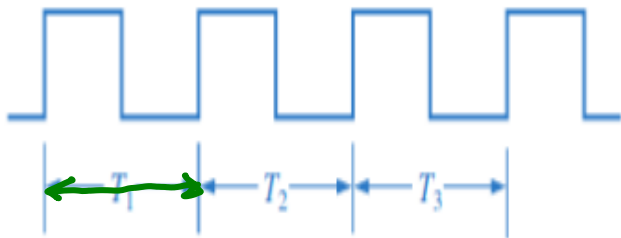


(a) Pulso positivo



(b) Pulso negativo





Período = $T_1 = T_2 = T_3 = \dots = T_n$

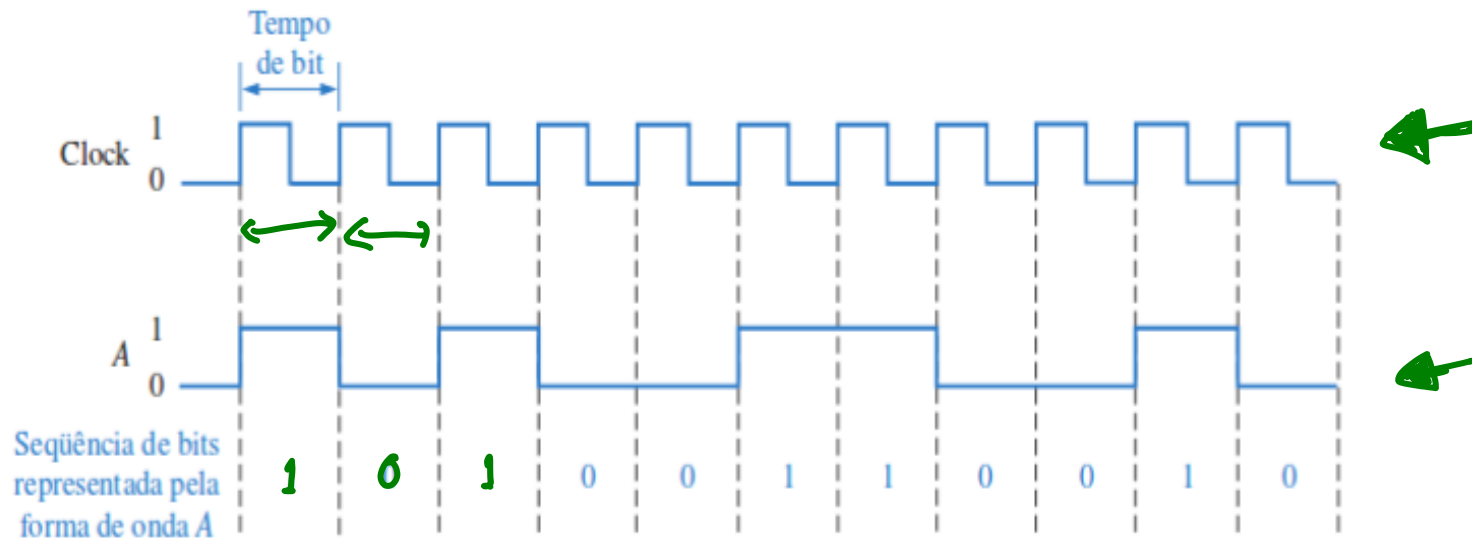
Frequência = $\frac{1}{T}$

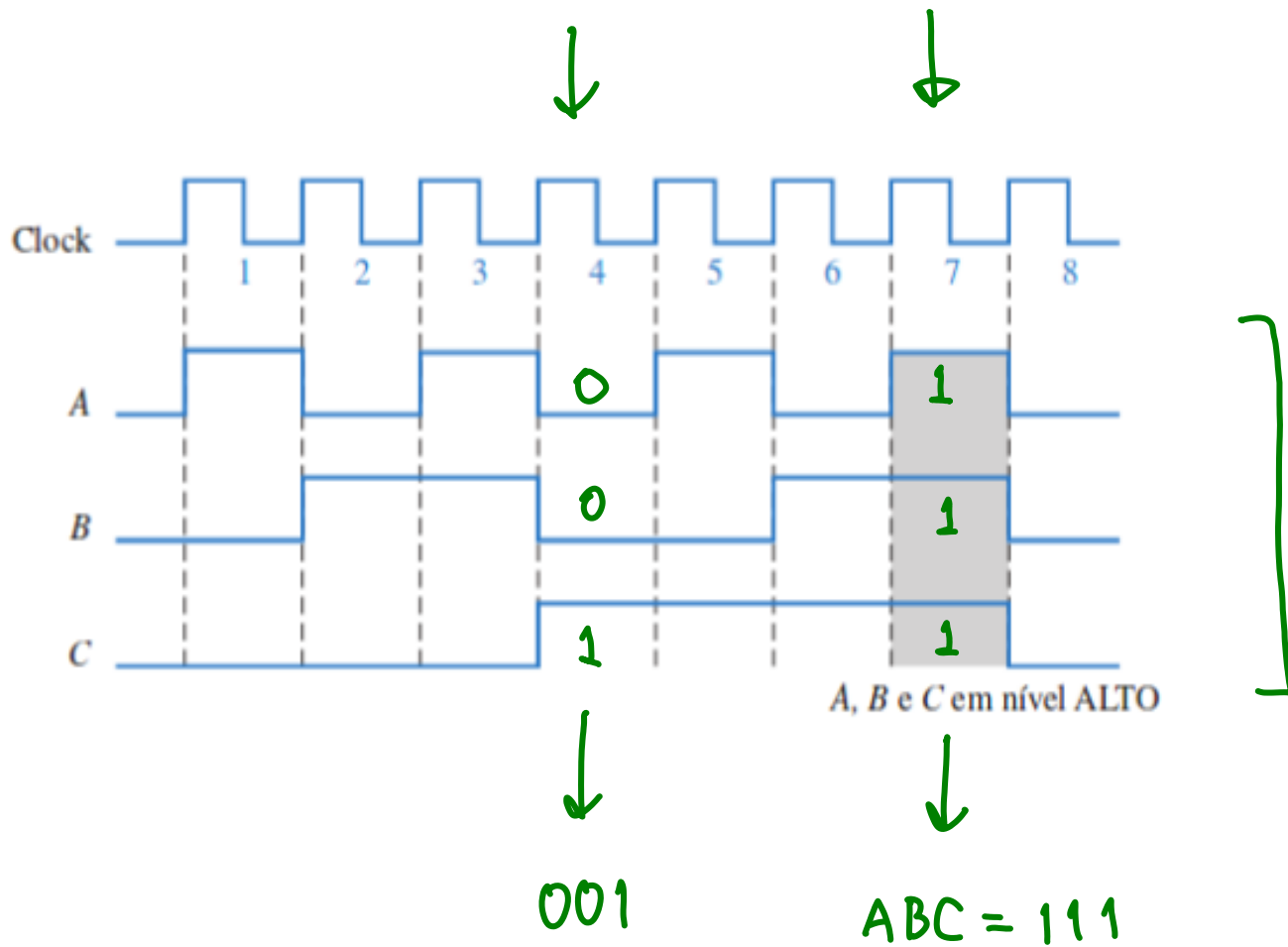
(a) Periódica (onda quadrada)

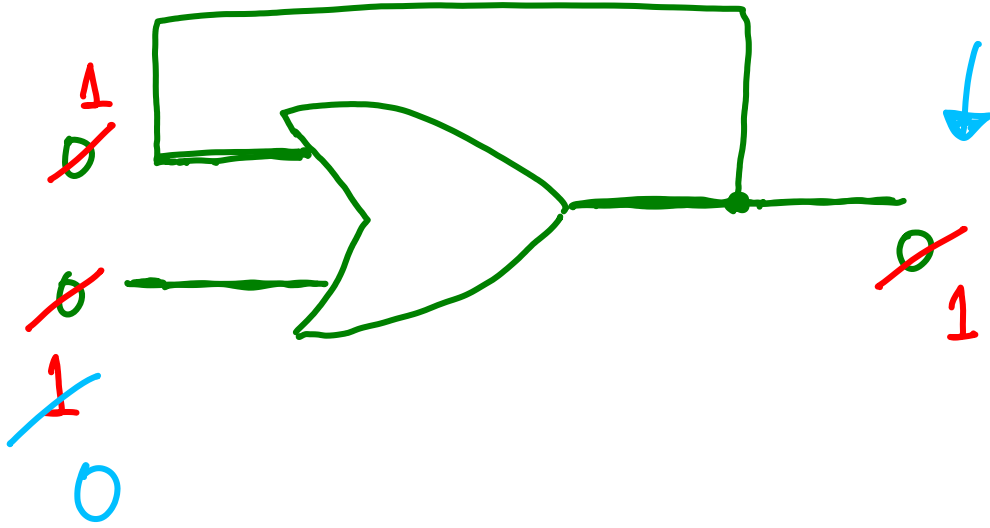


(b) Não-periódica

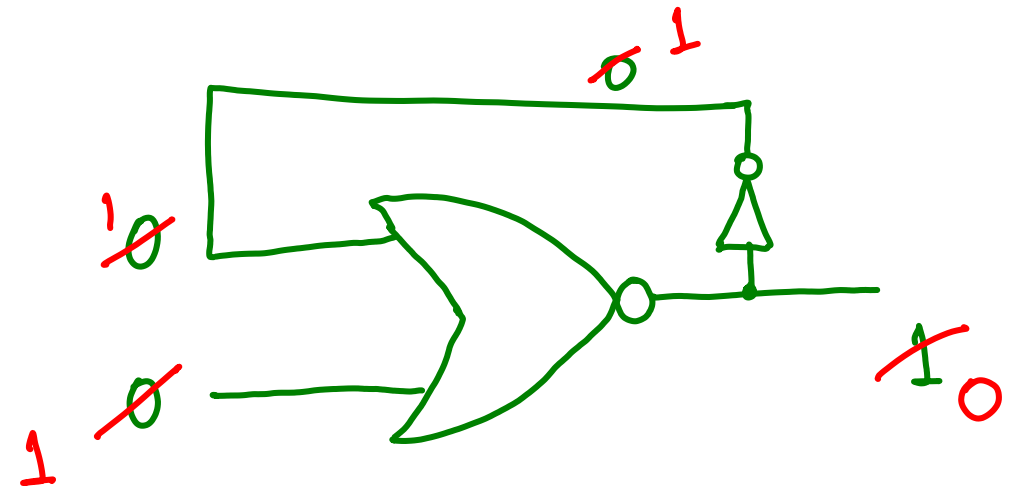




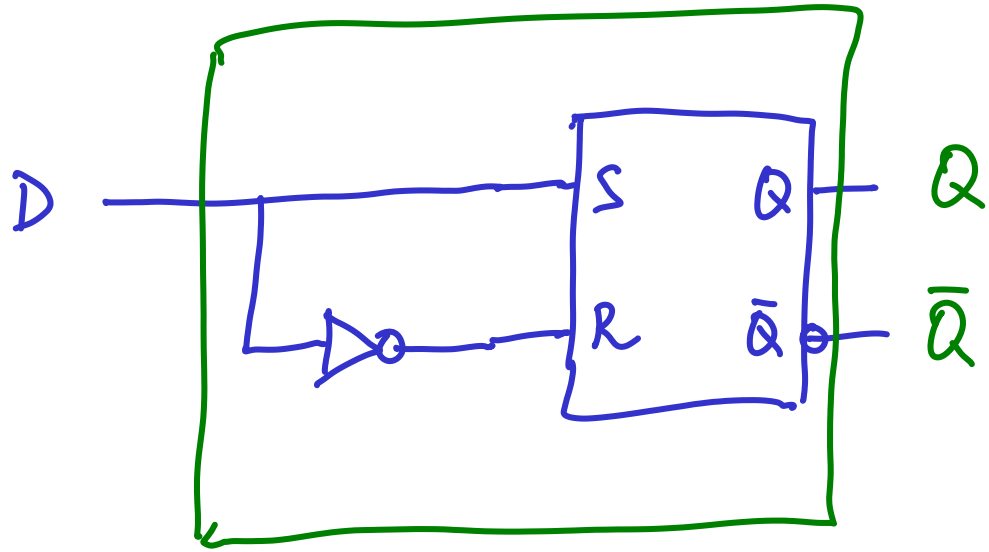




SET



RESET



flip-flop D



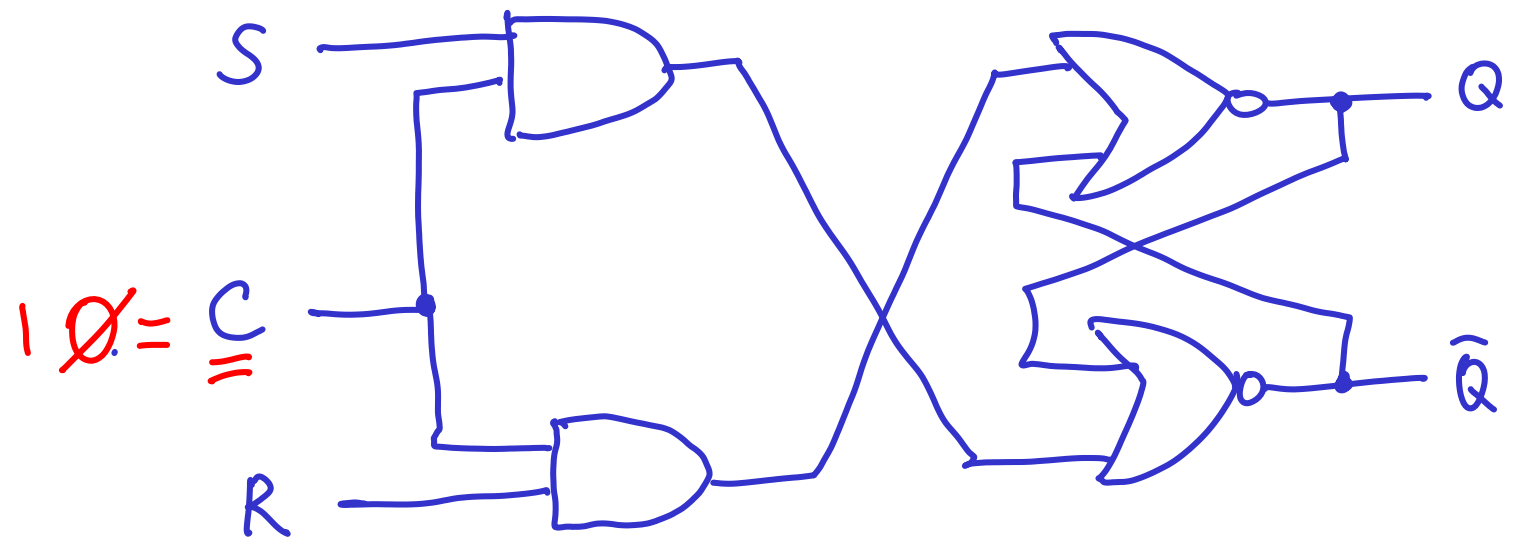
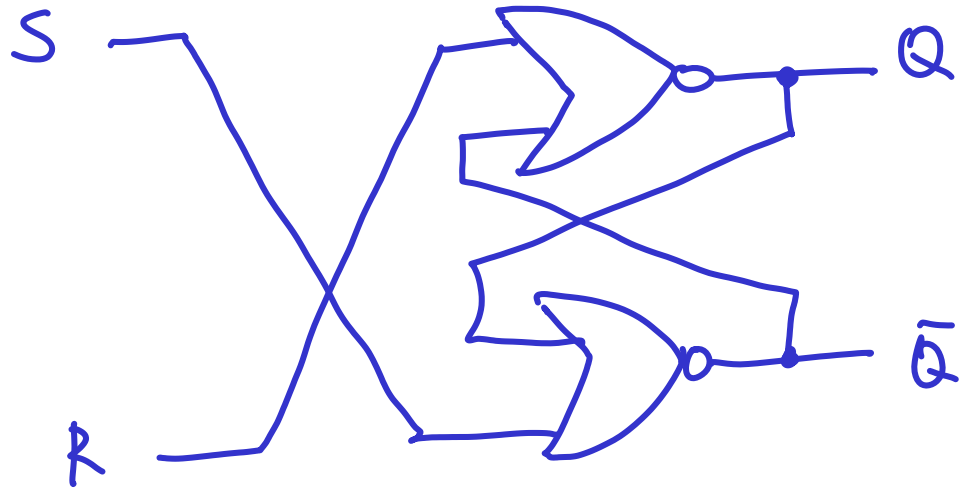
← estados actual ← próximos estados

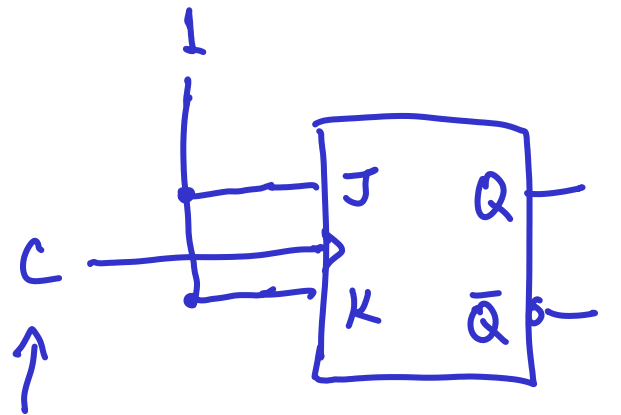
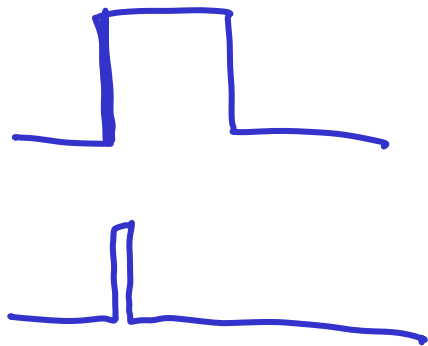
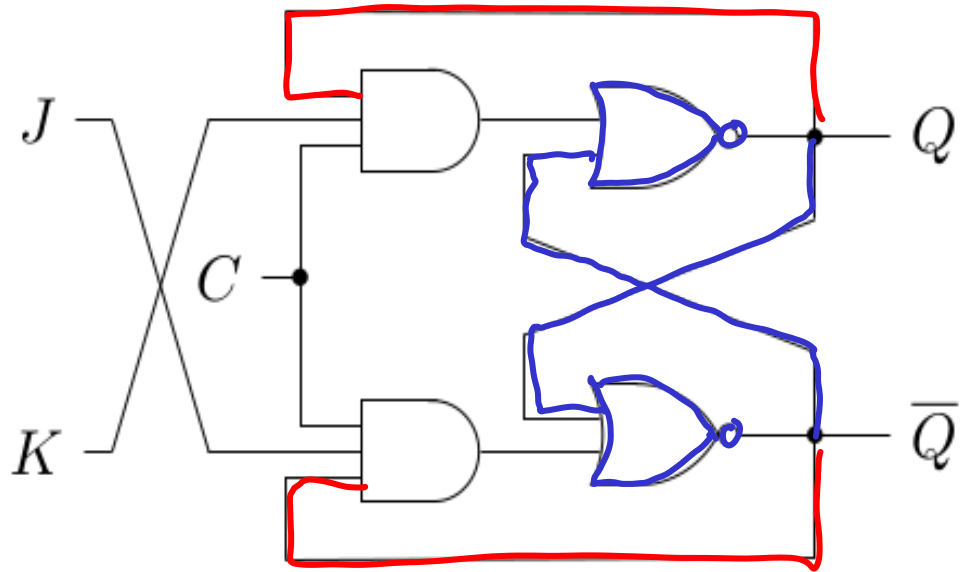
estados actual			estados próximos	
S	R	Q	Q*	
0	0	0	0	mantém
0	0	1	1	
0	1	0	0	reset
0	1	1	0	
1	0	0	1	set
1	0	1	1	
1	1	0		impensável
1	1	1		

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

Q*

$$Q^* = \bar{R}Q + S$$





Flip-flop T

J	K	Q	Q^*	
0	0	0	0	mantém
0	0	1	1	
0	1	0	0	reset
0	1	1	0	
1	0	0	1	set
1	0	1	1	
1	1	0	1	invert
1	1	1	0	

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

Q^*

$$Q^* = \bar{K}Q + J\bar{Q}$$