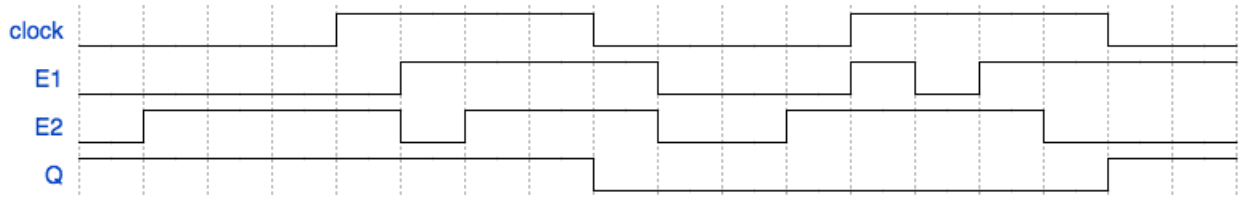
Universidade de Brasília

Circuitos Digitais – Prof. Marcelo Grandi Mandelli

Lista de Exercícios 7 – Latches e Flip-flops

1. A forma de onda abaixo descreve o comportamento de um flip-flop sem considerar o atraso. O valor de Q é inicializado em 1.



Qual a tabela verdade para esta forma de onda?

a)

CLK	E1	E2	Q_{t+1}
≠↑	X	X	Q
↑	0	1	0
↑	1	0	1
↑	1	1	$\overline{Q_t}$

b)

CLK	E1	E2	Q_{t+1}
≠↑	X	X	Q
↑	1	0	0
↑	0	1	1
↑	1	1	$\overline{Q_t}$

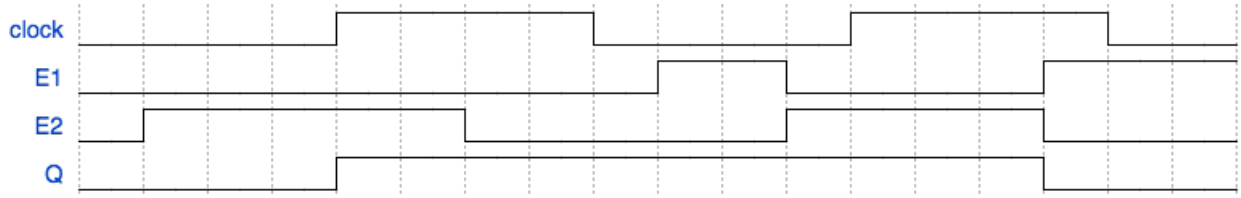
c)

CLK	E1	E2	Q_{t+1}
≠↓	X	X	Q
↓	0	1	0
↓	1	0	1
↓	1	1	$\overline{Q_t}$

d)

CLK	E1	E2	Q_{t+1}
≠↓	X	X	Q
↓	1	0	0
↓	0	1	1
↓	1	1	$\overline{Q_t}$

2. A forma de onda abaixo descreve o comportamento de um latch ou um flip-flop sem considerar o atraso. O valor de Q é inicializado em 0.



Qual a tabela verdade para essa forma de onda?

a)

CLK	E1	E2	Q_{t+1}
≠↑	X	X	Q
↑	0	0	Q
↑	0	1	0
↑	1	0	1
↑	1	1	$\overline{Q_t}$

b)

CLK	E1	E2	Q_{t+1}
0	X	X	Q
1	0	0	Q
1	1	0	0
1	0	1	1
1	1	1	$\overline{Q_t}$

c)

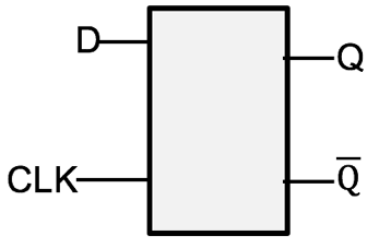
CLK	E1	E2	Q_{t+1}
0	X	X	Q
1	0	0	Q
1	0	1	0
1	1	0	1
1	1	1	$\overline{Q_t}$

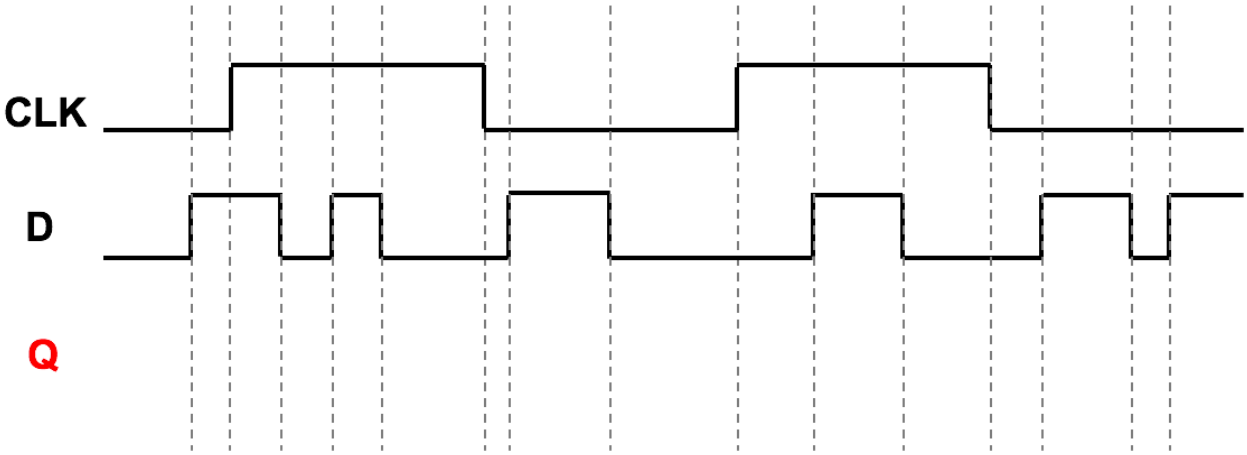
d)

CLK	E1	E2	Q_{t+1}
≠↑	X	X	Q
↑	0	0	Q
↑	1	0	0
↑	0	1	1
↑	1	1	$\overline{Q_t}$

3. Complete as formas de onda dos circuitos a seguir (desconsidere o atraso).

a)





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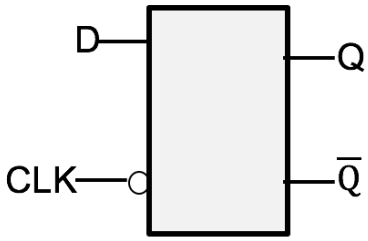

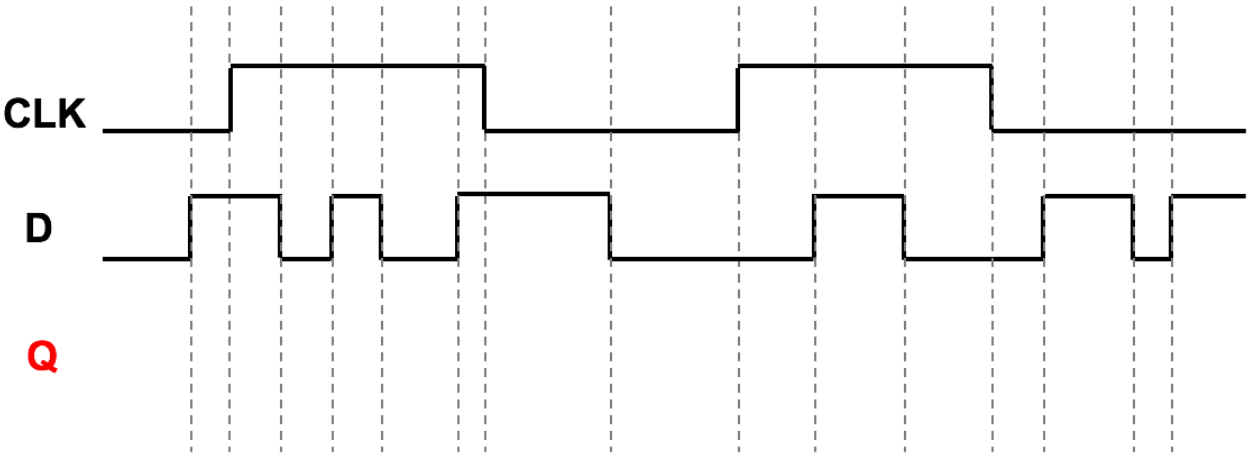

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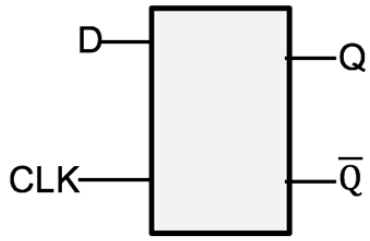

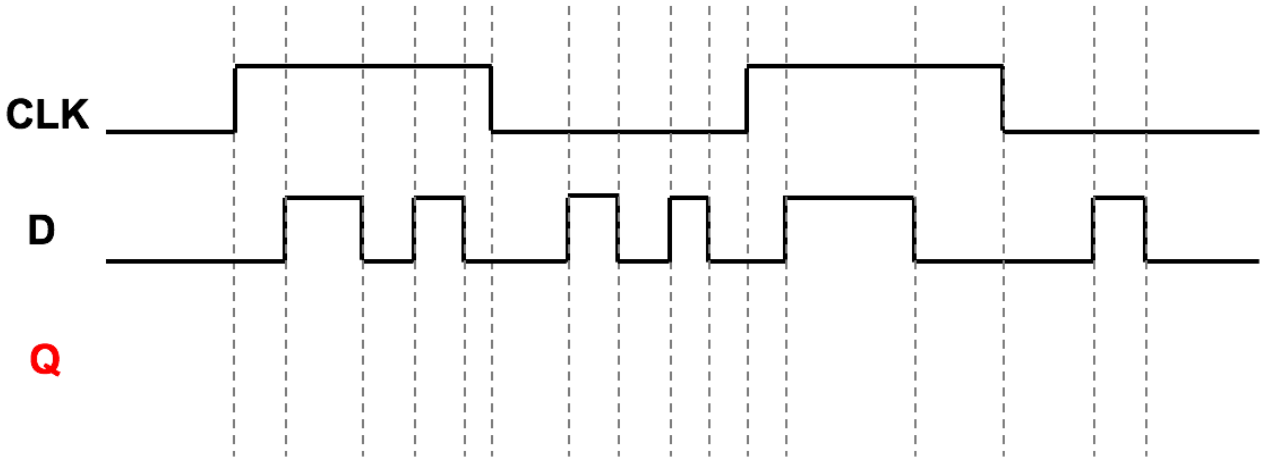

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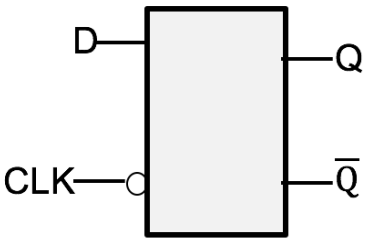

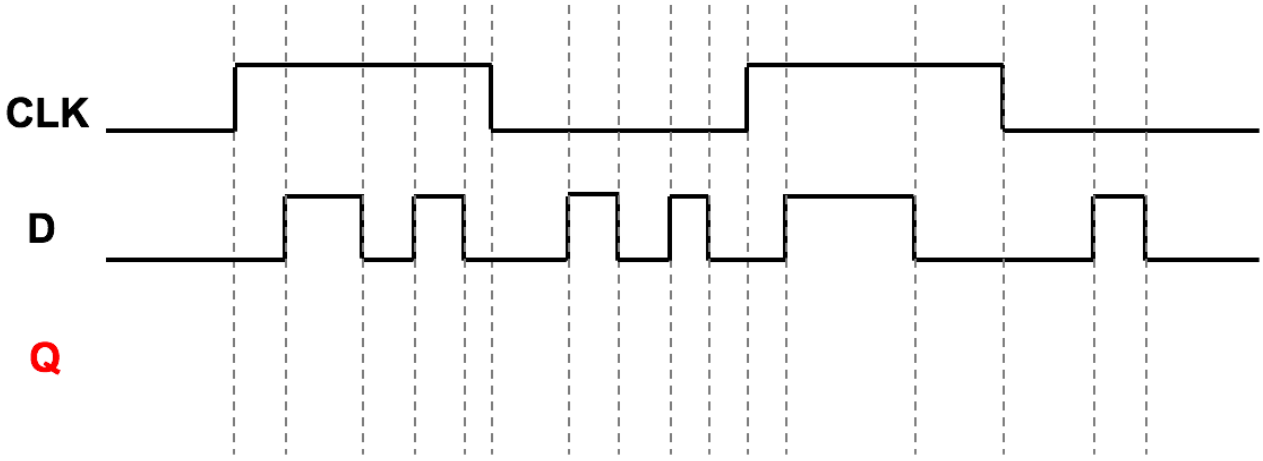

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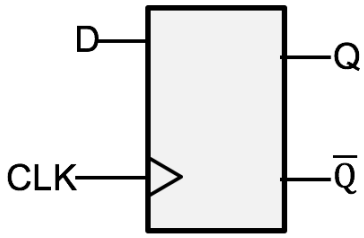

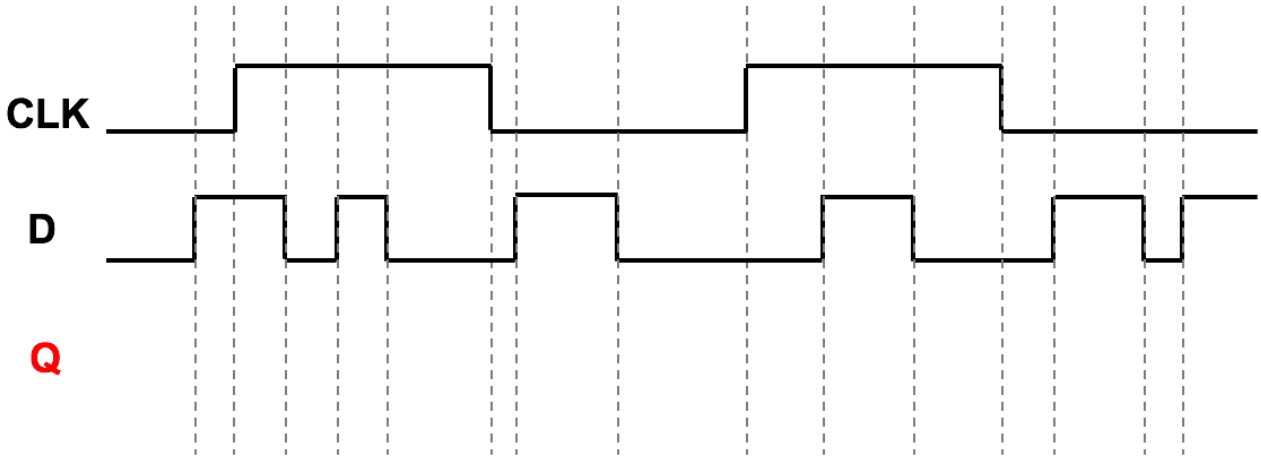

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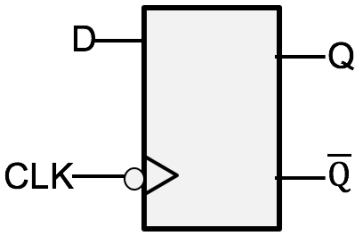

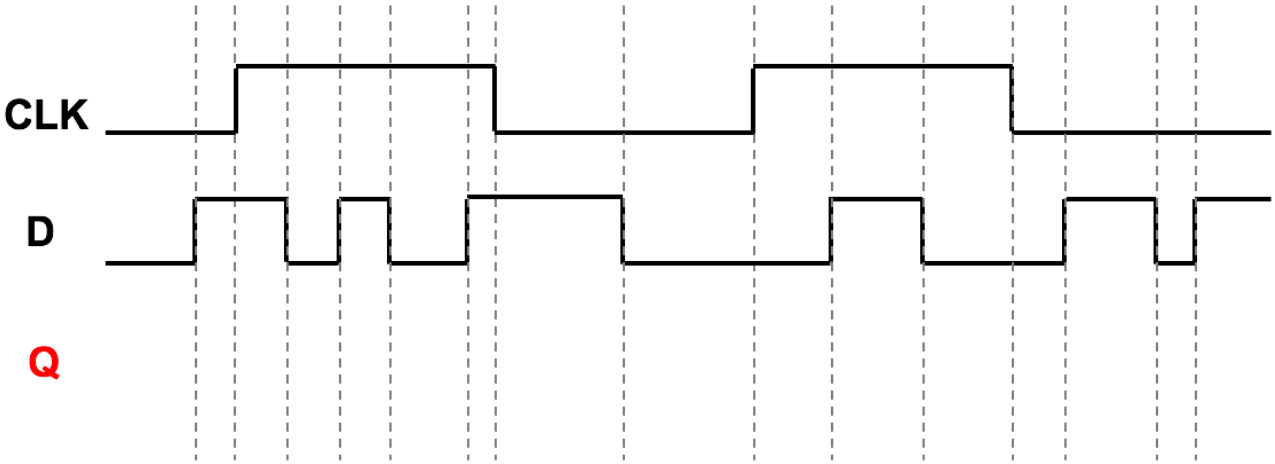

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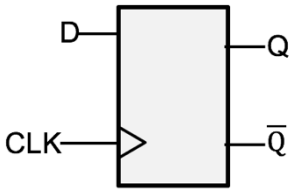
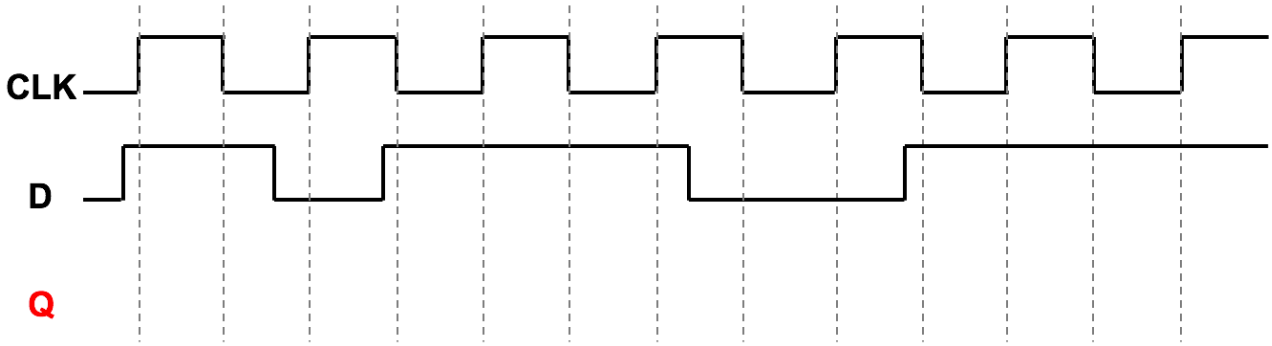

D
Q
CLK
$\overline{Q}$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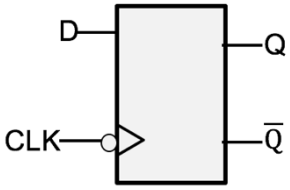
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CLK
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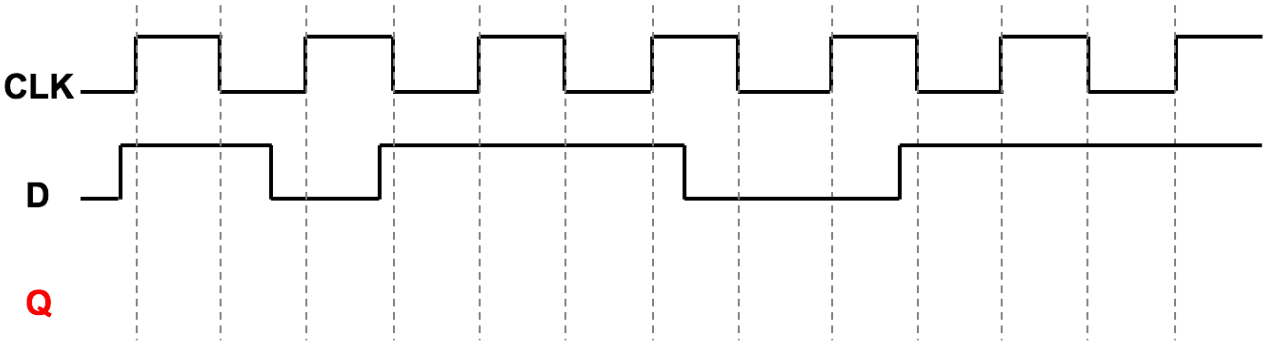
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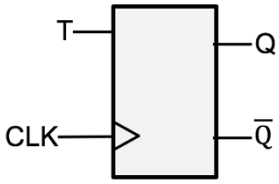
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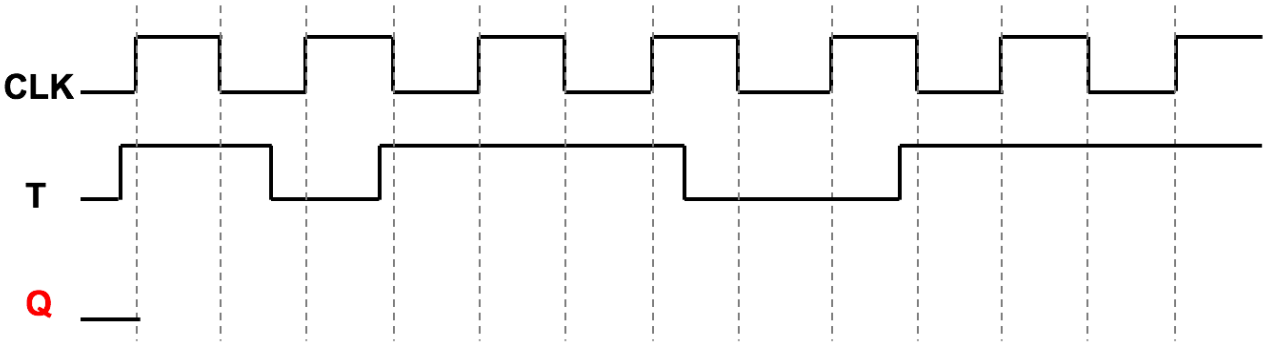
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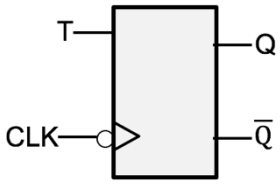
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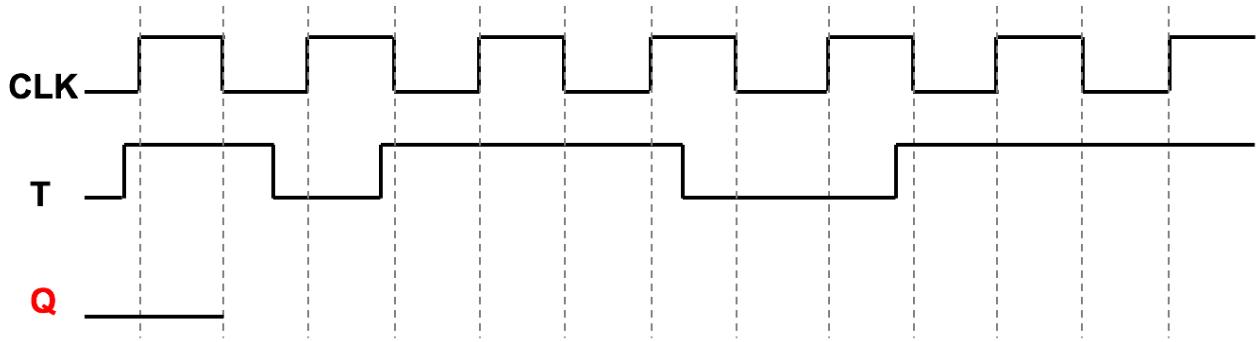
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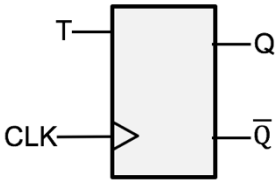
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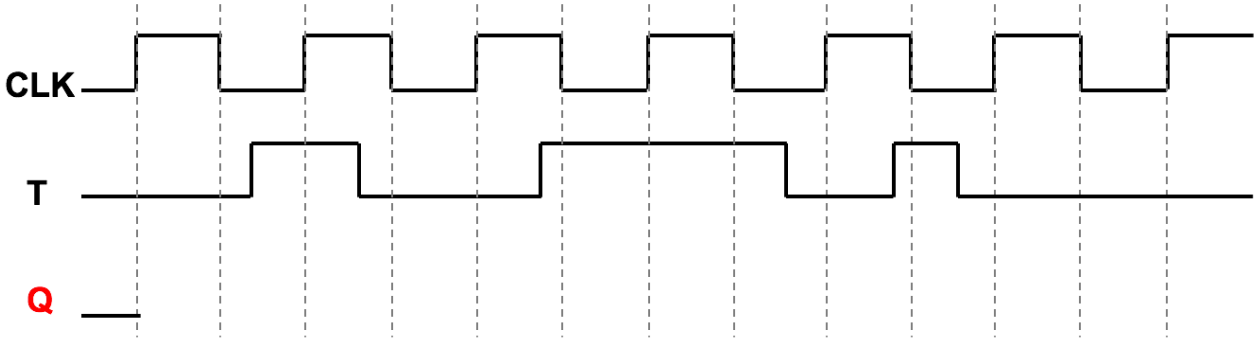
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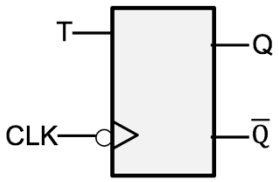
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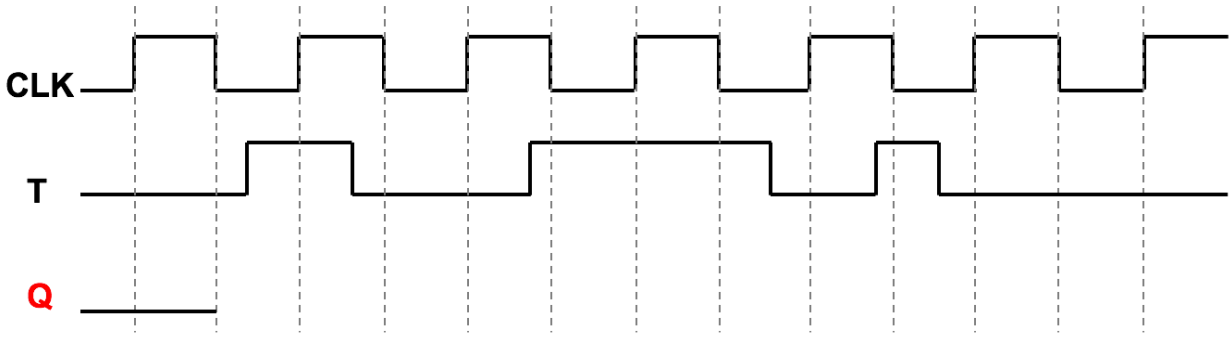
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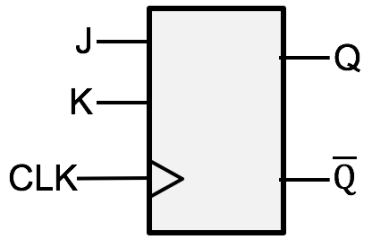

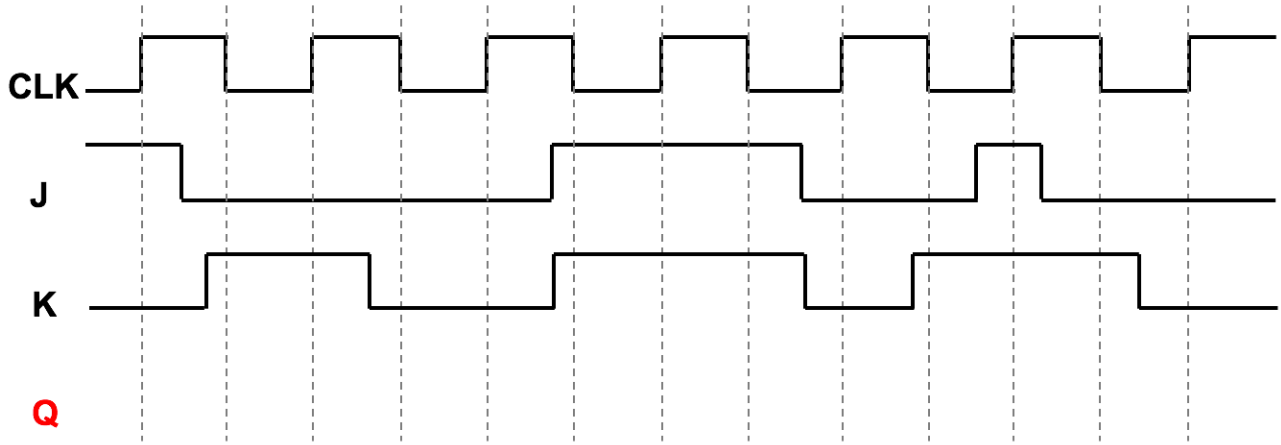

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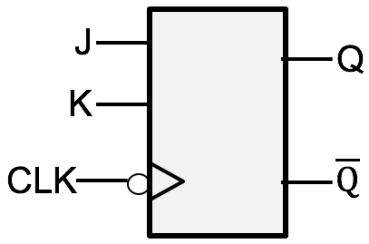

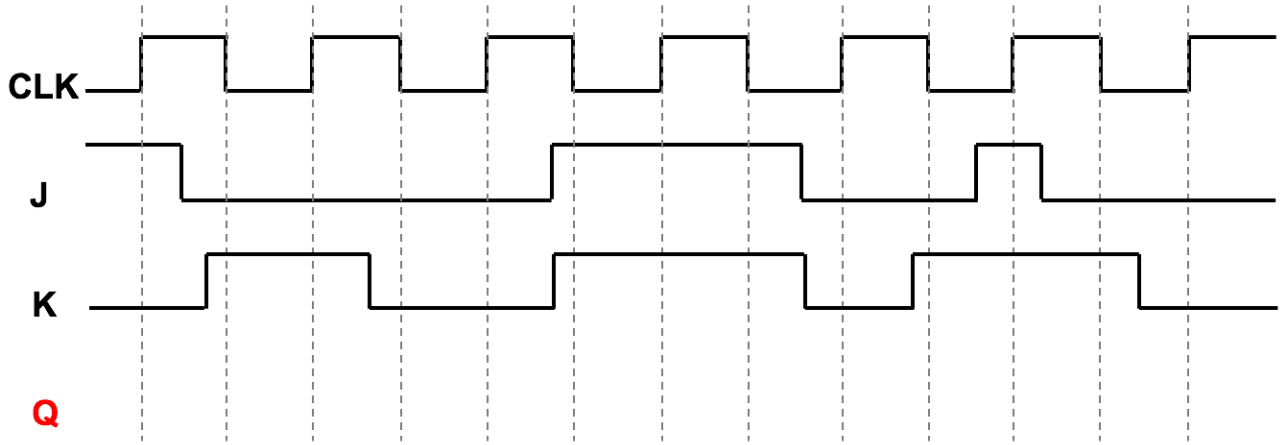

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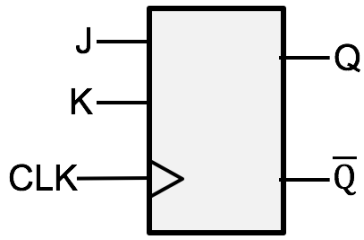

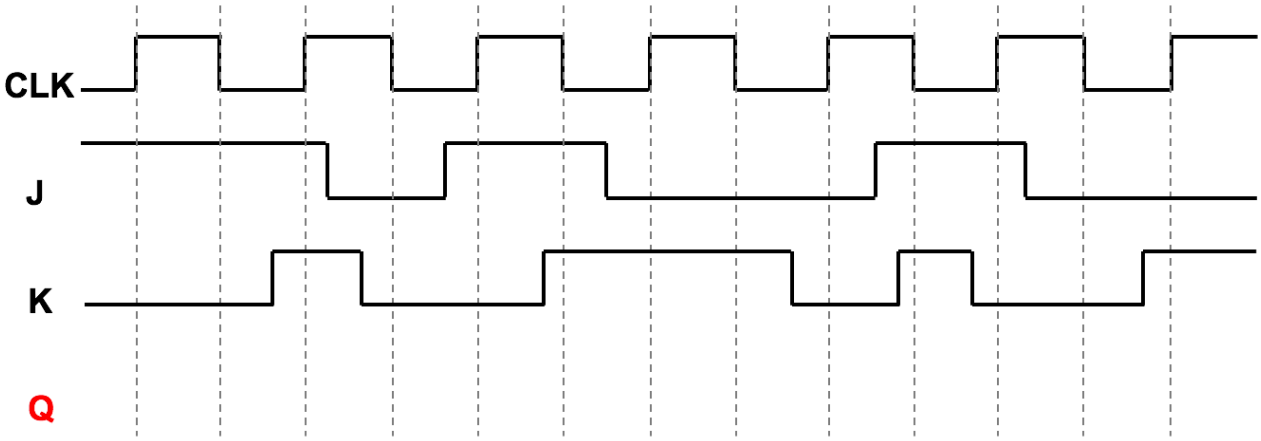

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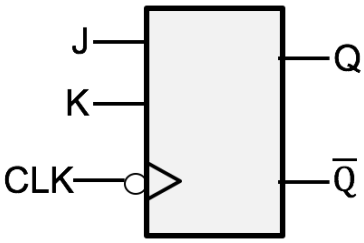
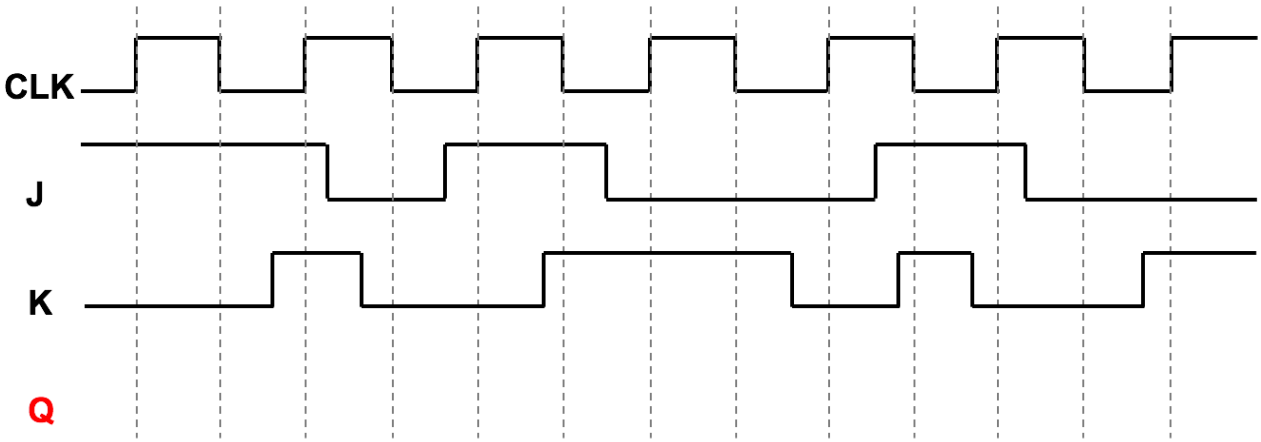
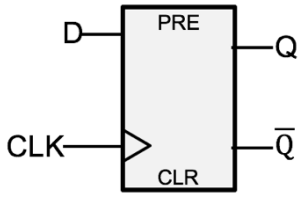
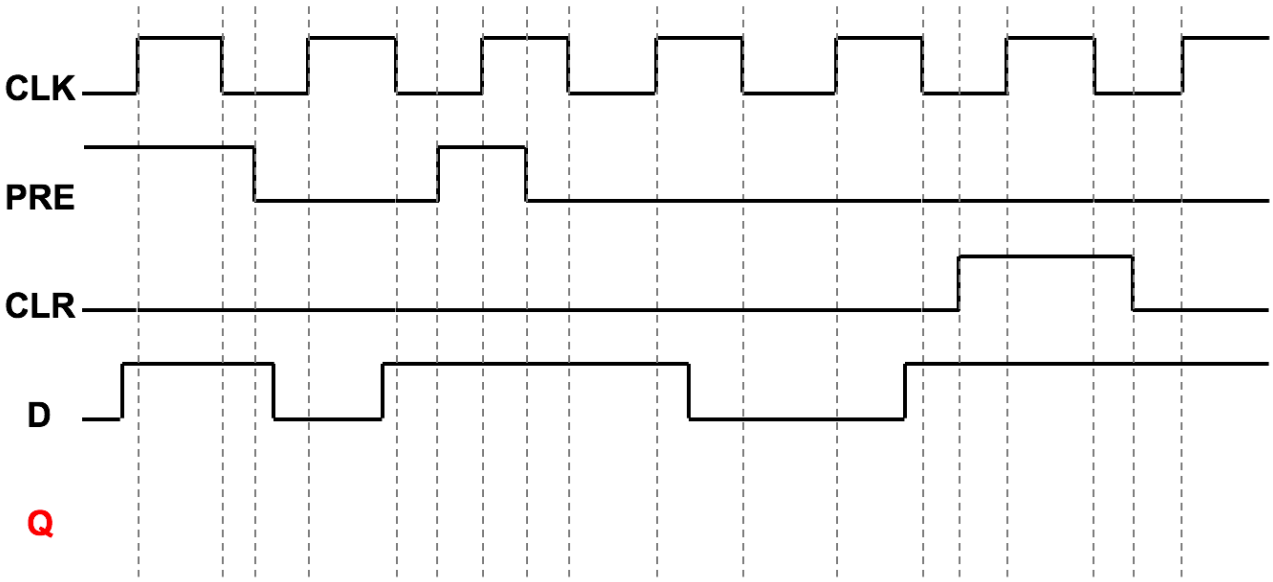




4. Complete as formas de onda dos circuitos a seguir (desconsidere o atraso). Considere que as entradas PRESET (PRE) e CLEAR (CLR) são ativas em 1.

a)





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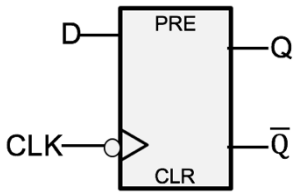

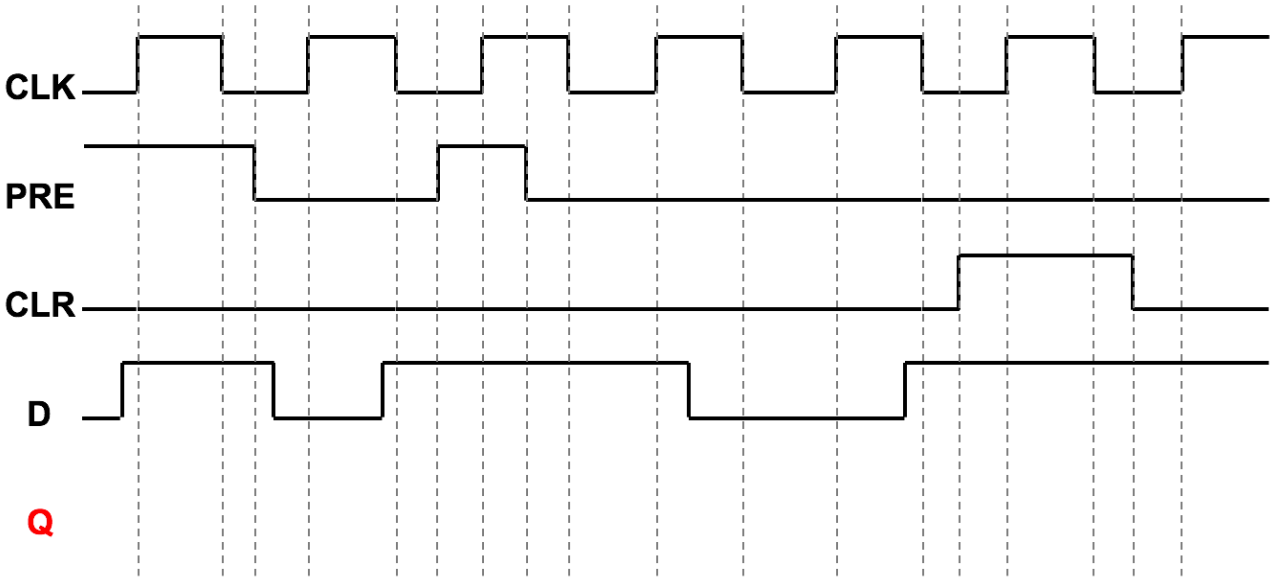

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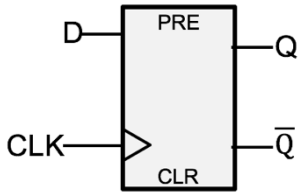
D
PRE
Q
CLK
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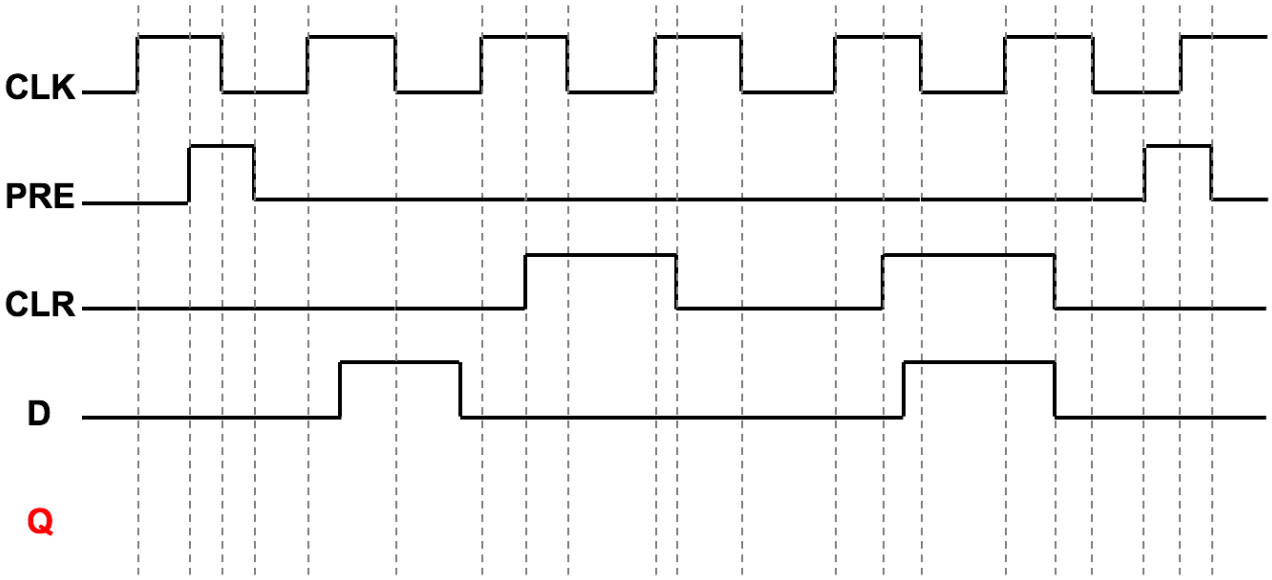
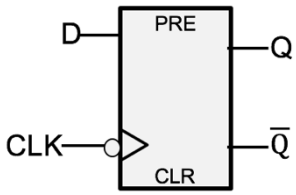
CLR


CLK
PRE
CLR
D
Q

d)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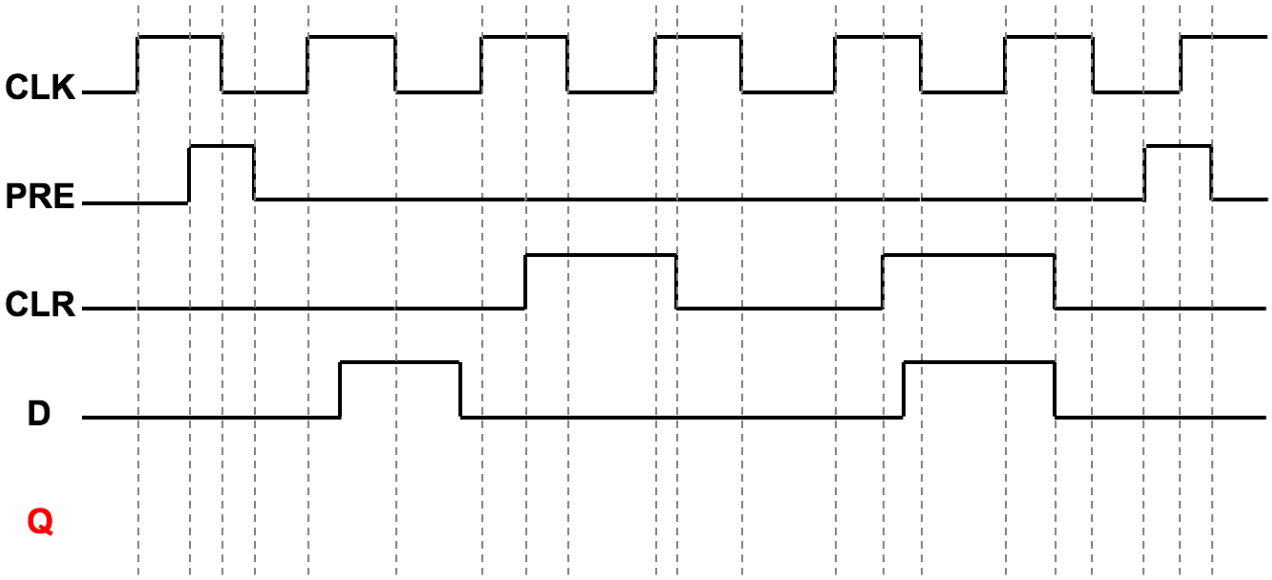
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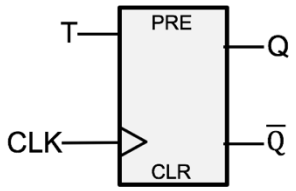
e)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Q
CLK
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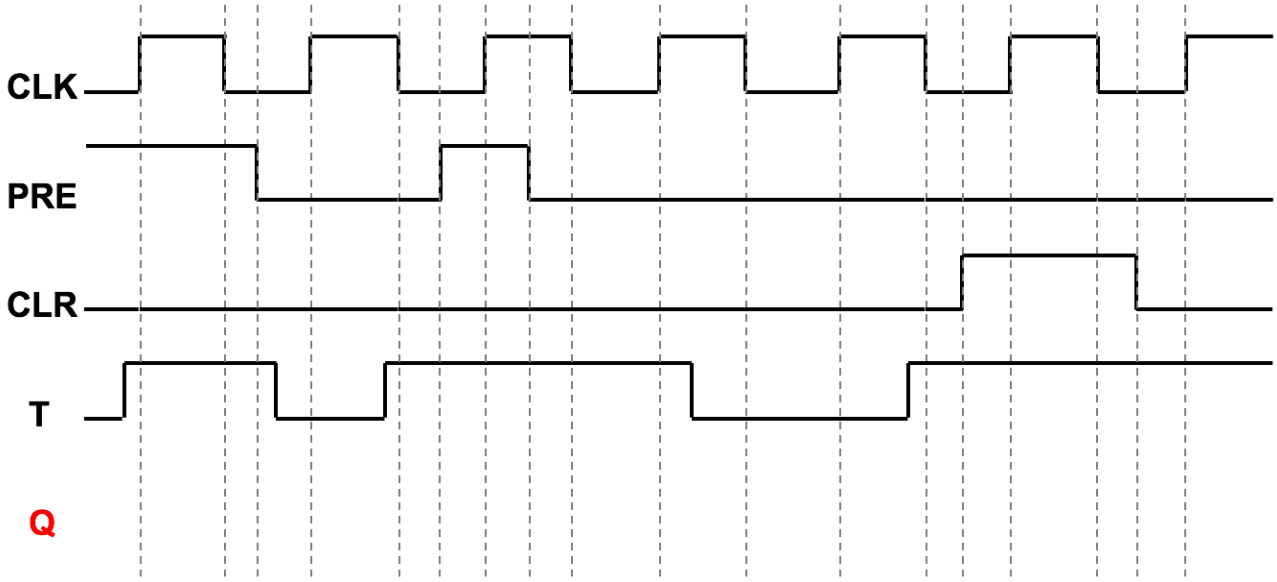
CLR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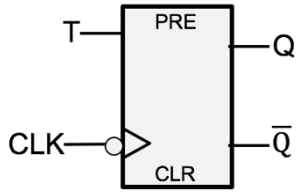
f)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Q
CLK
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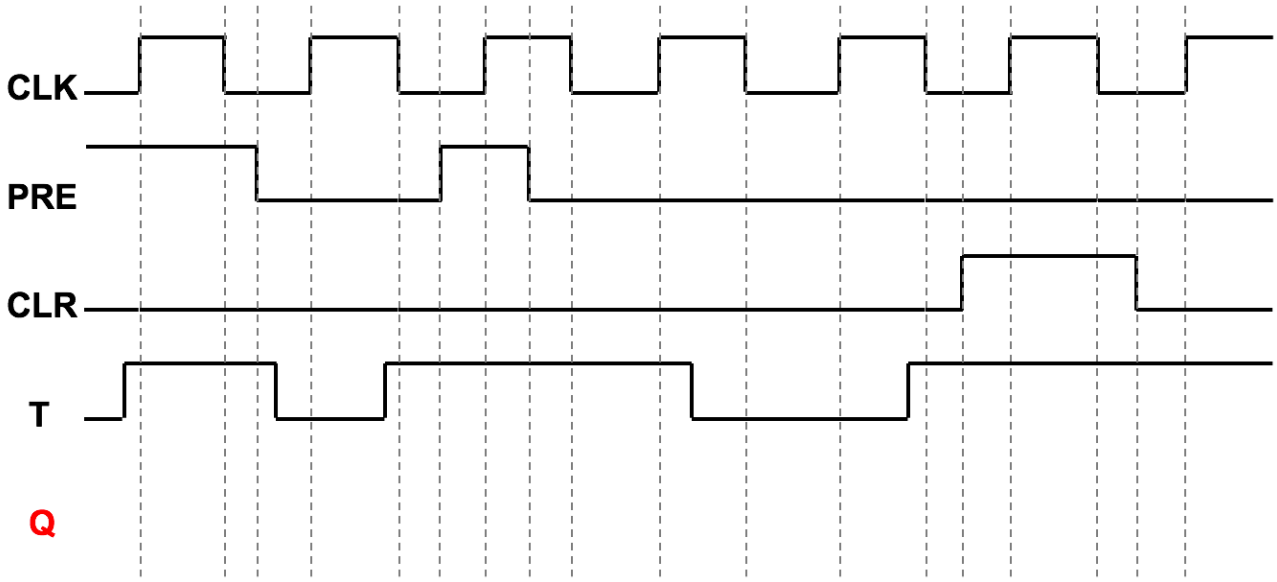
CLR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CLR
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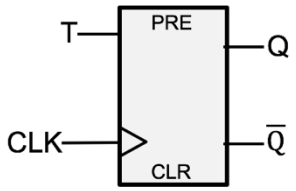
g)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Q
CLK
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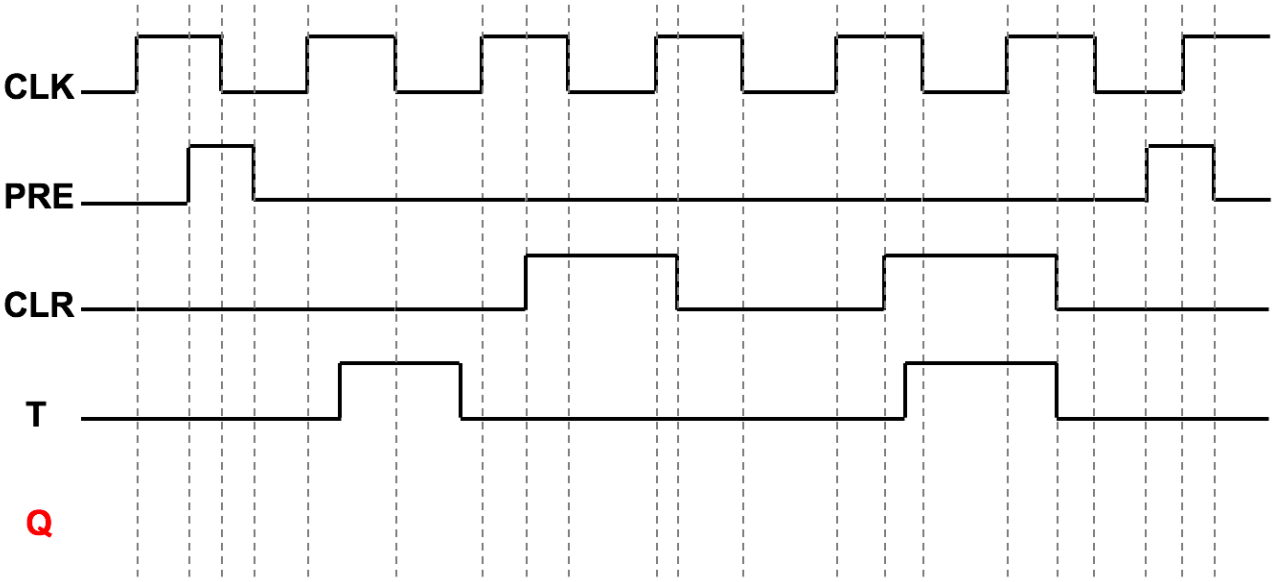
CLR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CLR
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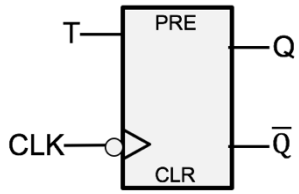
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PRE
Q
CLK
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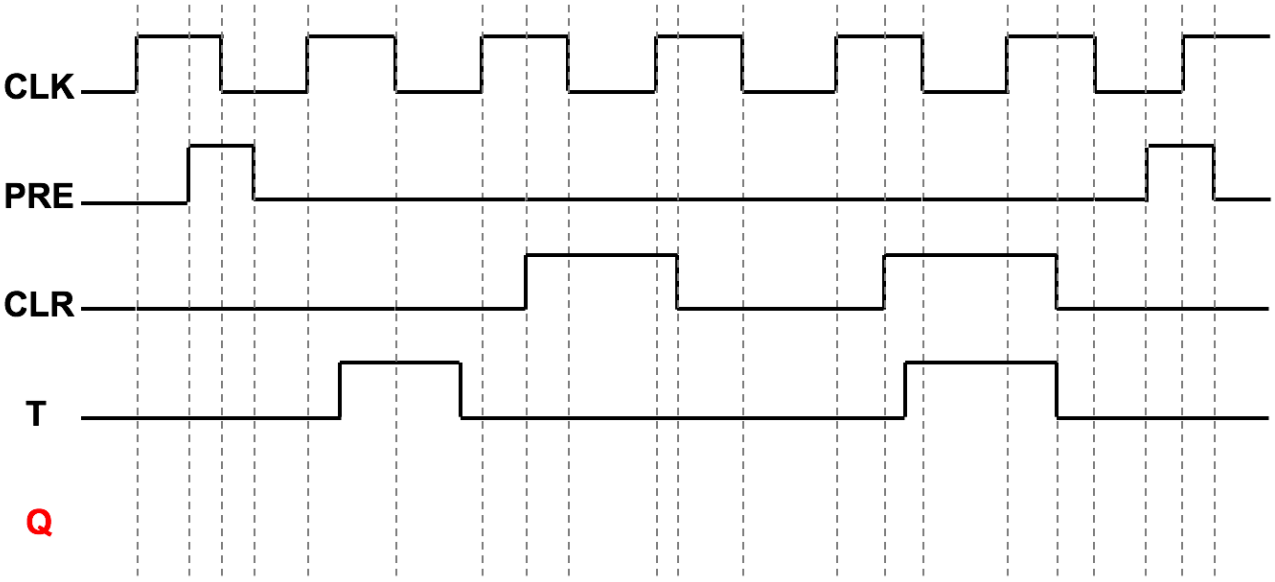
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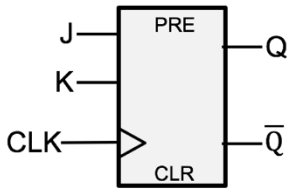
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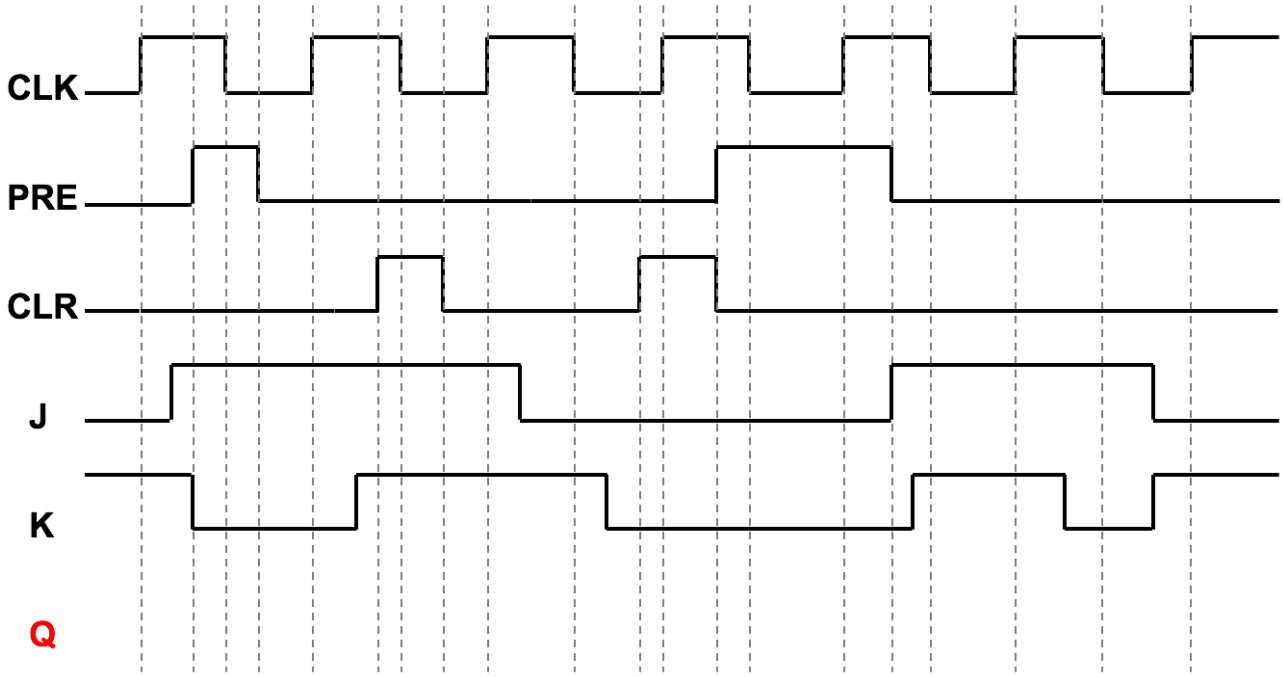
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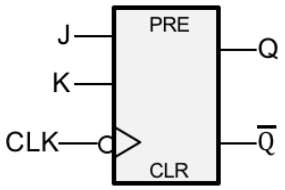
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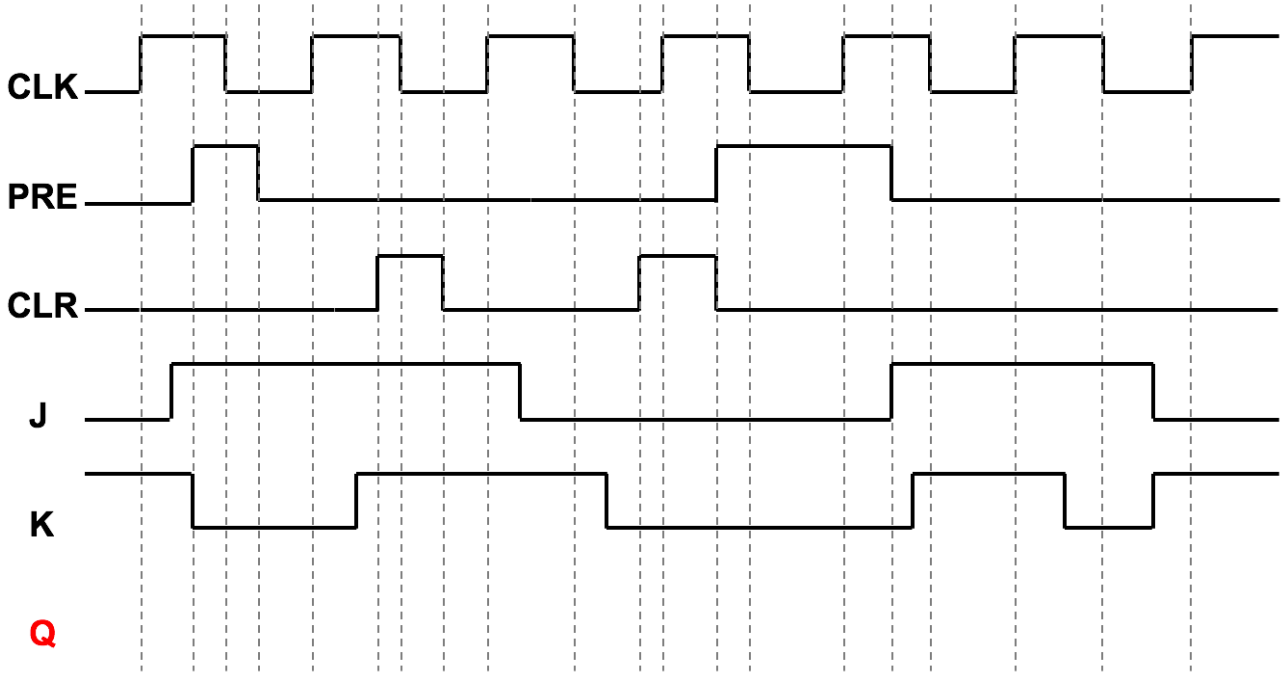
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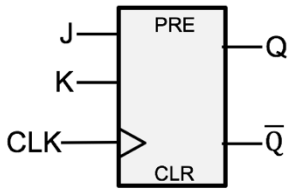
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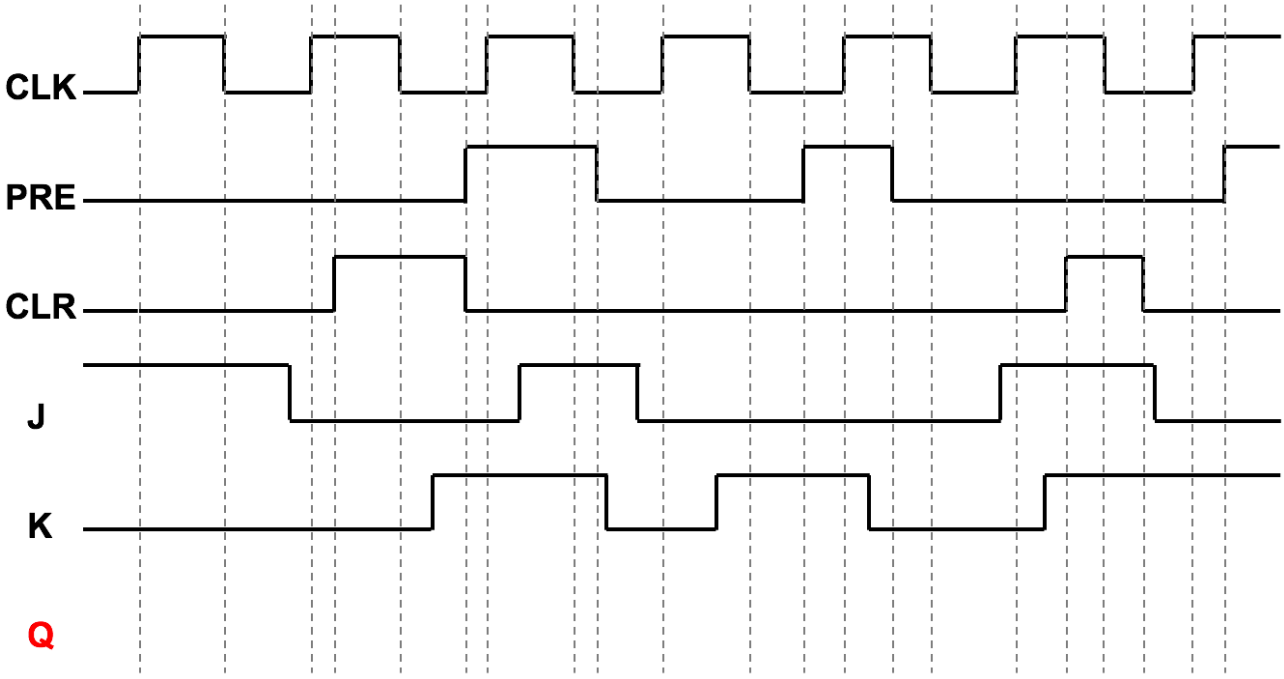
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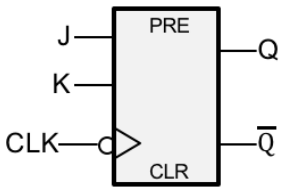
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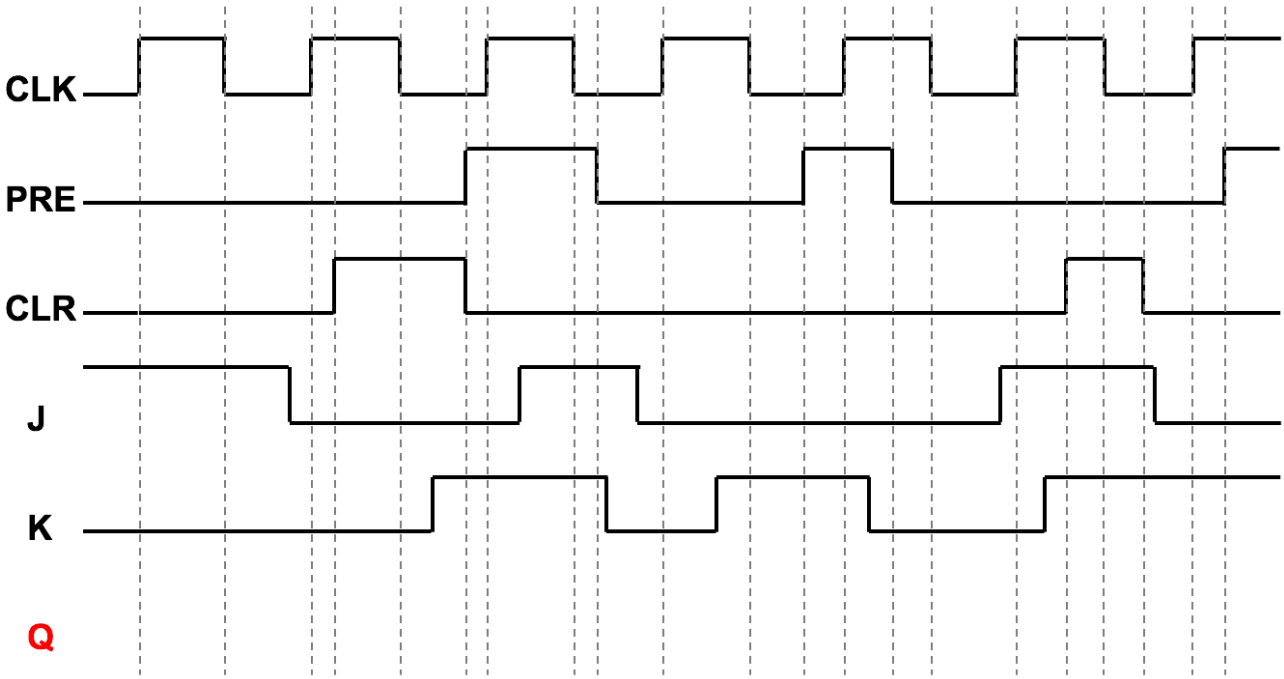
CLK
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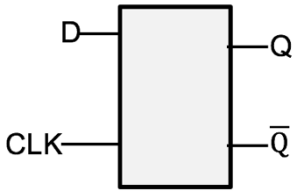
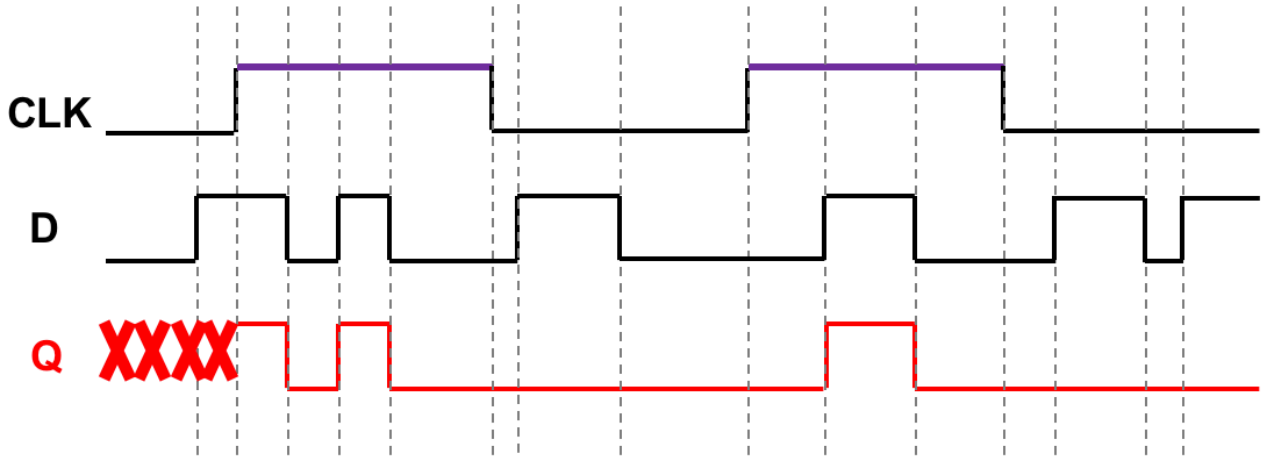
GABARITO

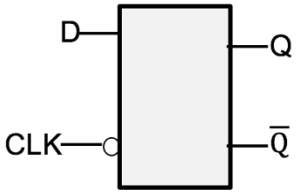
1. c)
2. b)
3.

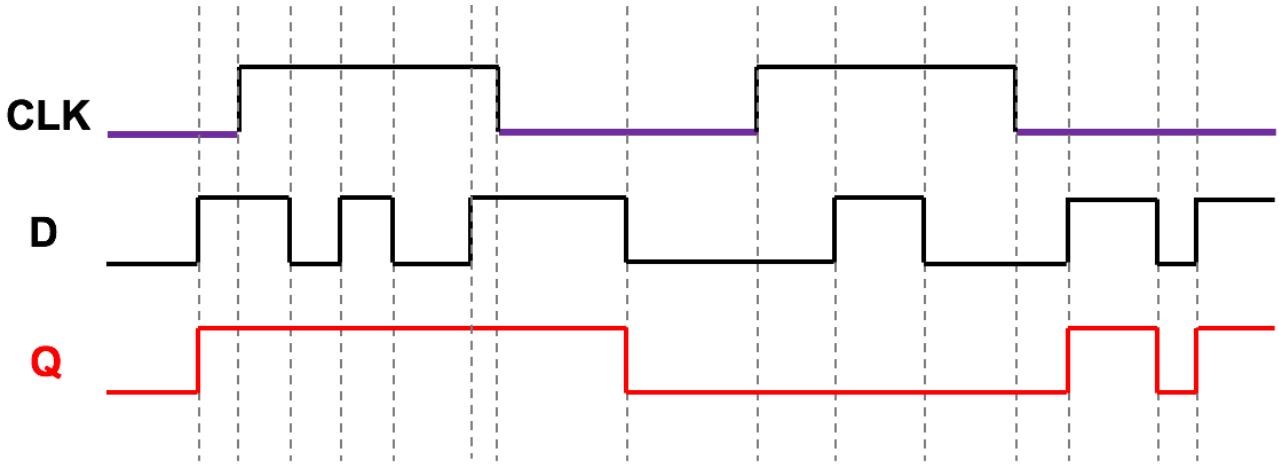
a) Latch tipo D ativo em nível lógico 1



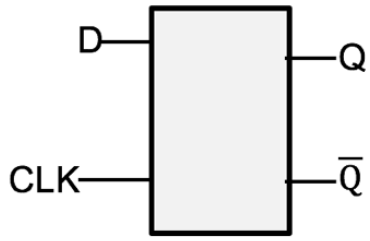


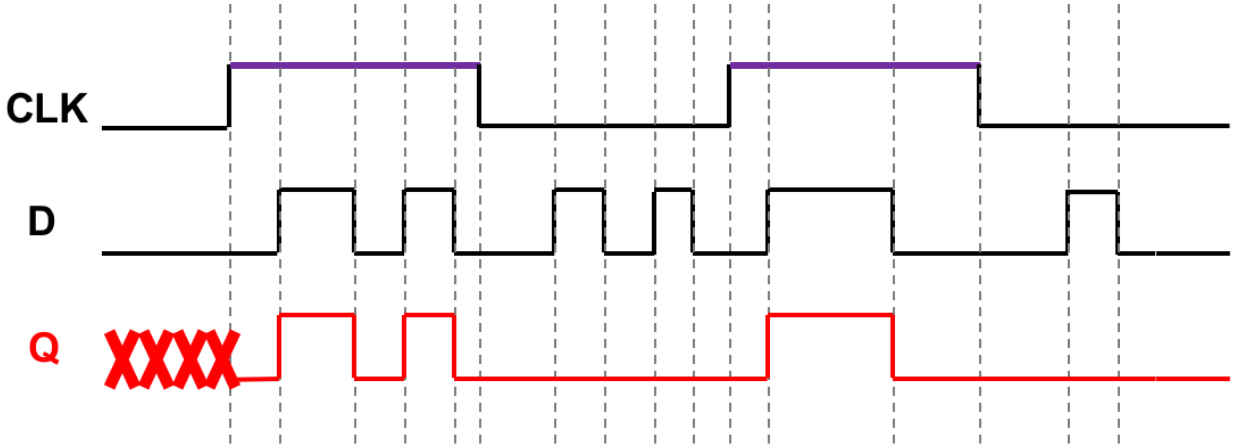
b) Latch tipo D ativo em nível lógico 0



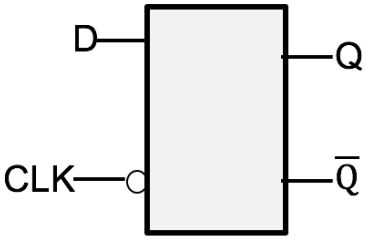


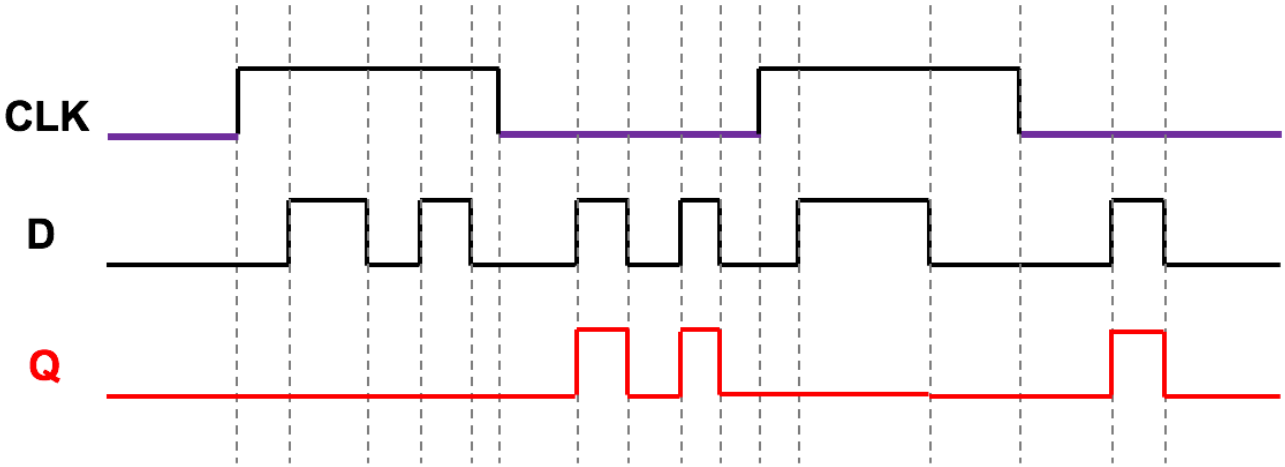
c) Latch tipo D ativo em nível lógico 1



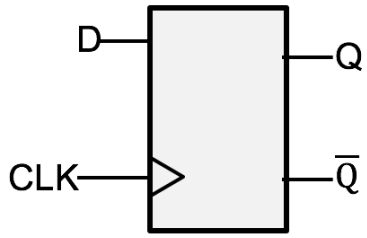


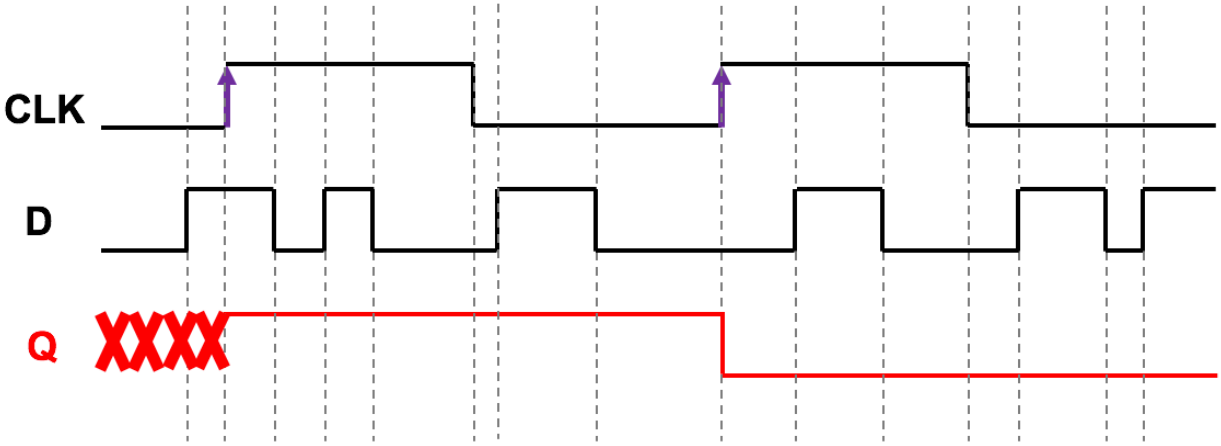
d) Latch tipo D ativo em nível lógico 0



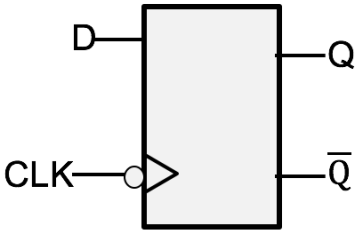


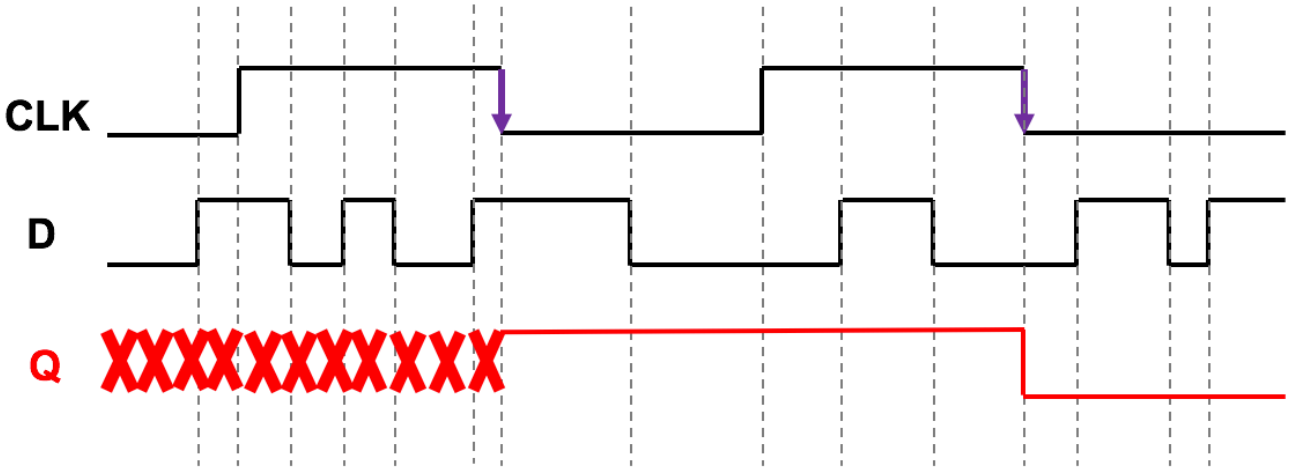
e) Flip-flop tipo D ativo por borda de subida



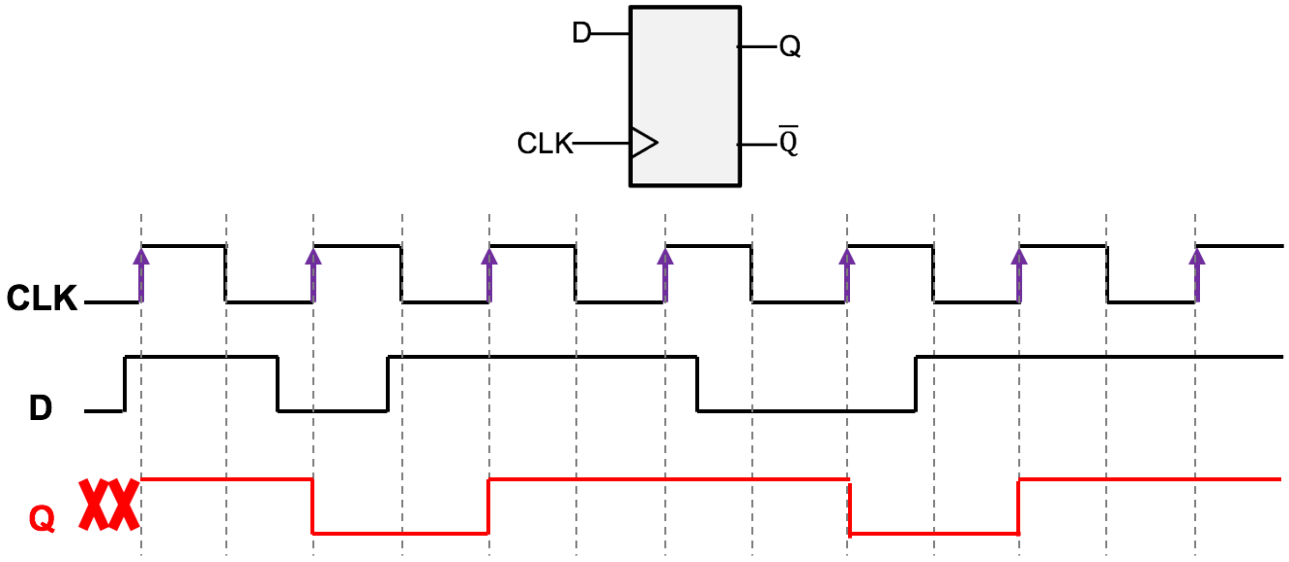


f) Flip-flop tipo D ativo por borda de descida

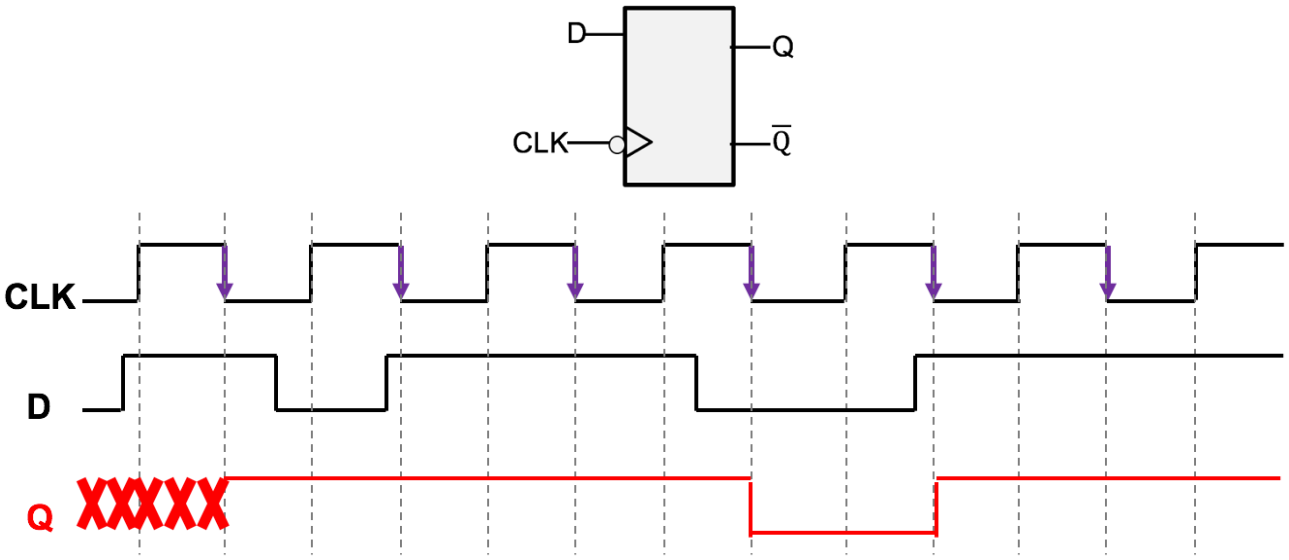




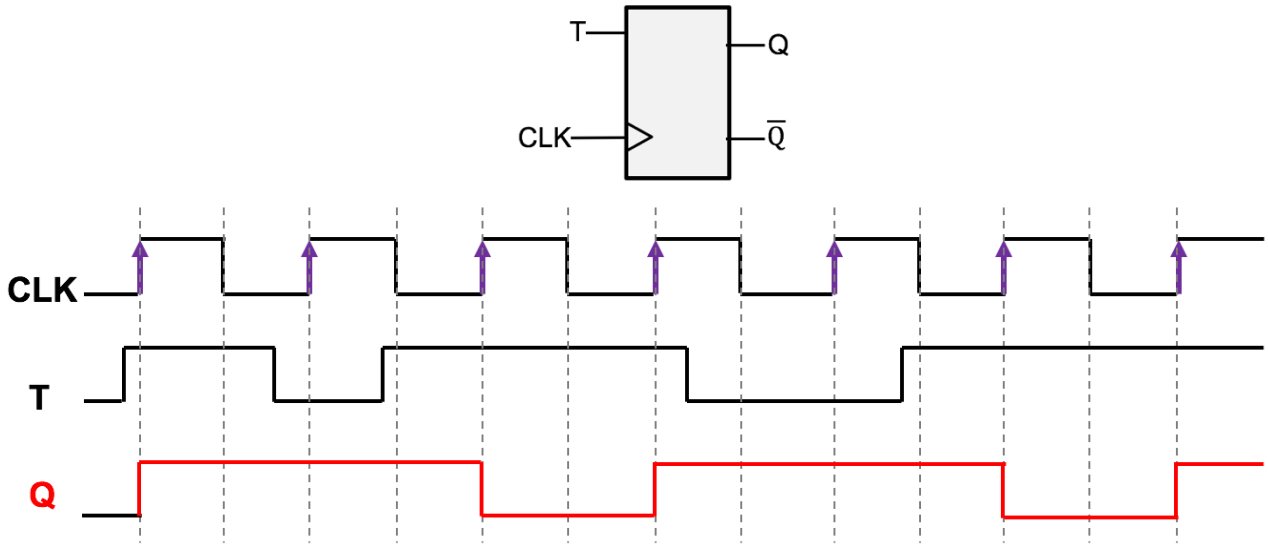
g) Flip-flop tipo D ativo por borda de subida



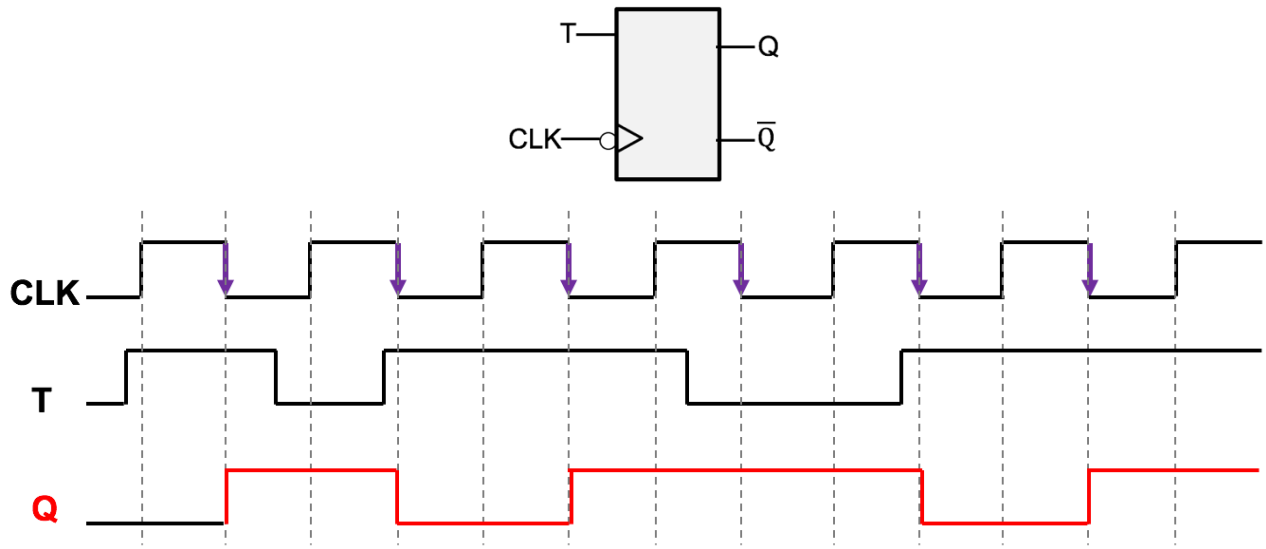
h) Flip-flop tipo D ativo por borda de descida



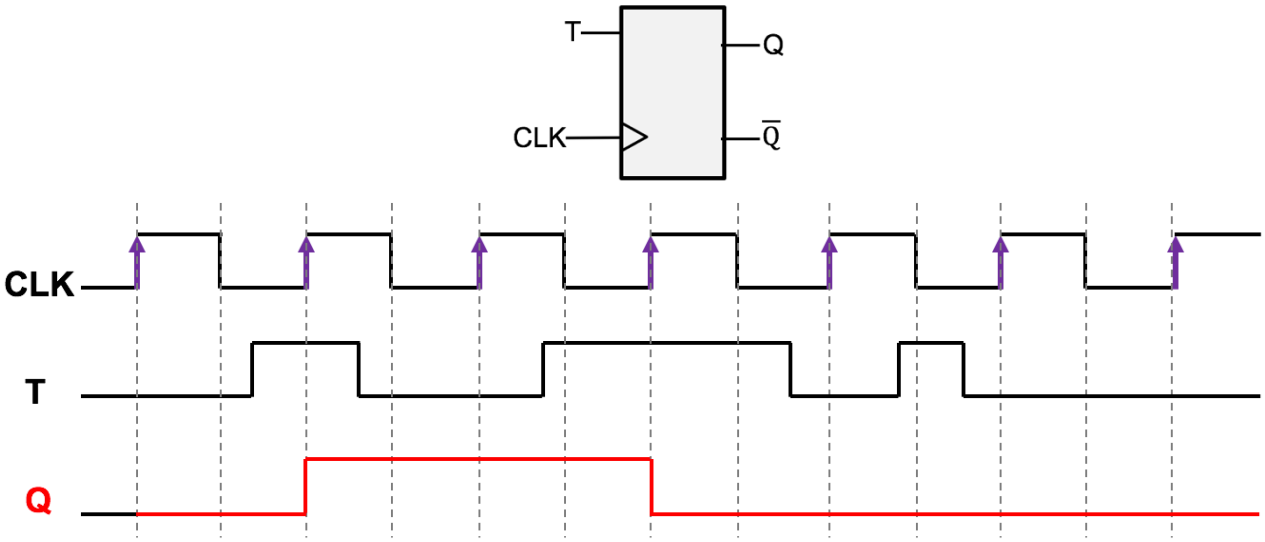
i) Flip-flop tipo T ativo por borda de subida



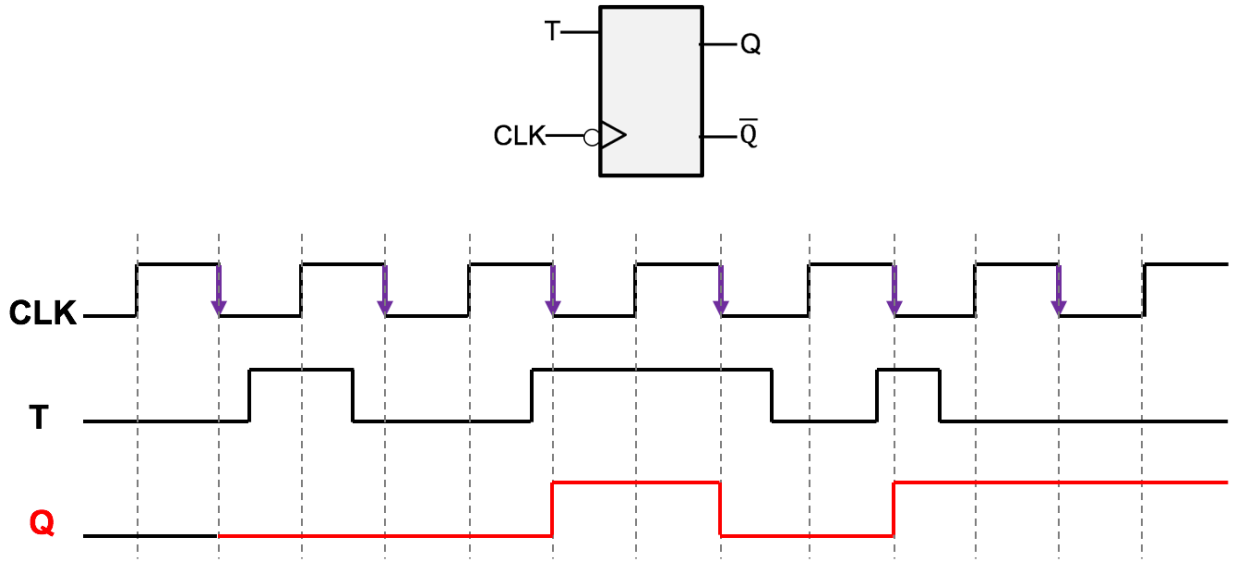
j) Flip-flop tipo T ativo por borda de descida



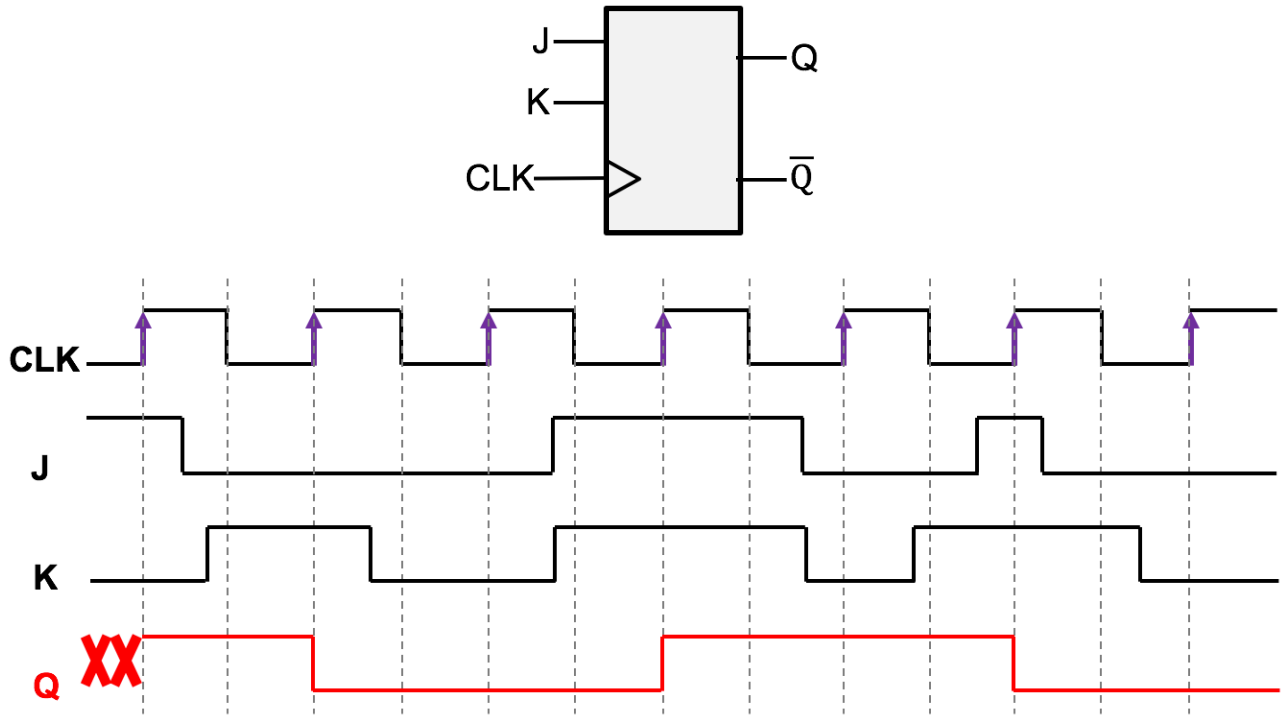
k) Flip-flop tipo T ativo por borda de subida



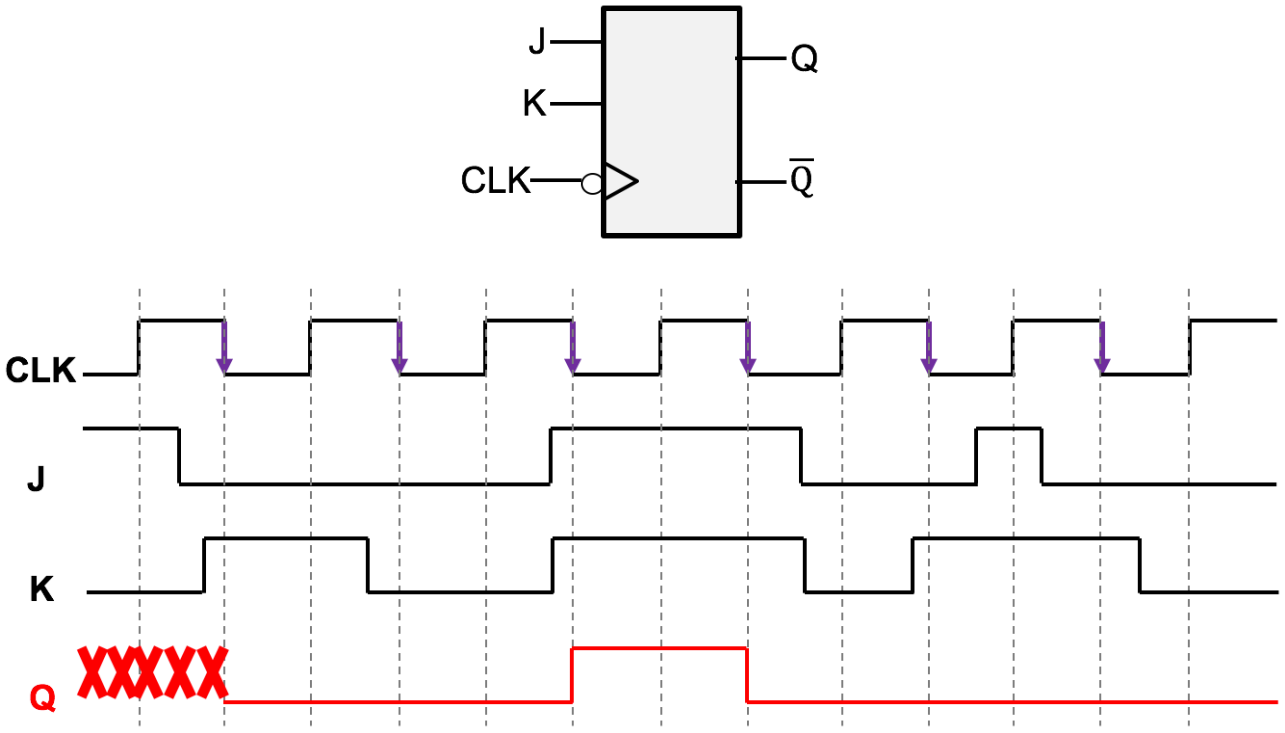
l) Flip-flop tipo T ativo por borda de descida



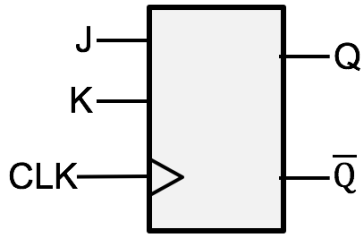
m) Flip-flop tipo JK ativo por borda de subida

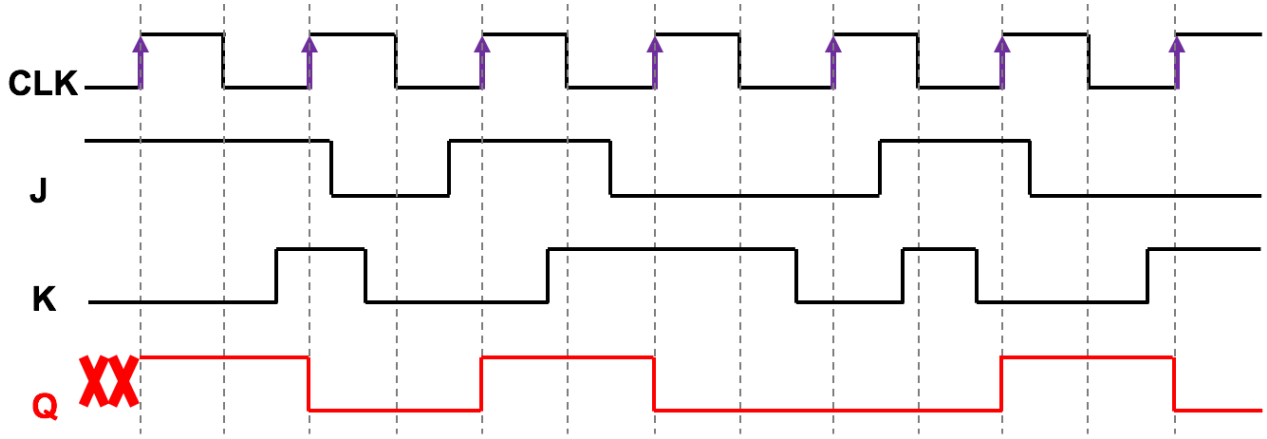


n) Flip-flop tipo JK ativo por borda de descida

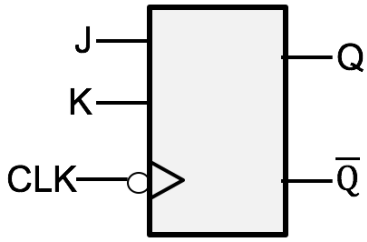


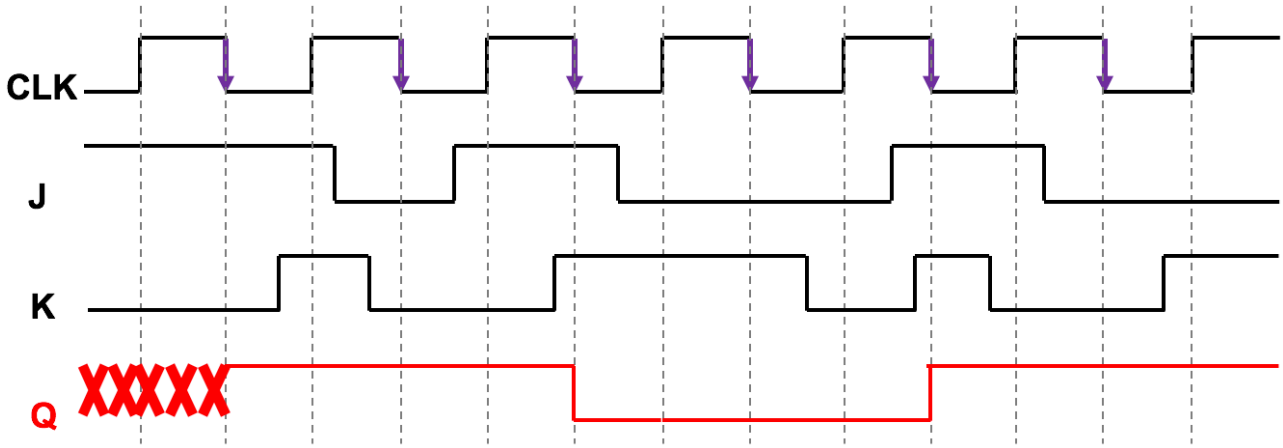
o) Flip-flop tipo JK ativo por borda de subida





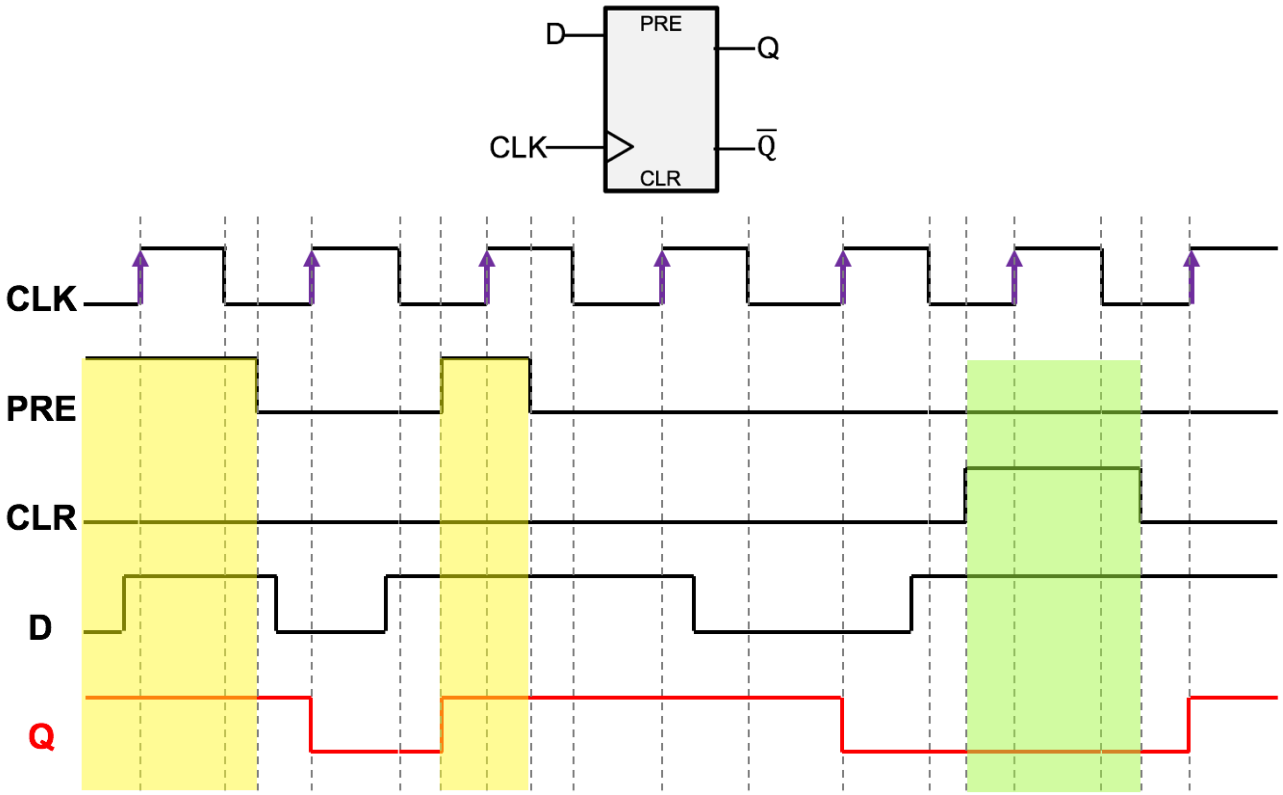
p) Flip-flop tipo JK ativo por borda de descida



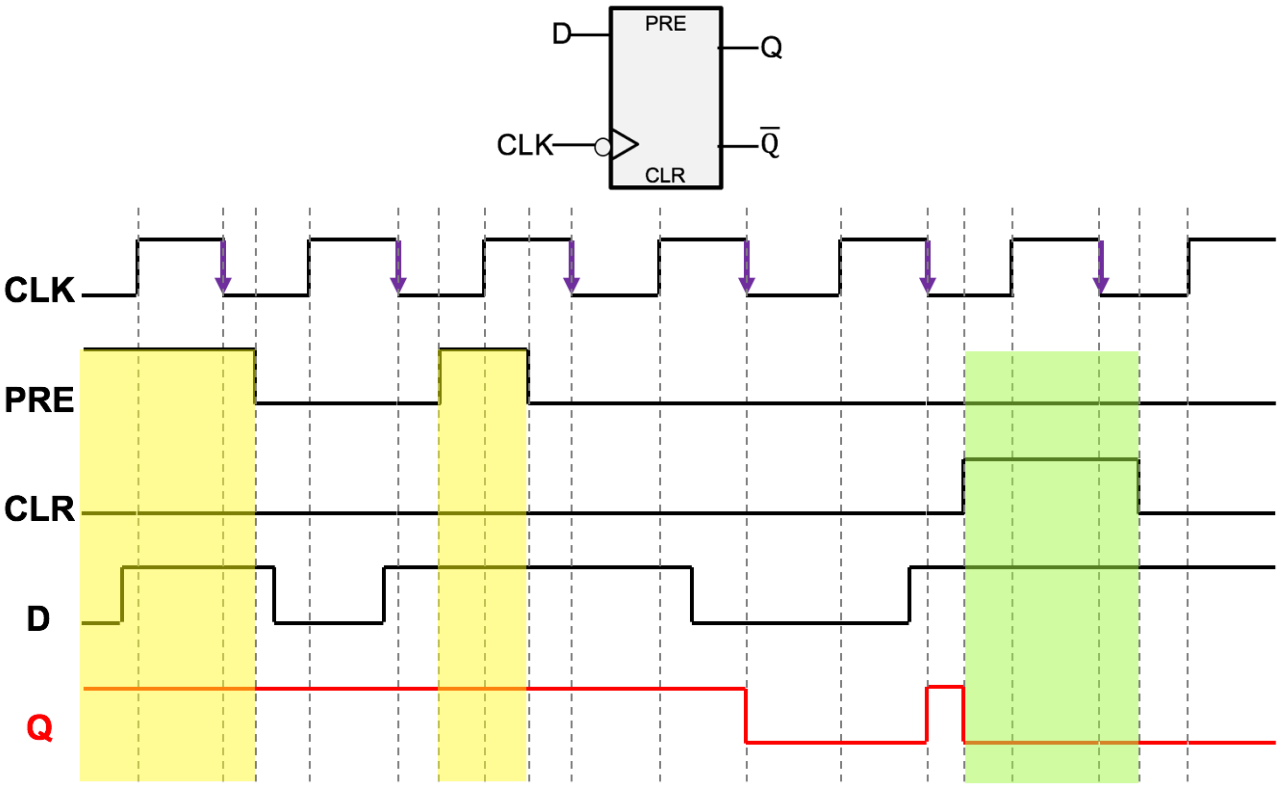


4.

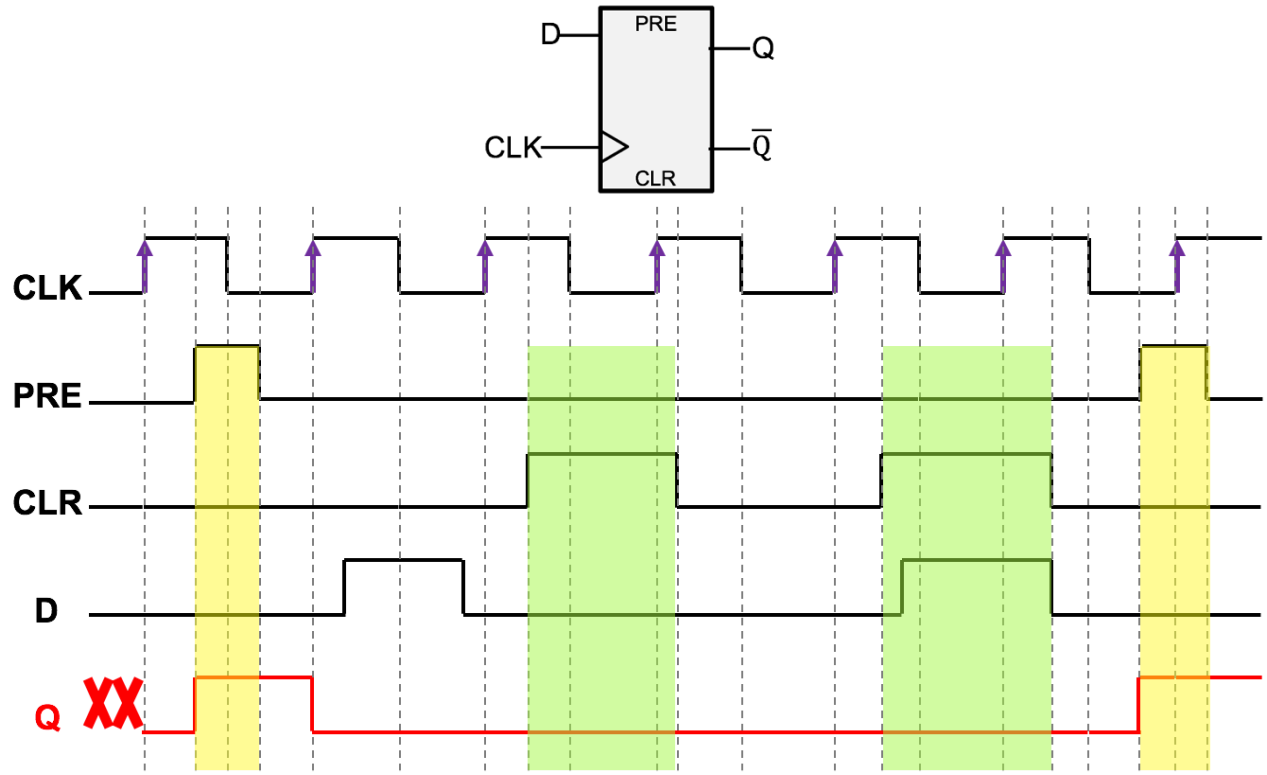
a) Flip-flop tipo D ativo por borda de subida



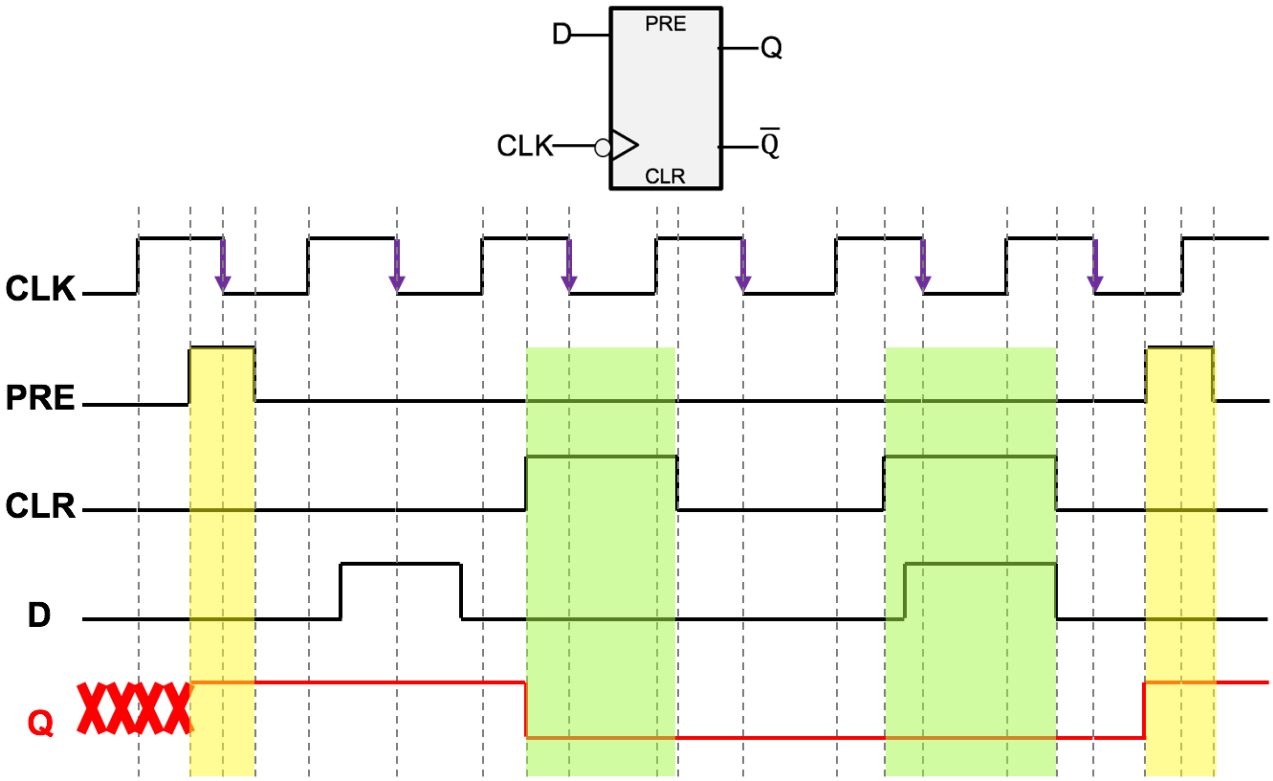
b) Flip-flop tipo D ativo por borda de descida



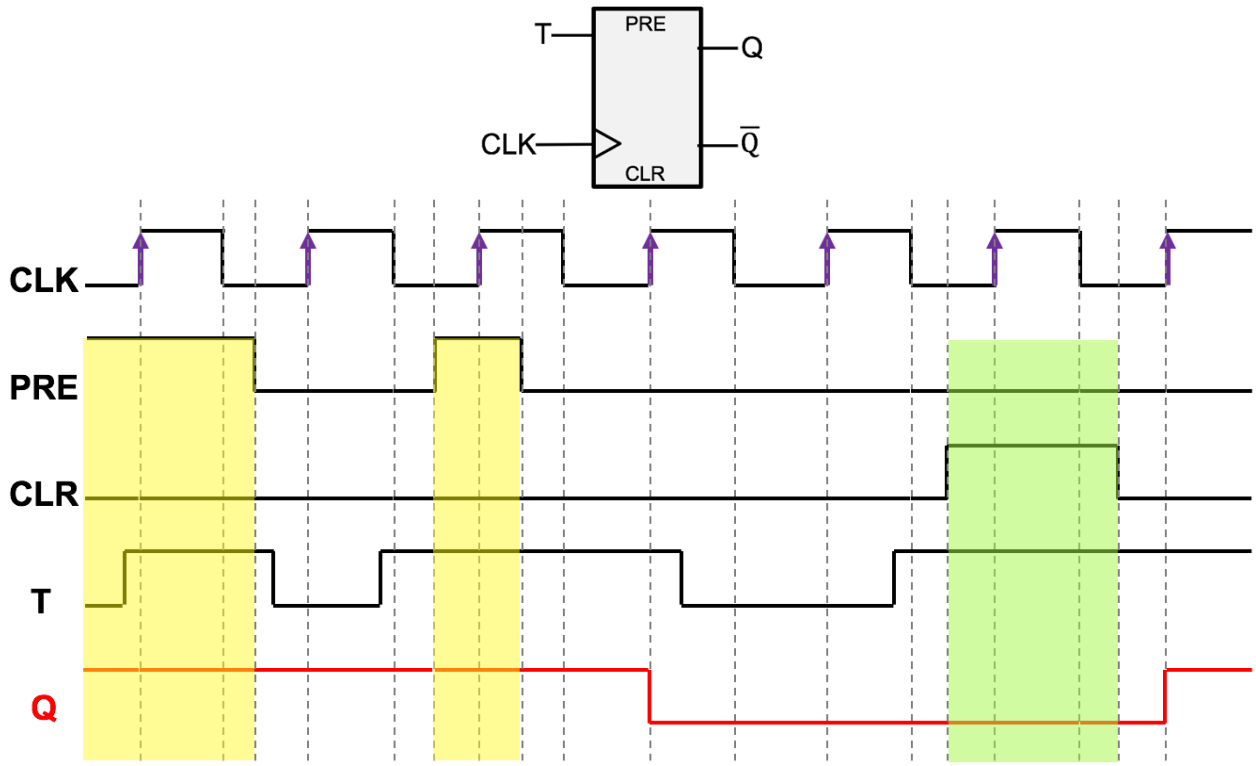
c) Flip-flop tipo D ativo por borda de subida



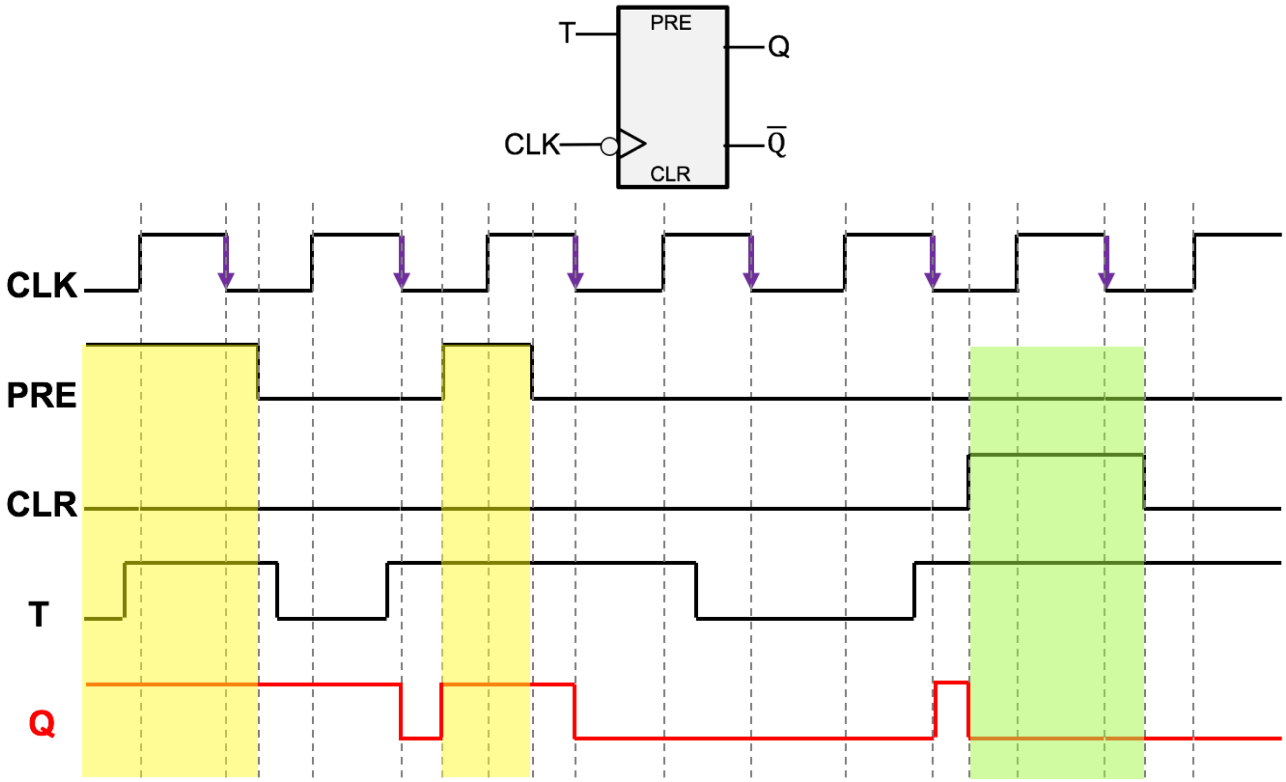
d) Flip-flop tipo D ativo por borda de descida



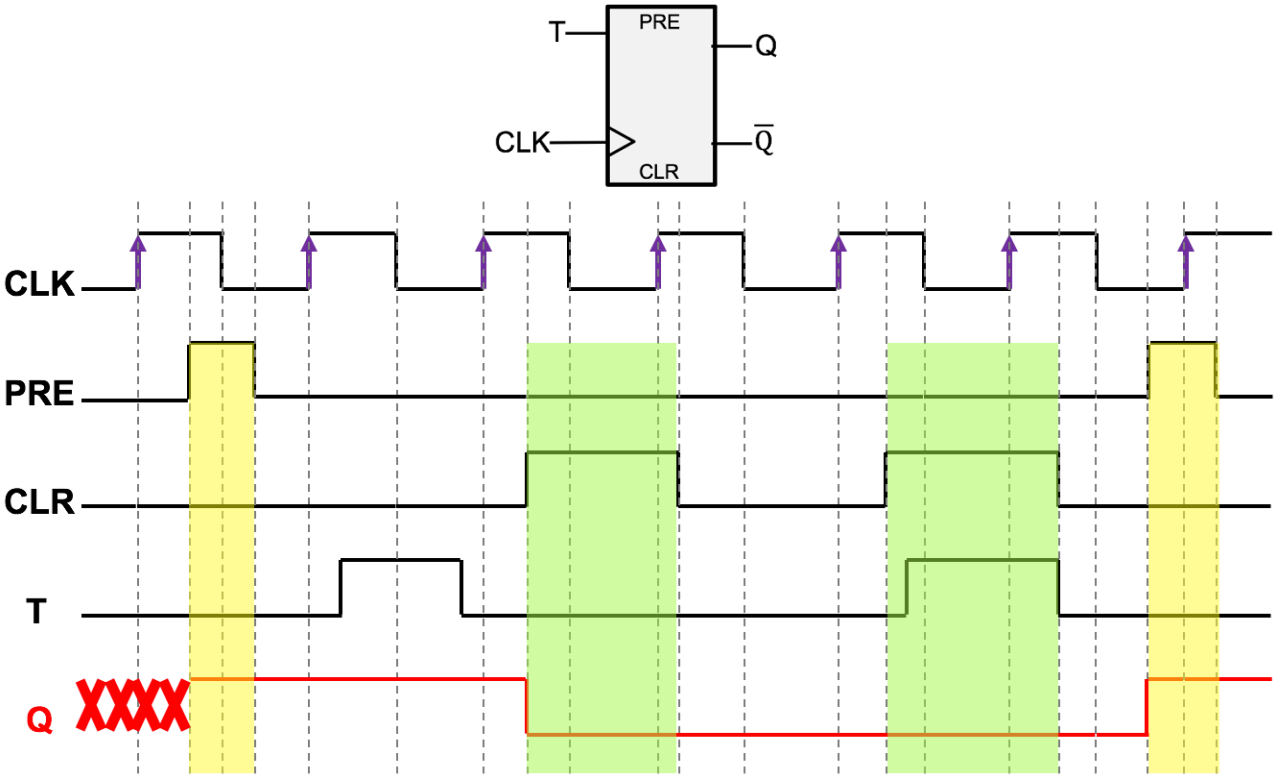
e) Flip-flop tipo T ativo por borda de subida



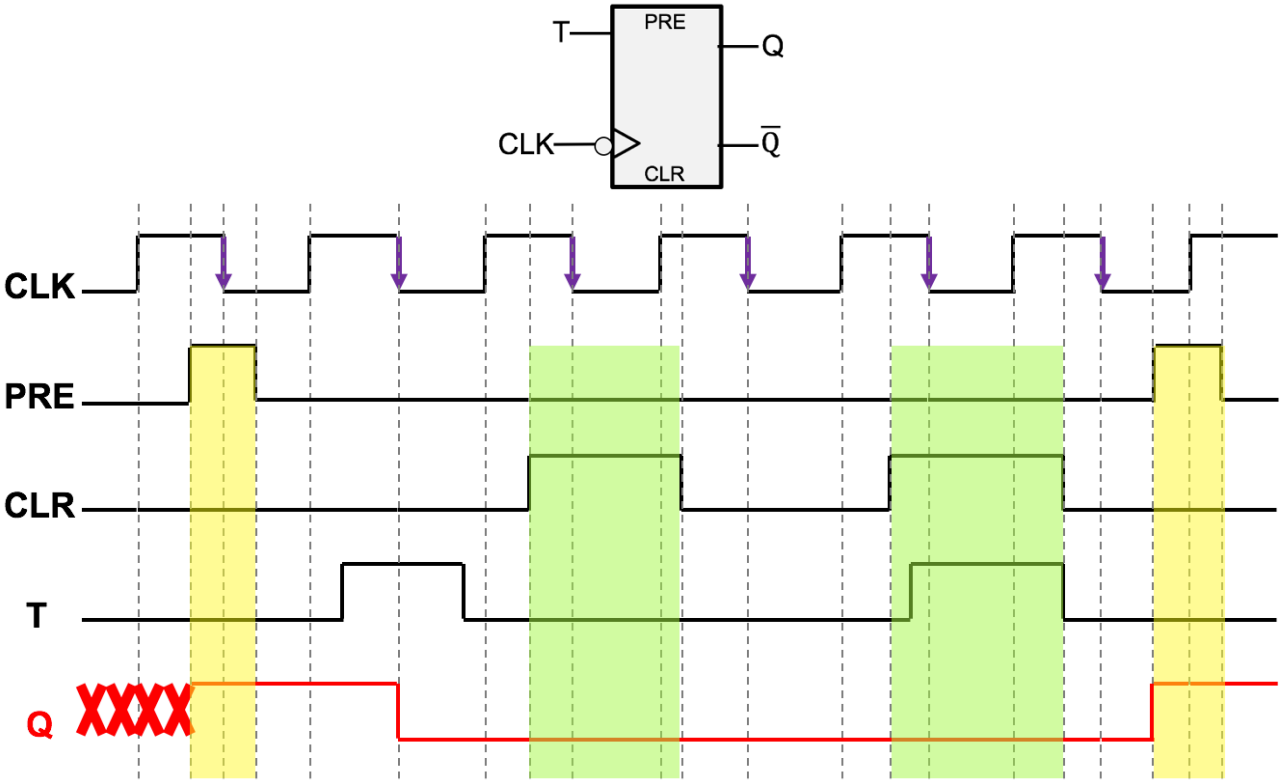
f) Flip-flop tipo T ativo por borda de descida



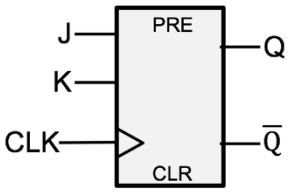
g) Flip-flop tipo T ativo por borda de subida

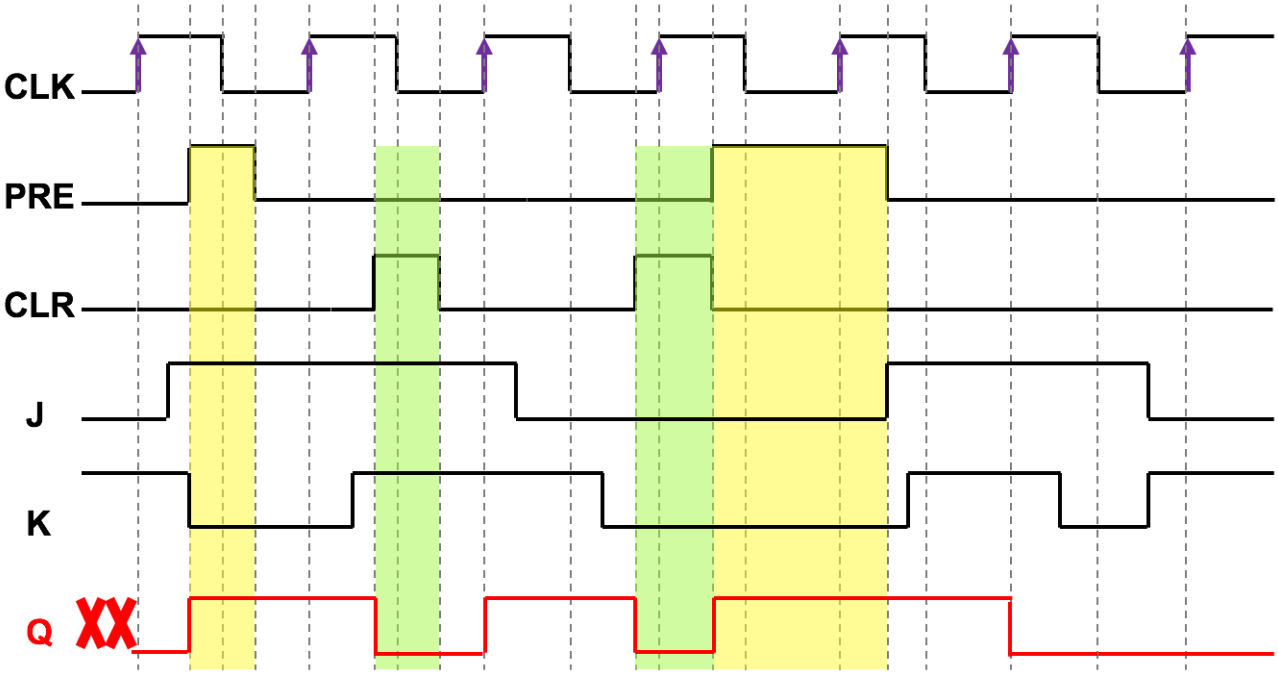


h) Flip-flop tipo T ativo por borda de descida

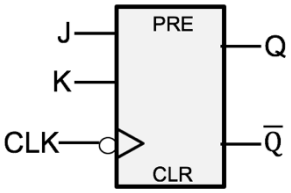


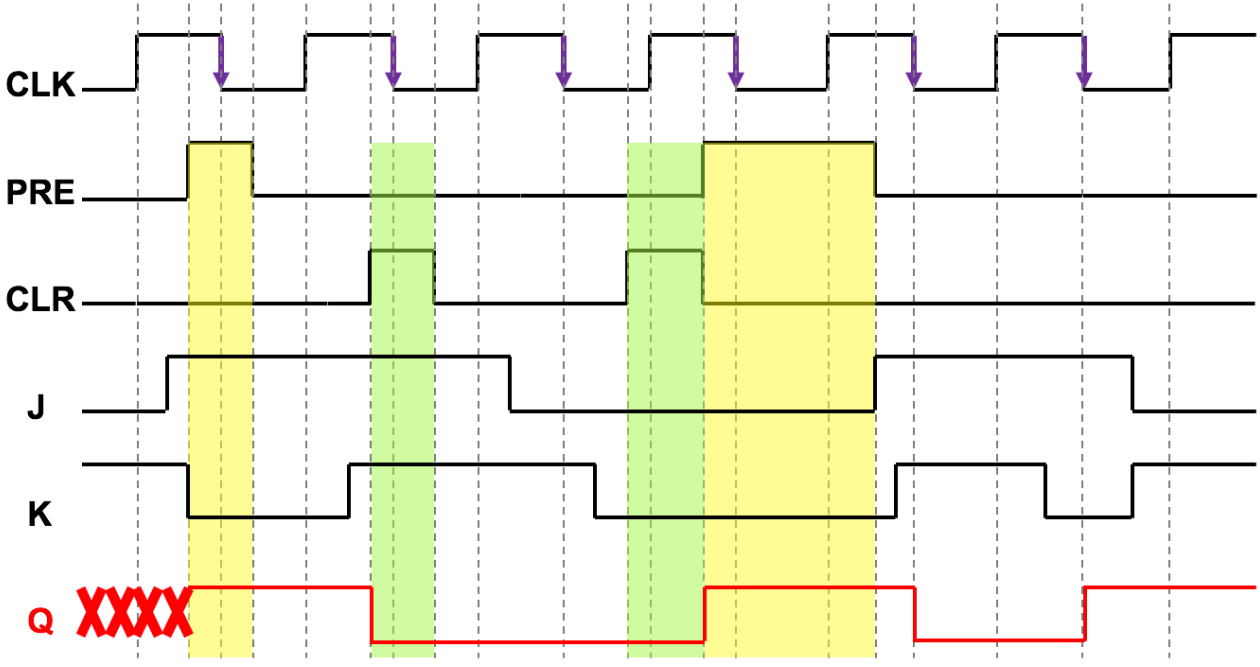
i) Flip-flop tipo JK ativo por borda de subida



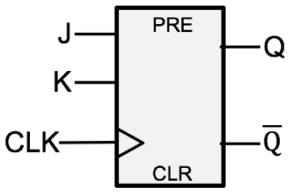


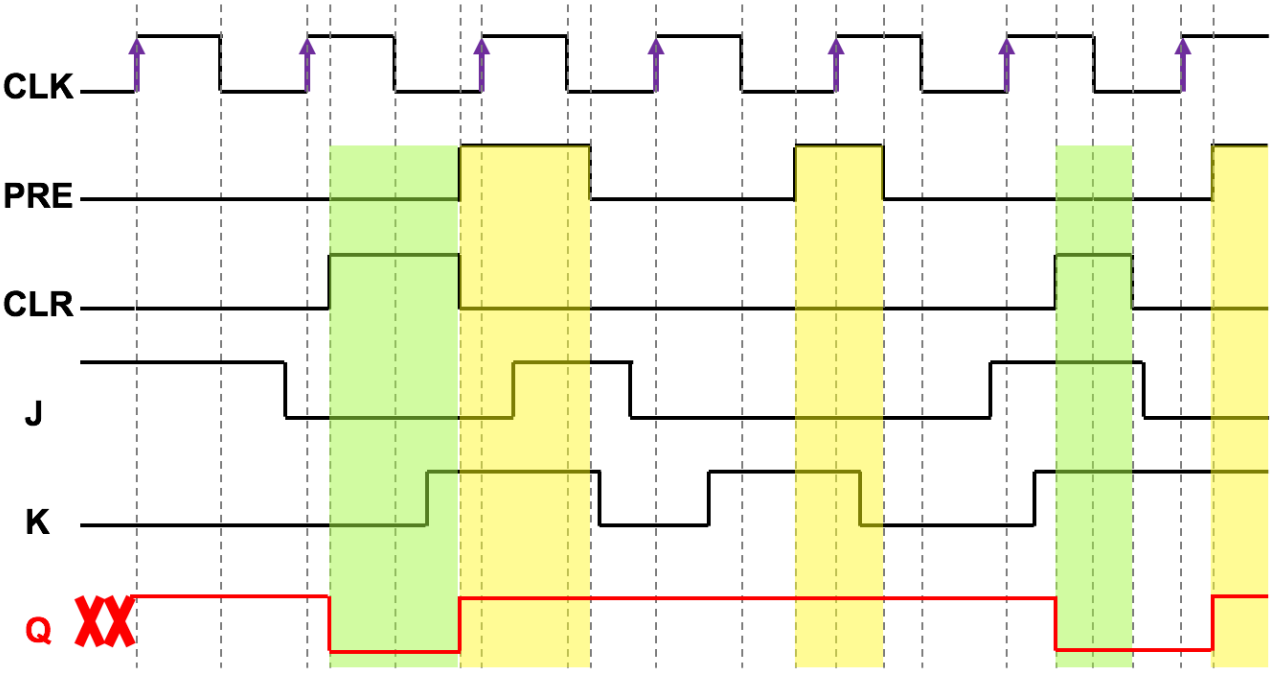
j) Flip-flop tipo JK ativo por borda de descida





k) Flip-flop tipo JK ativo por borda de subida





l) Flip-flop tipo JK ativo por borda de descida