

FIGURA 5-41 Operação de transferência assíncrona de dados.

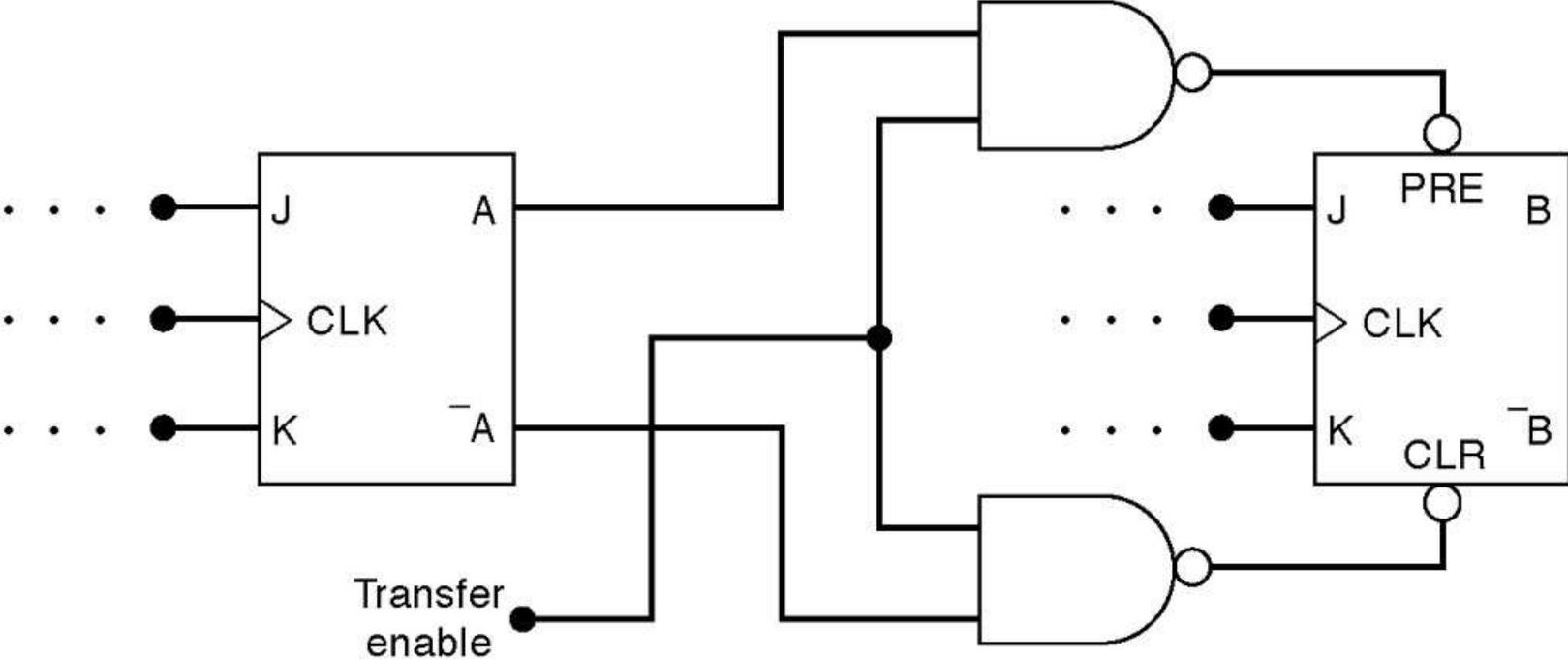


FIGURA 5-42 Transferência paralela do conteúdo do registrador X para o registrador Y.

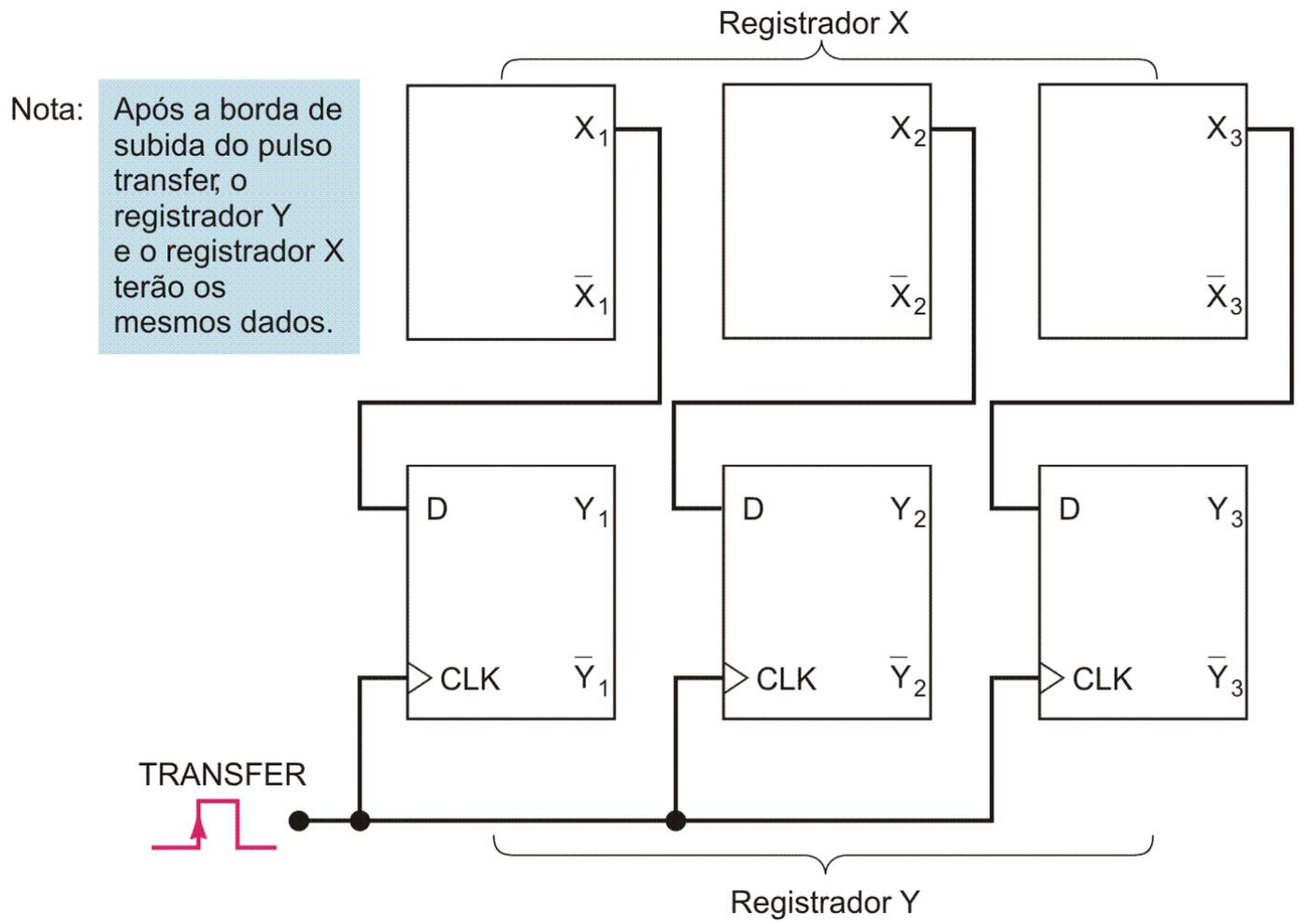


FIGURA 5-43 Registrador de deslocamento de quatro bits.

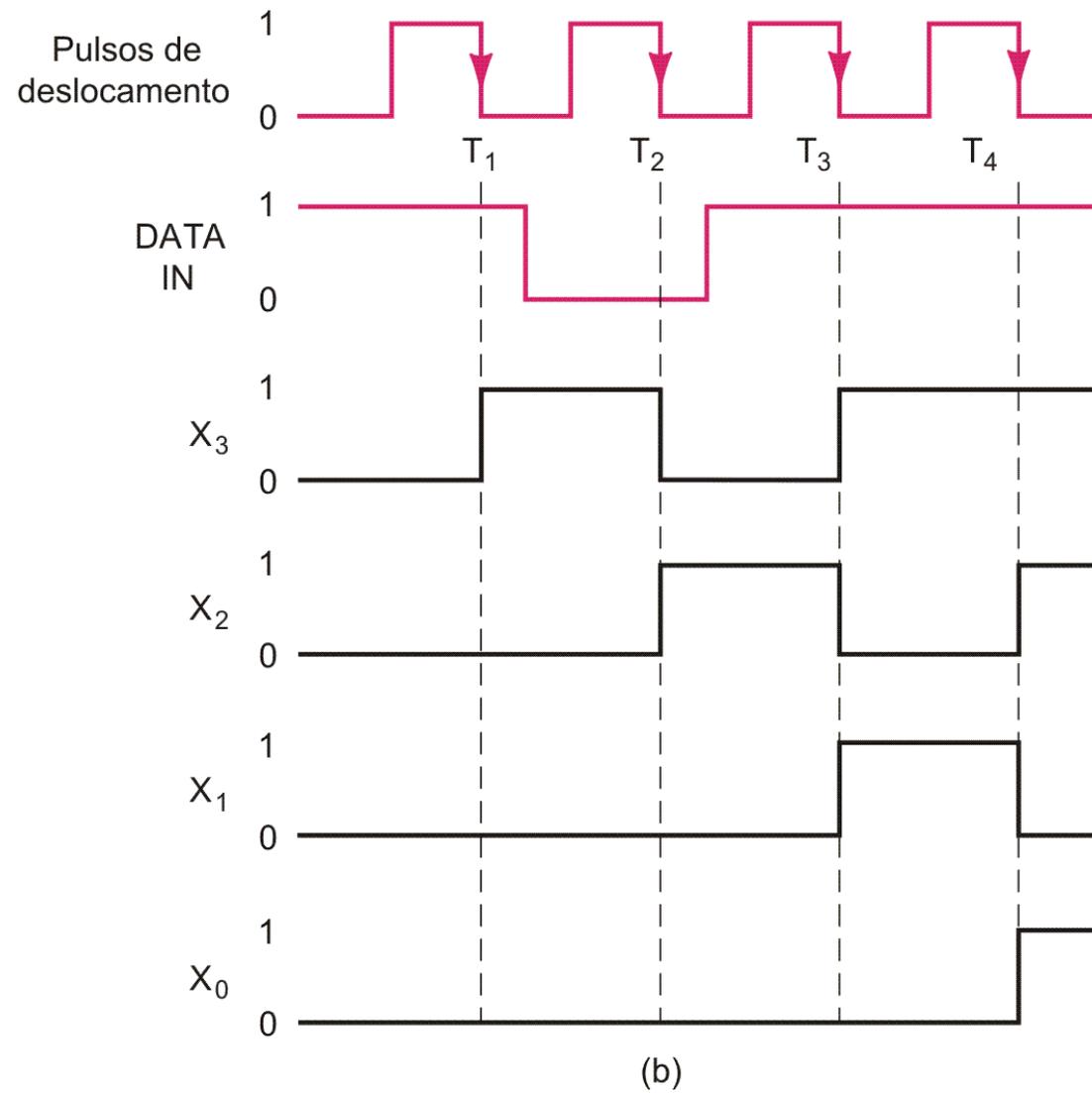
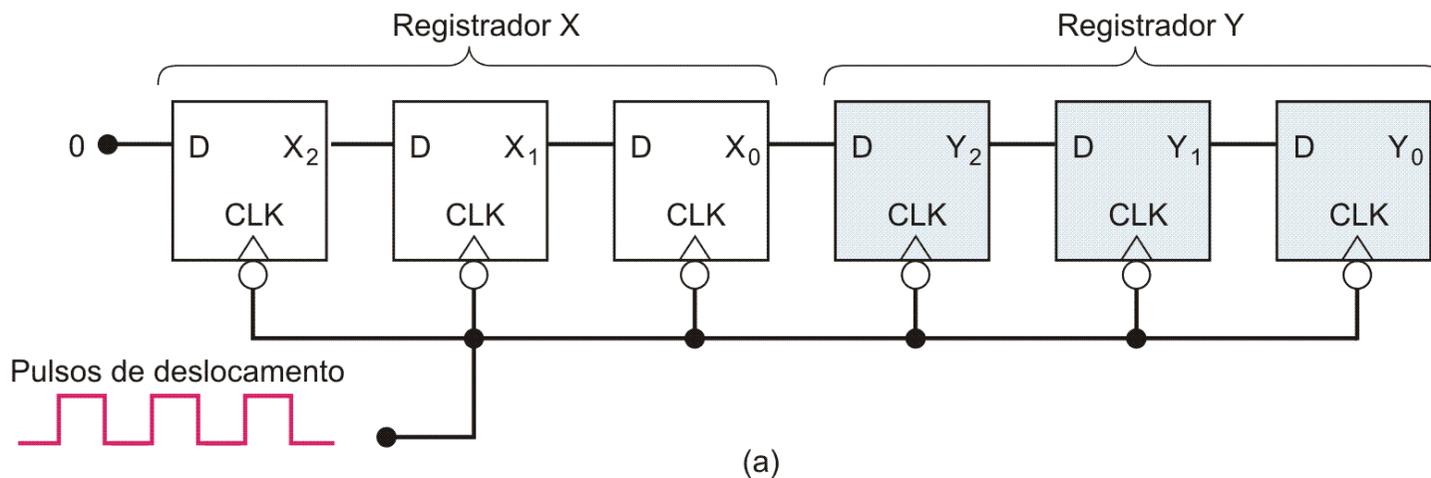


FIGURA 5-44 Transferência serial de dados de um registrador X para um registrador Y.



X ₂	X ₁	X ₀	Y ₂	Y ₁	Y ₀	
1	0	1	0	0	0	← Antes dos pulsos serem aplicados
0	1	0	1	0	0	← Após o primeiro pulso
0	0	1	0	1	0	← Após o segundo pulso
0	0	0	1	0	1	← Após o terceiro pulso

FIGURA 5-45 Flip-flops *J-K* conectados para formar um contador binário de três bits (módulo 8).

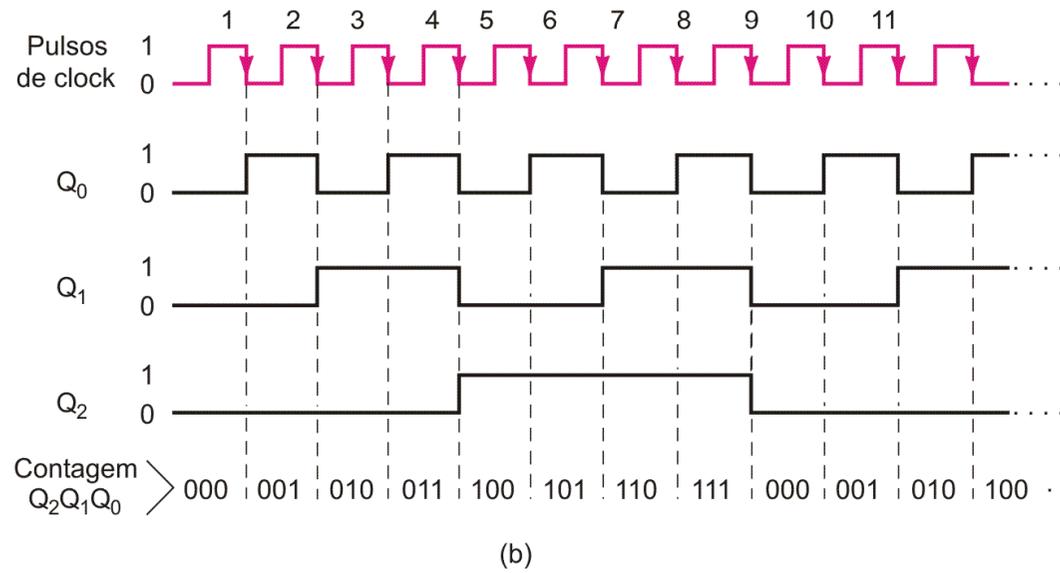
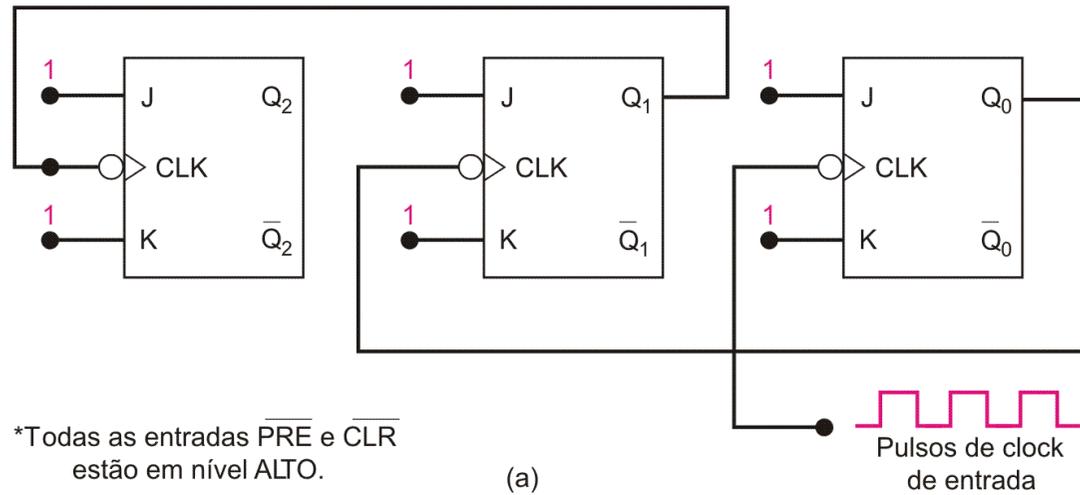
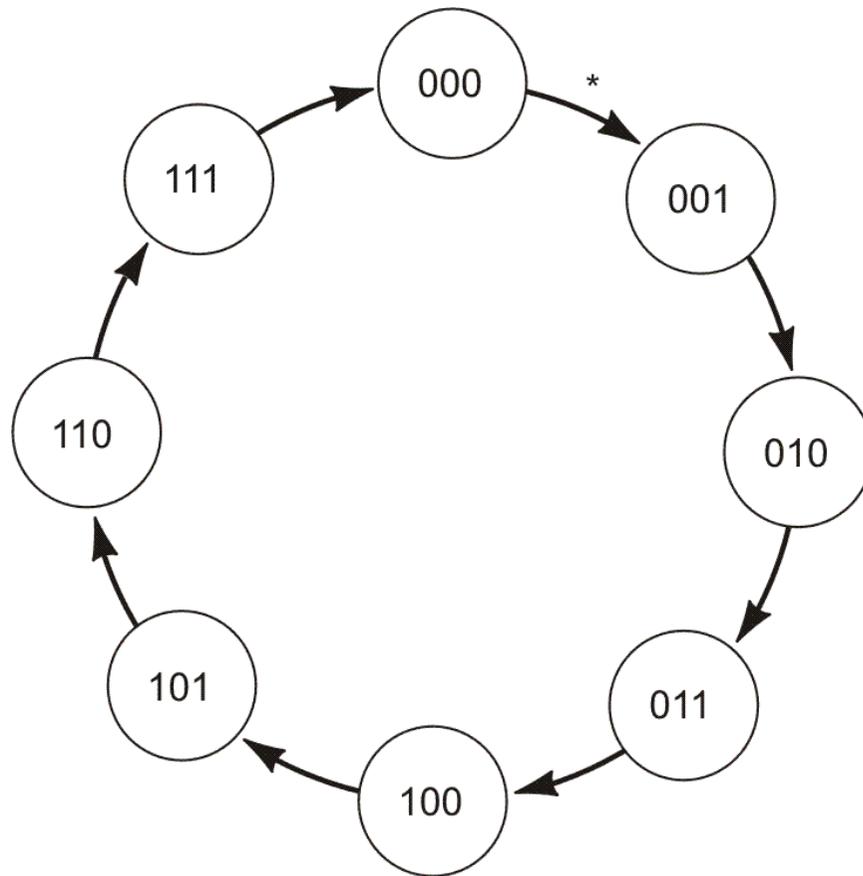


FIGURA 5-46 Tabela com os estados dos flip-flops mostrando uma sequência de contagem binária.

2^2	2^1	2^0	
Q_2	Q_1	Q_0	
0	0	0	Antes de aplicar os pulsos de clock
0	0	1	Após o pulso #1
0	1	0	Após o pulso #2
0	1	1	Após o pulso #3
1	0	0	Após o pulso #4
1	0	1	Após o pulso #5
1	1	0	Após o pulso #6
1	1	1	Após o pulso #7
0	0	0	Após o pulso #8 retorna para 000
0	0	1	Após o pulso #9
0	1	0	Após o pulso #10
0	1	1	Após o pulso #11
.	.	.	.
.	.	.	.
.	.	.	.

FIGURA 5-47 O diagrama de transição de estados mostra como os estados de um contador mudam a cada pulso de clock aplicado.



* Nota: cada seta representa a ocorrência de um pulso de clock

FIGURA 5-48 Exemplo de um microprocessador transferindo dados binários para um registrador externo.

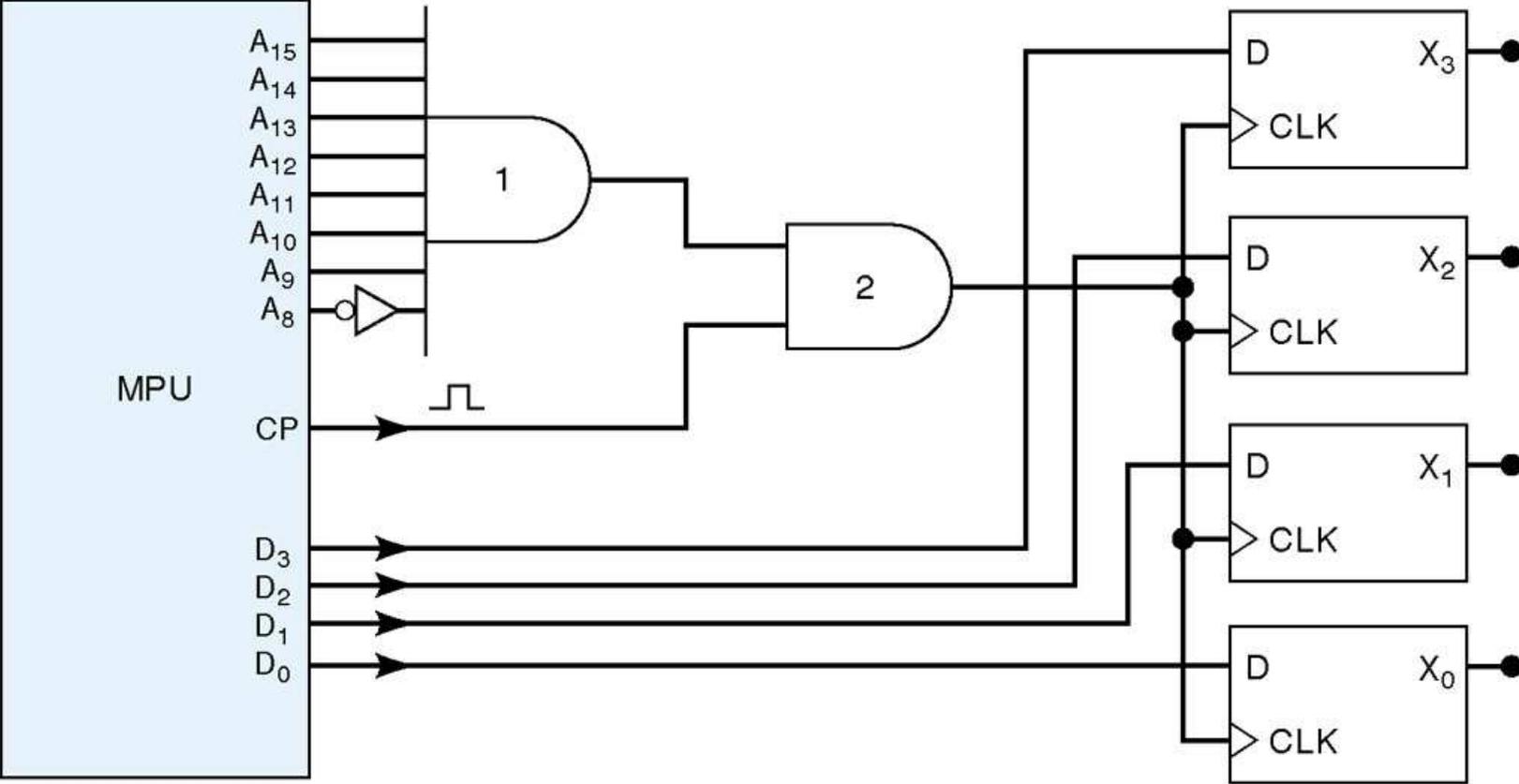


FIGURA 5-49 (a) Se os tempos de transições das entradas forem muito longos, a saída de um dispositivo lógico comum pode oscilar ou mudar imprevisivelmente de estado; (b) Um dispositivo lógico com entrada Schmitt-trigger produz uma saída com transições rápidas.

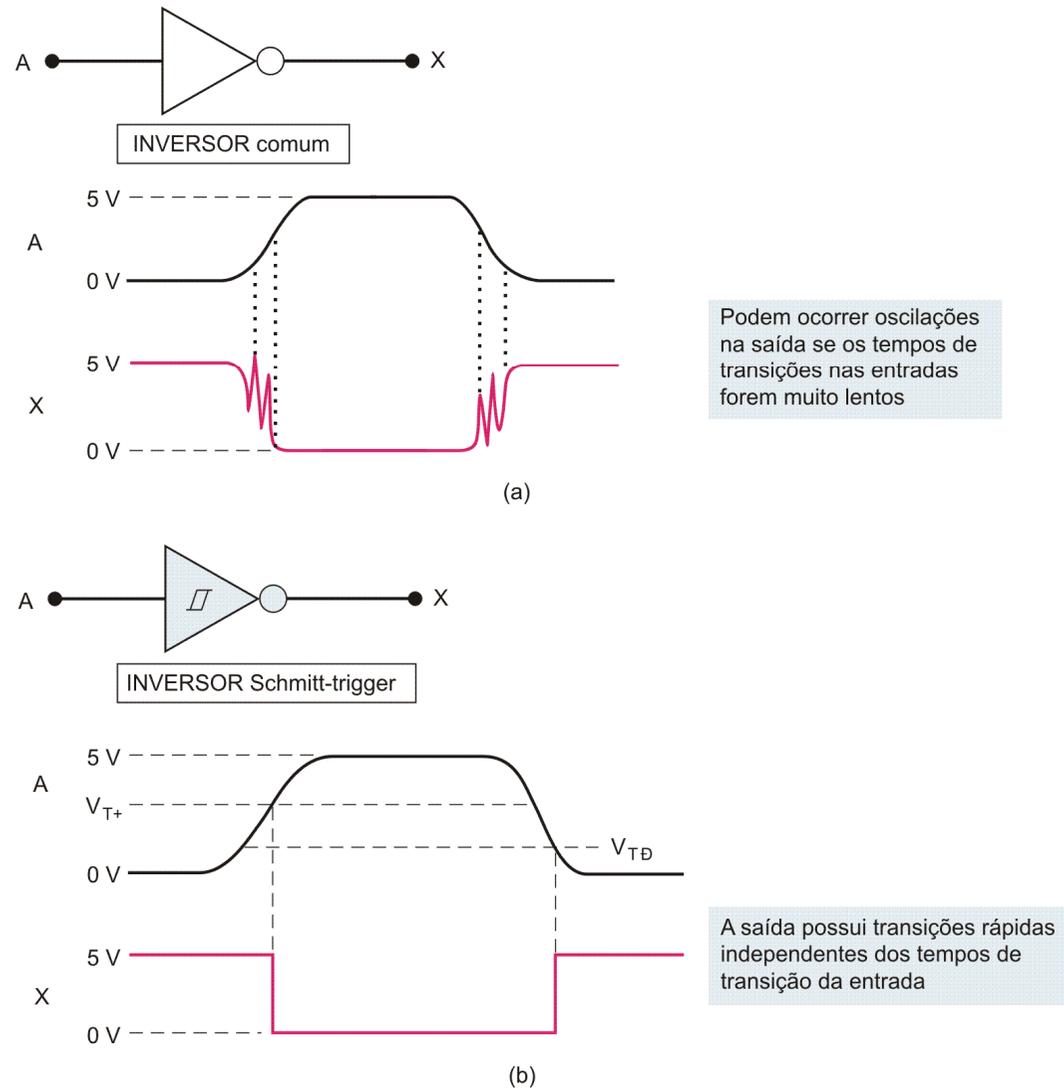


FIGURA 5-50 Símbolo e forma de onda típicas de um monoestável cujo modo de operação é não-redispável.

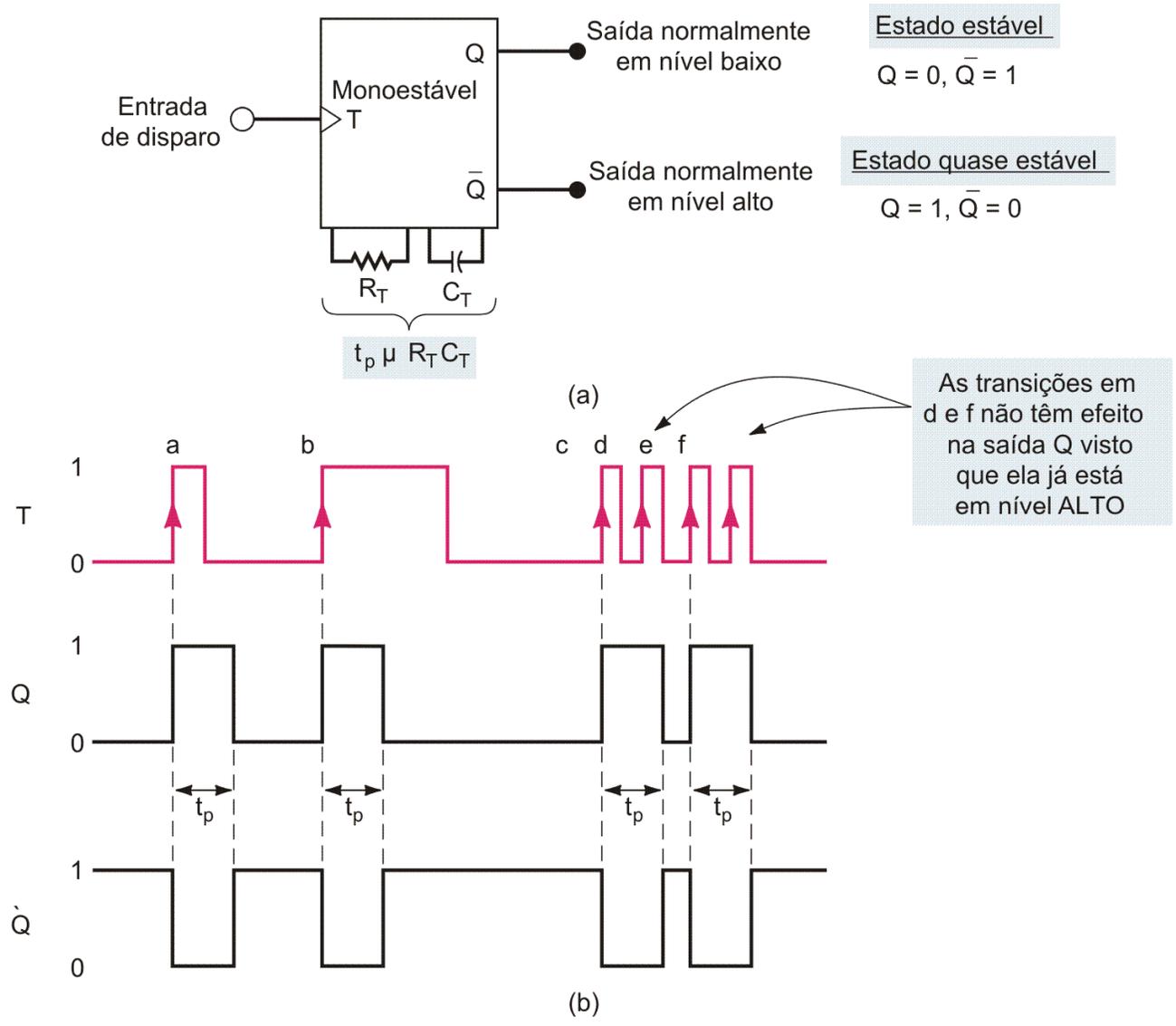


FIGURA 5-51 (a) Resposta comparativa de um monoestável não-redisparável com outro redisparável com um tempo $t_p = 2\text{ms}$. (b) O monoestável redisparável inicia a temporização de um novo intervalo de tempo t_p a cada pulso de disparo recebido.

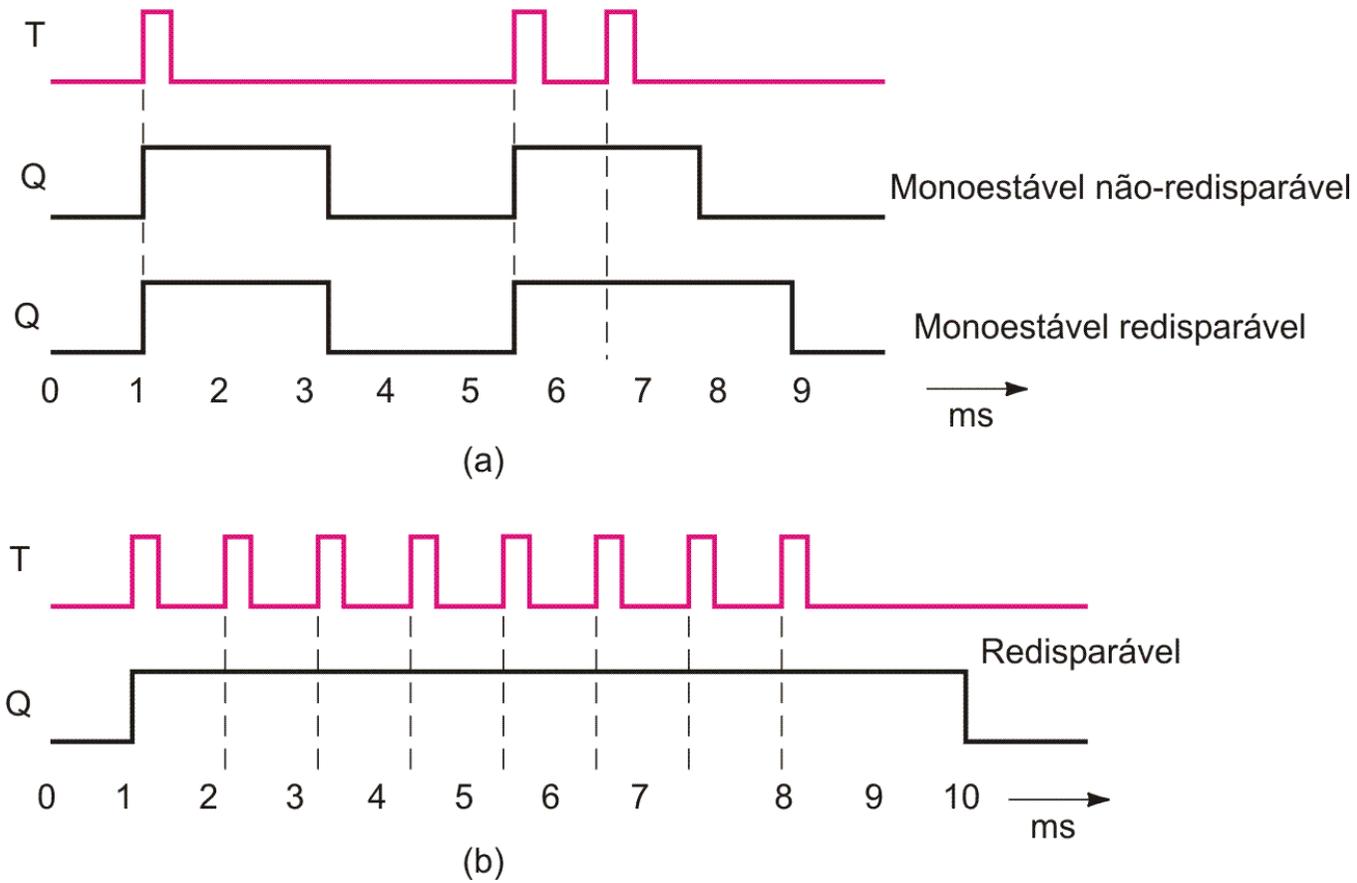


FIGURA 5-52 Símbolos lógicos para o monoestável não-redispáravel 74121; (a) Tradicional (b) IEEE/ANSI.

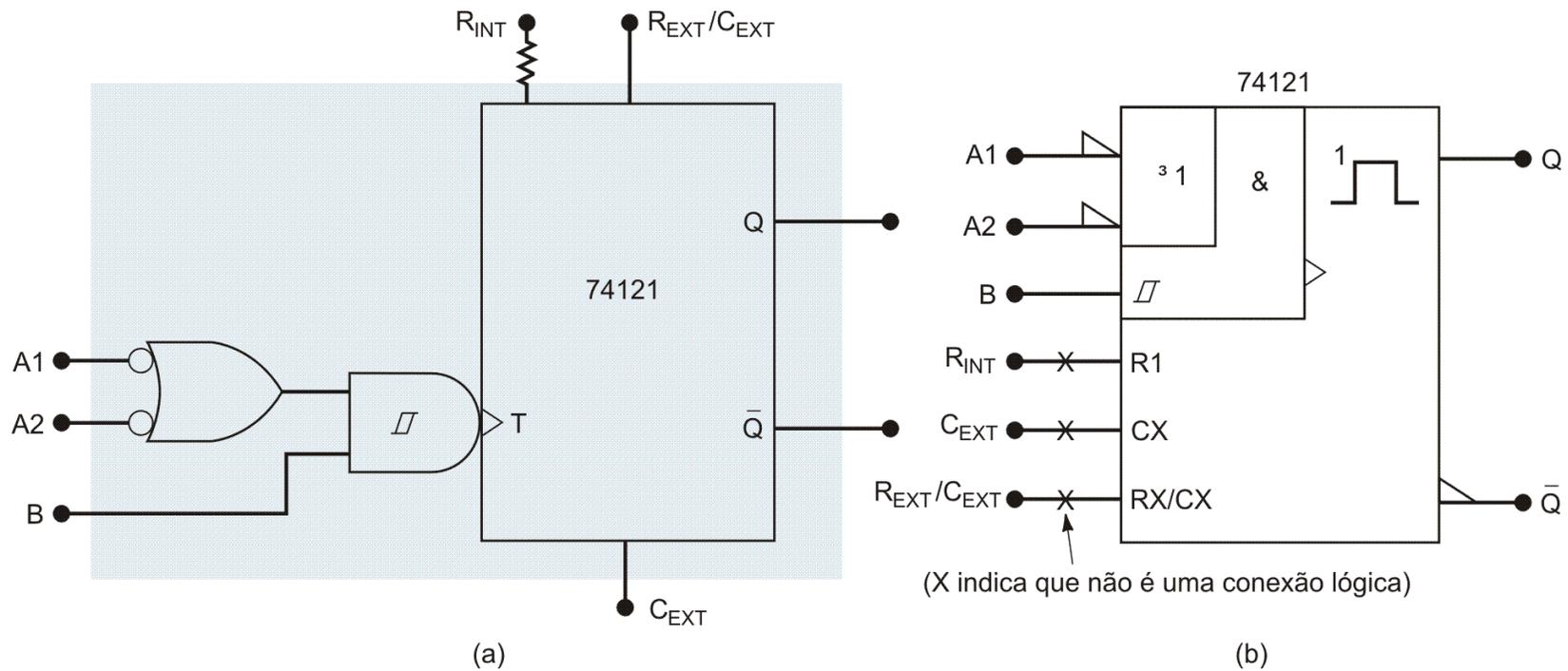


FIGURA 5-53 Exemplo 5-16.

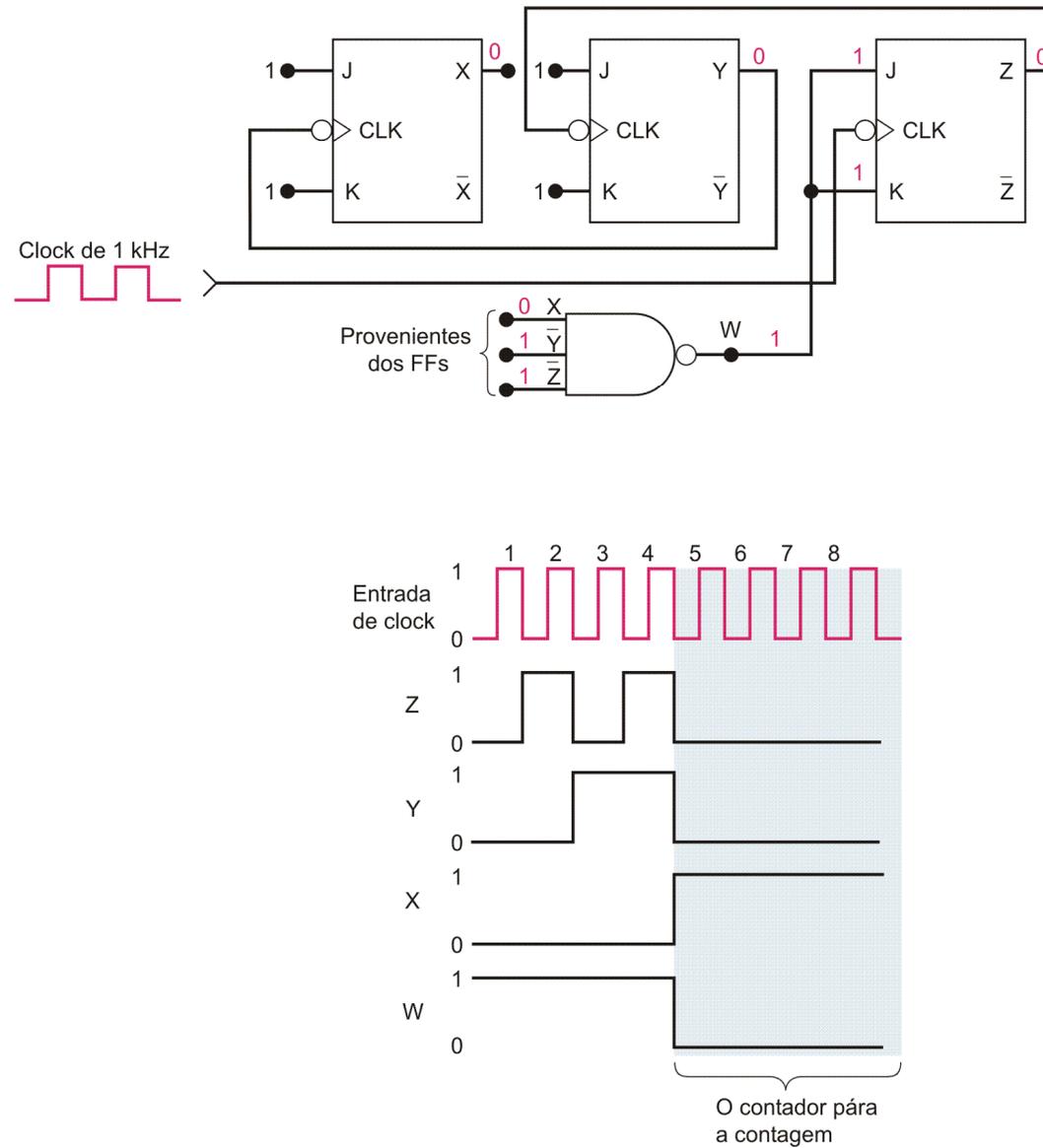


FIGURA 5-54 Oscilador Schmitt-trigger usando um INVERSOR 7414. Uma NAND Schmitt-trigger também poser usada.

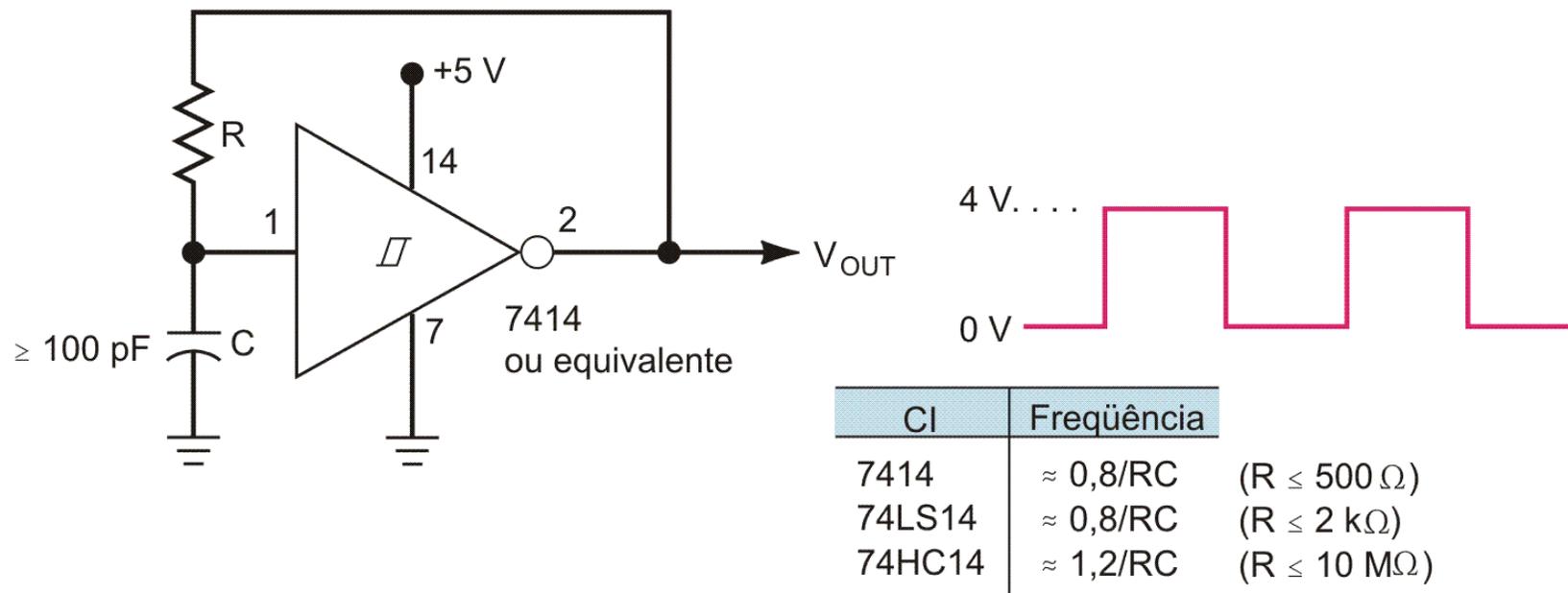
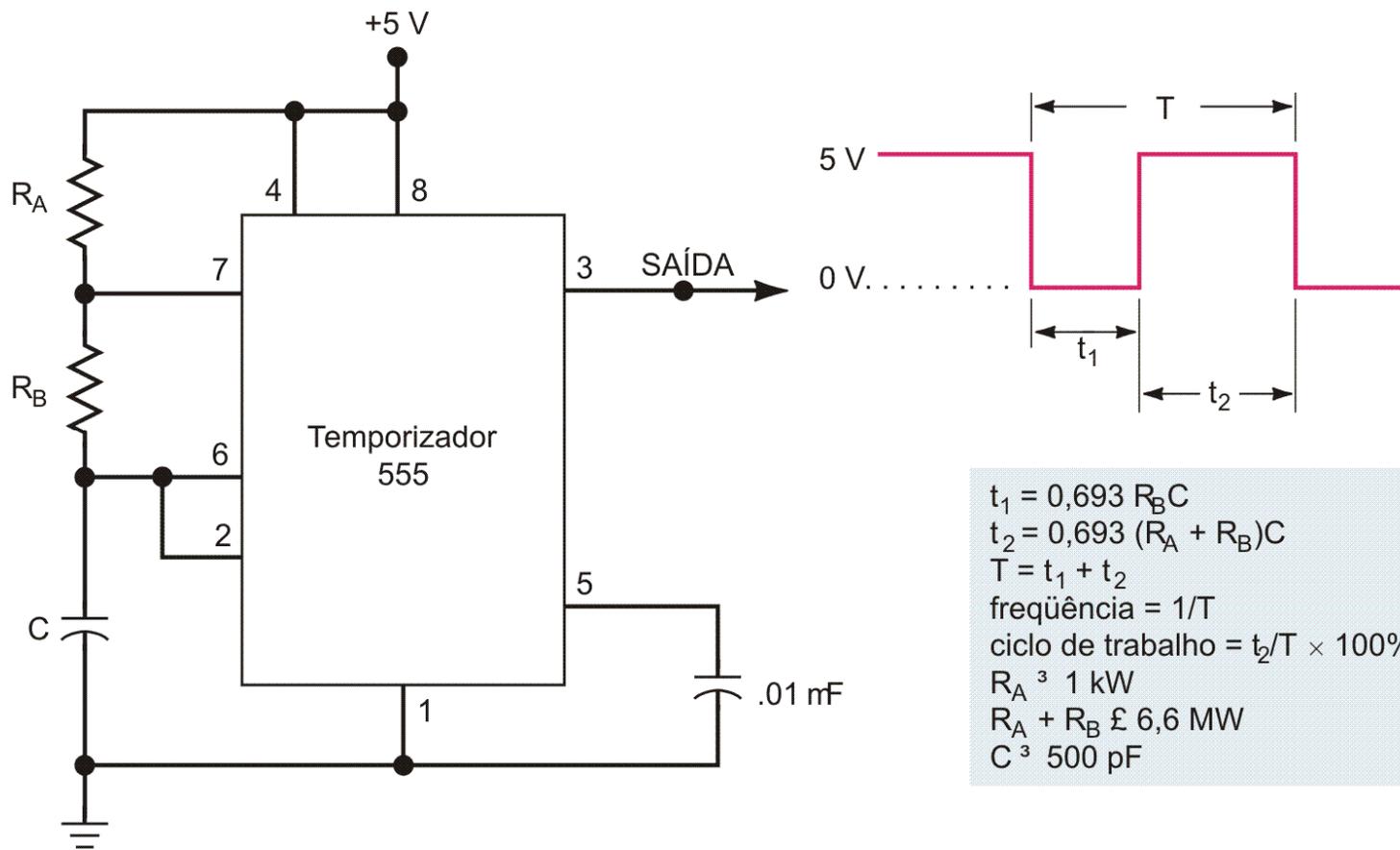
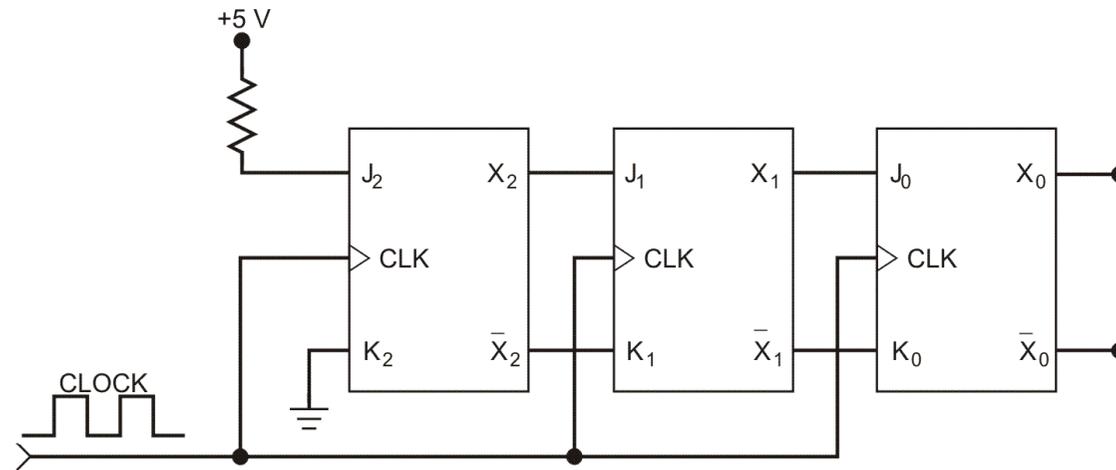


FIGURA 5-55 CI temporizador 555 usado como um multivibrador astável.



$t_1 = 0,693 R_B C$
 $t_2 = 0,693 (R_A + R_B) C$
 $T = t_1 + t_2$
 freqüência = $1/T$
 ciclo de trabalho = $t_2/T \times 100\%$
 $R_A \geq 1 \text{ kW}$
 $R_A + R_B \leq 6,6 \text{ MW}$
 $C \leq 500 \text{ pF}$

FIGURA 5-56 Exemplo 5-18.



Número do pulso de clock	"Esperada"			"Real"		
	X ₂	X ₁	X ₀	X ₂	X ₁	X ₀
0	0	0	0	0	0	0
1	1	0	0	1	0	0
2	1	1	0	1	1	0
3	1	1	1	1	1	1
4	1	1	1	1	1	0
5	1	1	1	1	1	1
6	1	1	1	1	1	0
7	1	1	1	1	1	1
8	1	1	1	1	1	0

FIGURA 5-57 Exemplo 5-19.

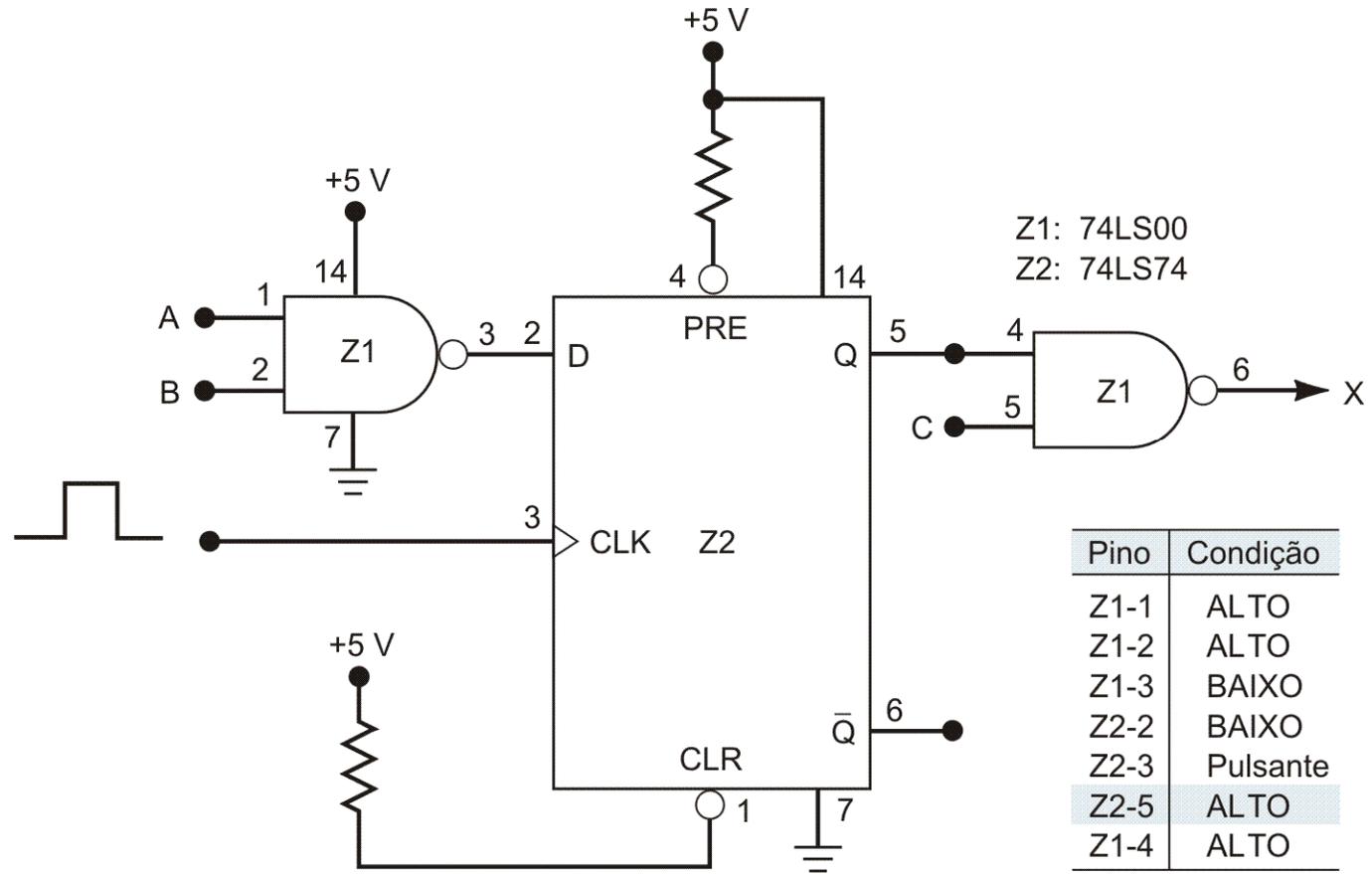


FIGURA 5-58 O deslçamento d oclock ocorre quando dois FFs, supostamente disparados simultaneamente, são disparados em momentos diferentes em virtude de um atraso no sinal de clock que chega no segundo flip-flop.

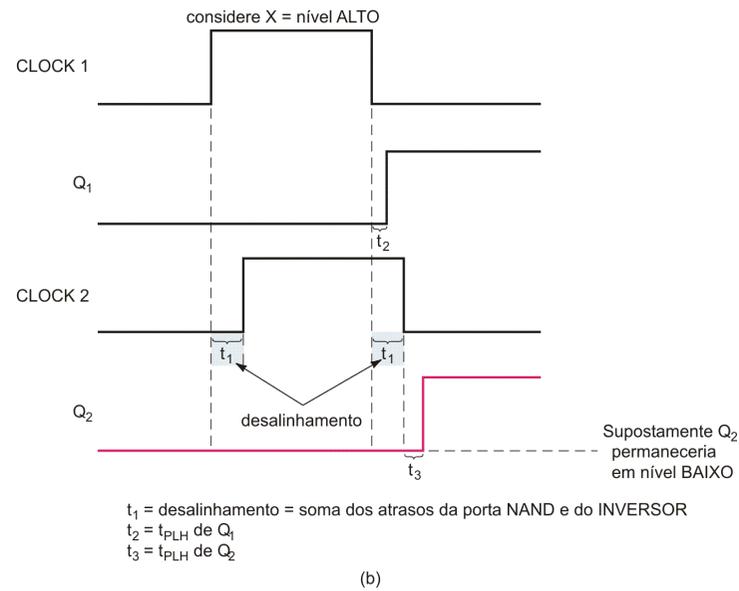
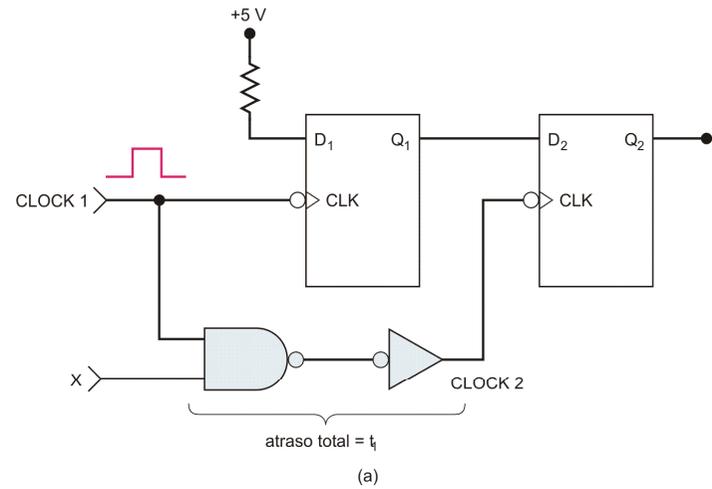
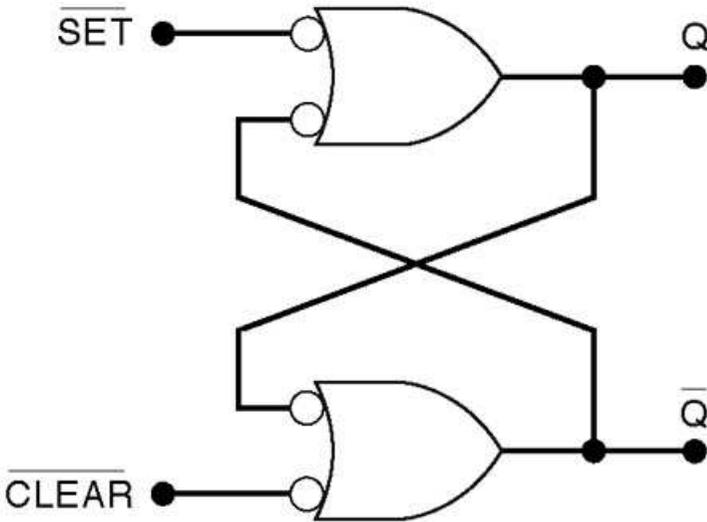
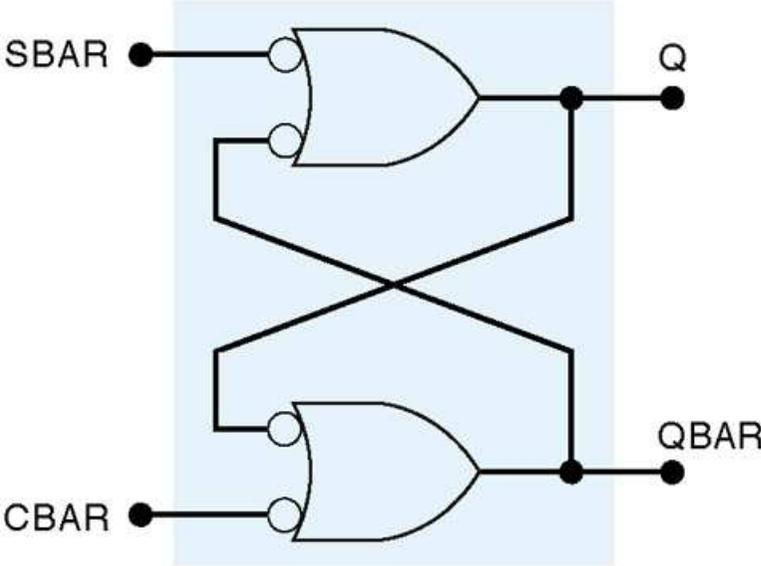


FIGURA 5-59 (a) latch NAND; (b) latch NAND com as entradas e saídas renomeadas.



(a)



(b)

FIGURA 5-60 Arquivo CUPL para o modo de entrada por transição de estados para um simples contador.

```
Name      states.pld      ; Designer   N.S.Widmer   ;
Partno    1234567      ; Company   Purdue University;
Date      June 2      ; Assembly  Chapter 5    ;
Revision  02          ; Location  Chapter 5    ;
Device    G16v8      ; Format     j          ;

/*      Simple 3-bit Binary UP counter example      */

/* INPUTS                                           */

PIN 1 = clock      ; /* pin 1 must be clock in for GAL 16V8*/

/* OUTPUTS                                          */

PIN 12 = Q0      ;
PIN 13 = Q1      ;
PIN 14 = Q2      ;

/*      HARDWARE DESCRIPTION      */

sequence [Q2, Q1, Q0]

(
    present b'000 next b'001;
    present b'001 next b'010;
    present b'010 next b'011;
    present b'011 next b'100;
    present b'100 next b'101;
    present b'101 next b'110;
    present b'110 next b'111;
    present b'111 next b'000;
)

```

FIGURA 5-61 Problemas 5-1 a 5-3.

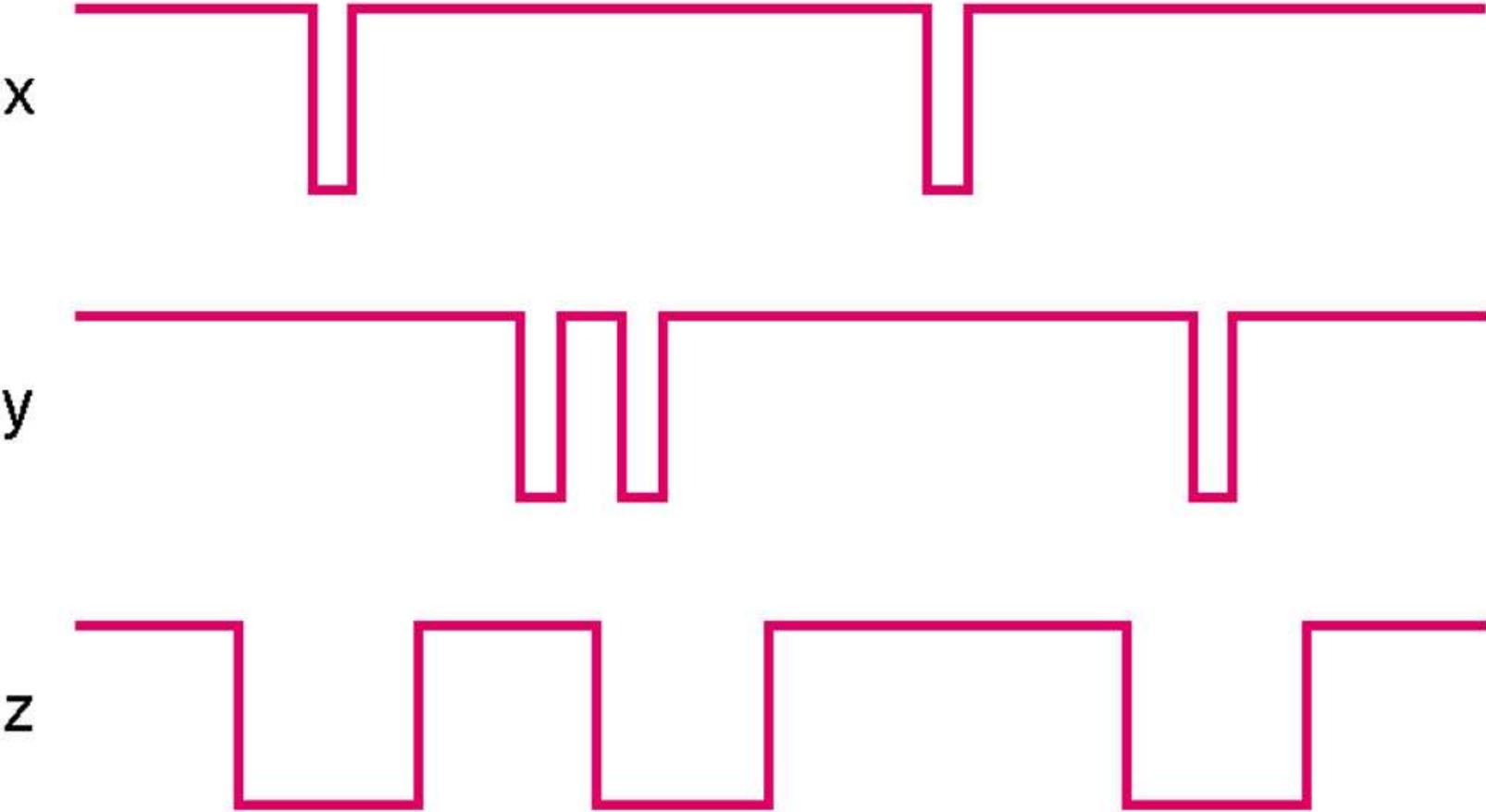


FIGURA 5-62 Problema 5-3.

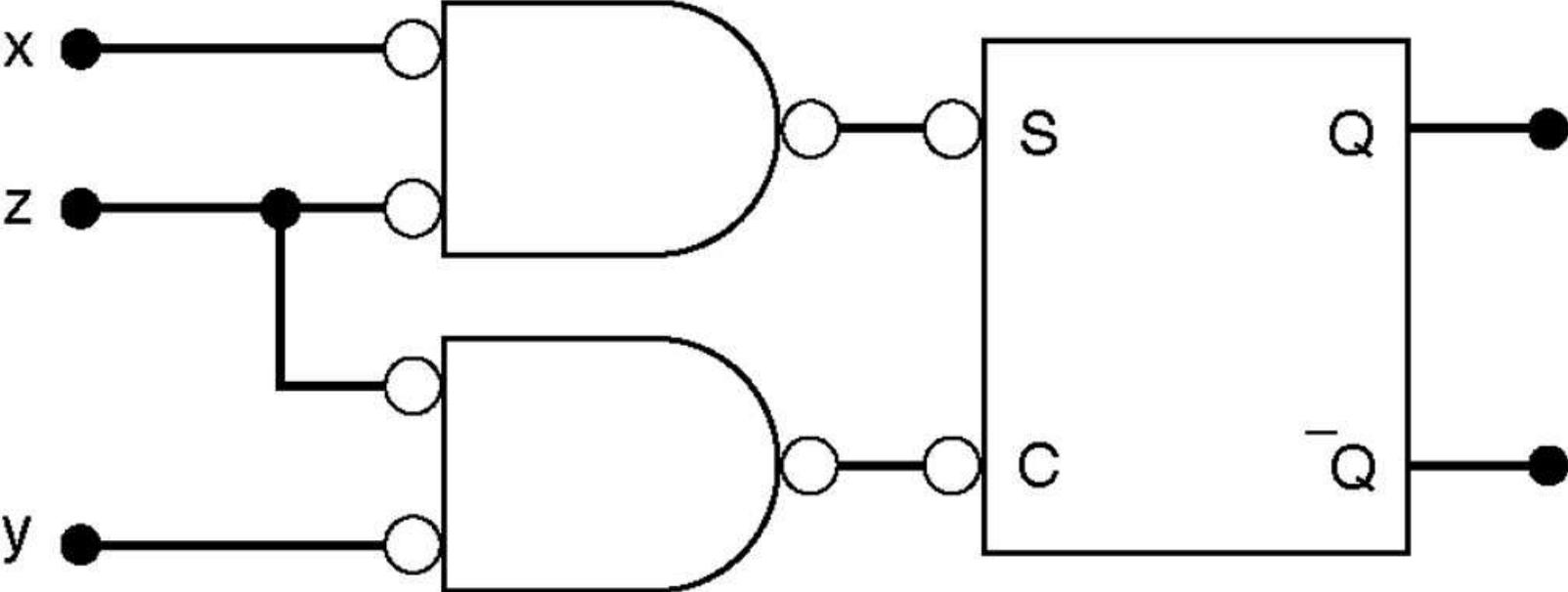


FIGURA 5-63 Problema 5-6.

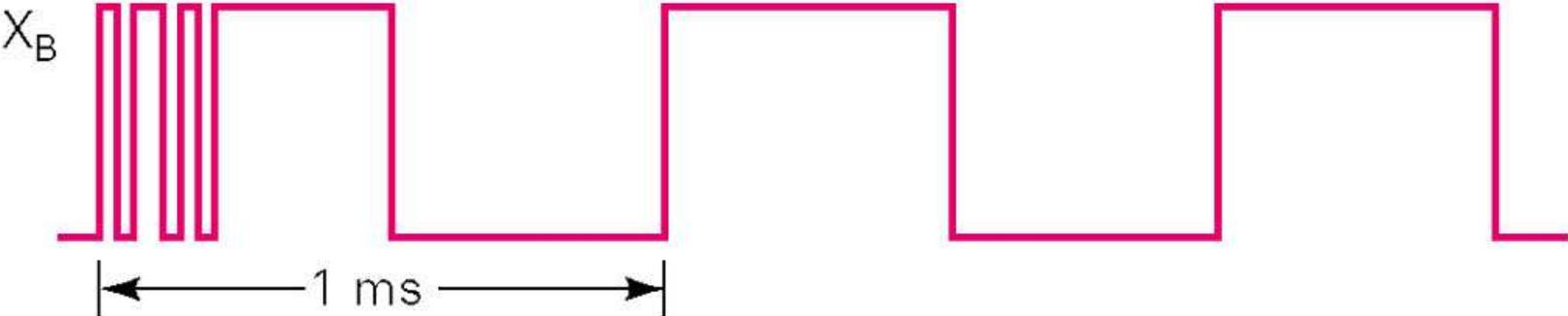


FIGURA 5-64 Problema 5-9

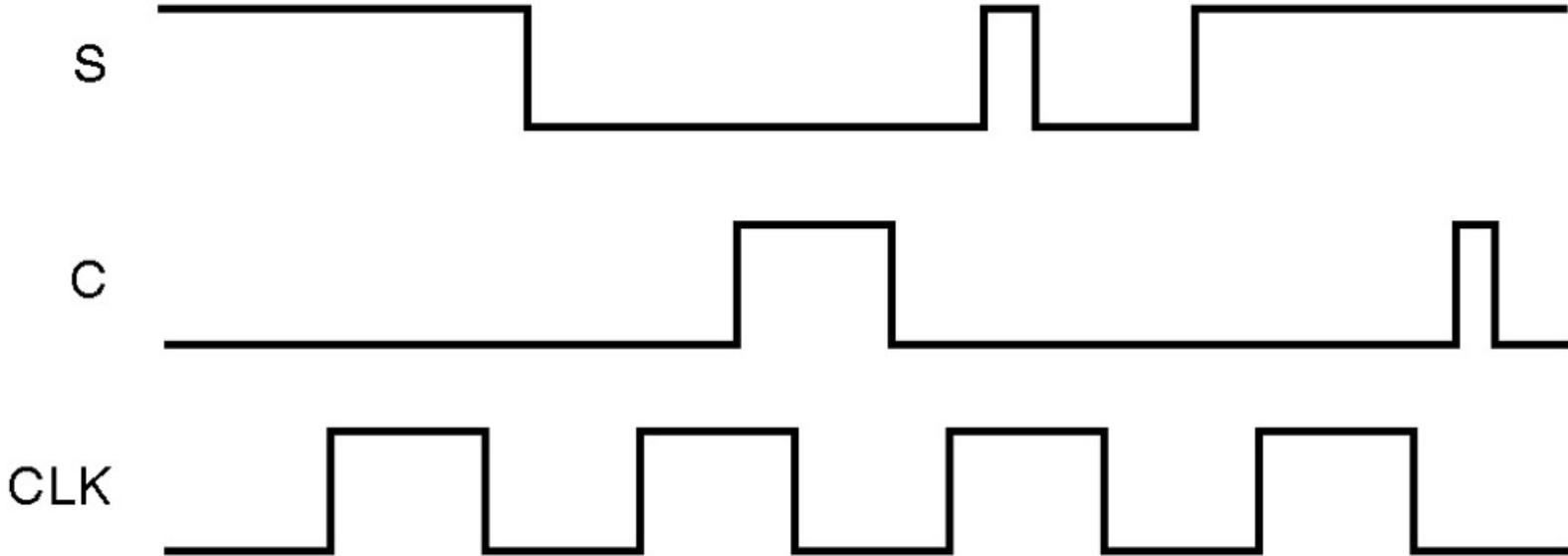


FIGURA 5-65 Problema 5-12.

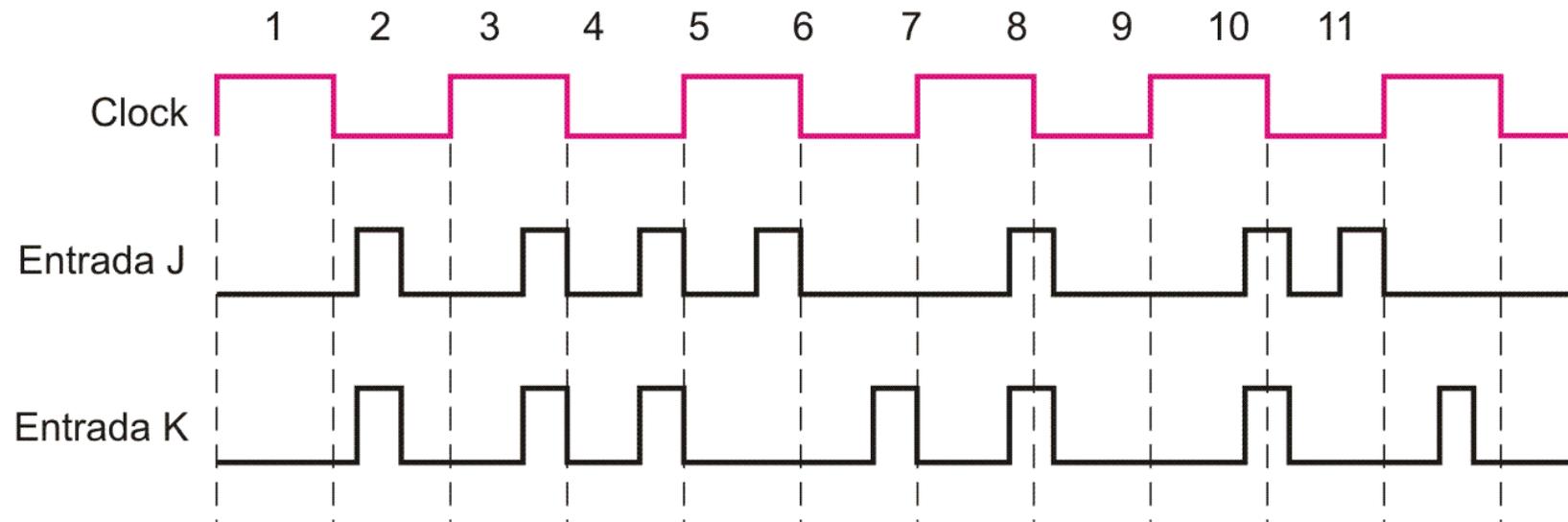


FIGURA 5-66 Problema 5-13.

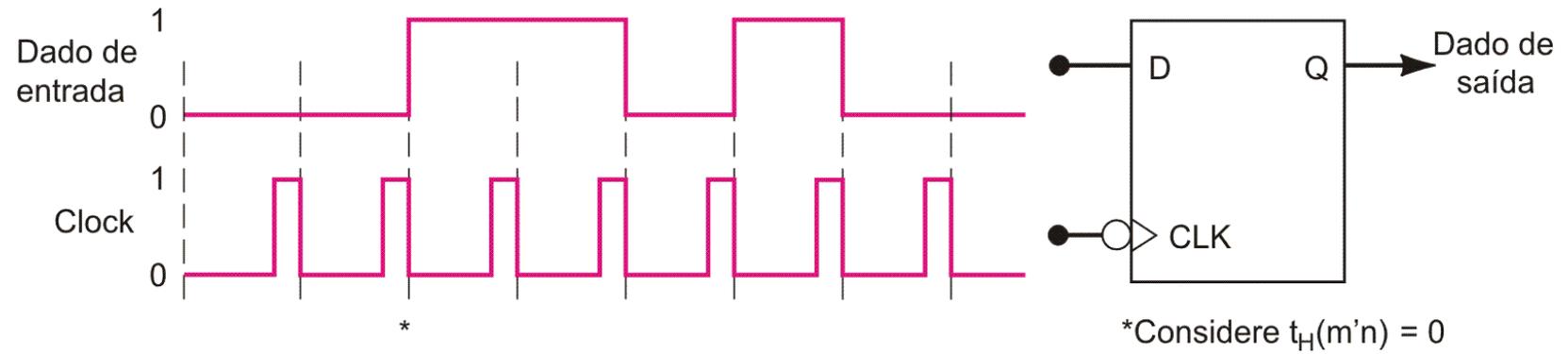


FIGURA 5-67 Flip-flop *D* configurado como um FF tipo T (Problemas 5-15 e 5-16).

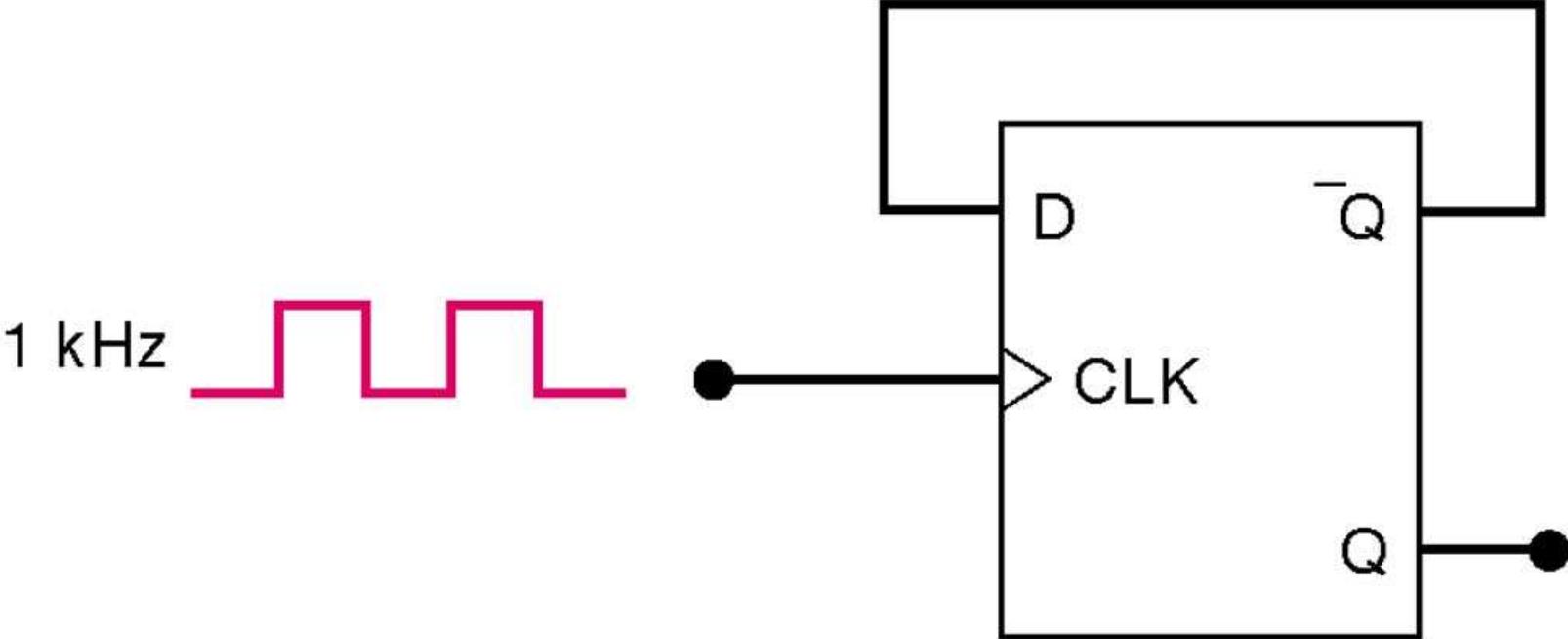


FIGURA 5-68 Problema 5-18.

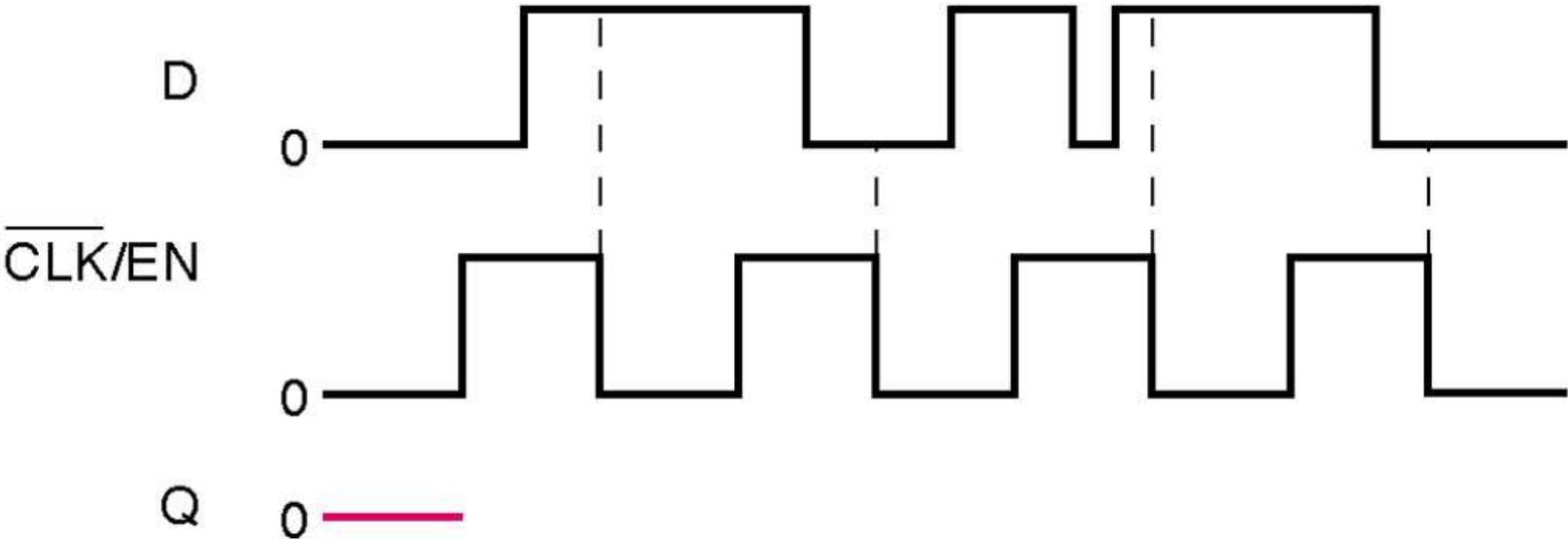


FIGURA 5-69 Problema 5-20.

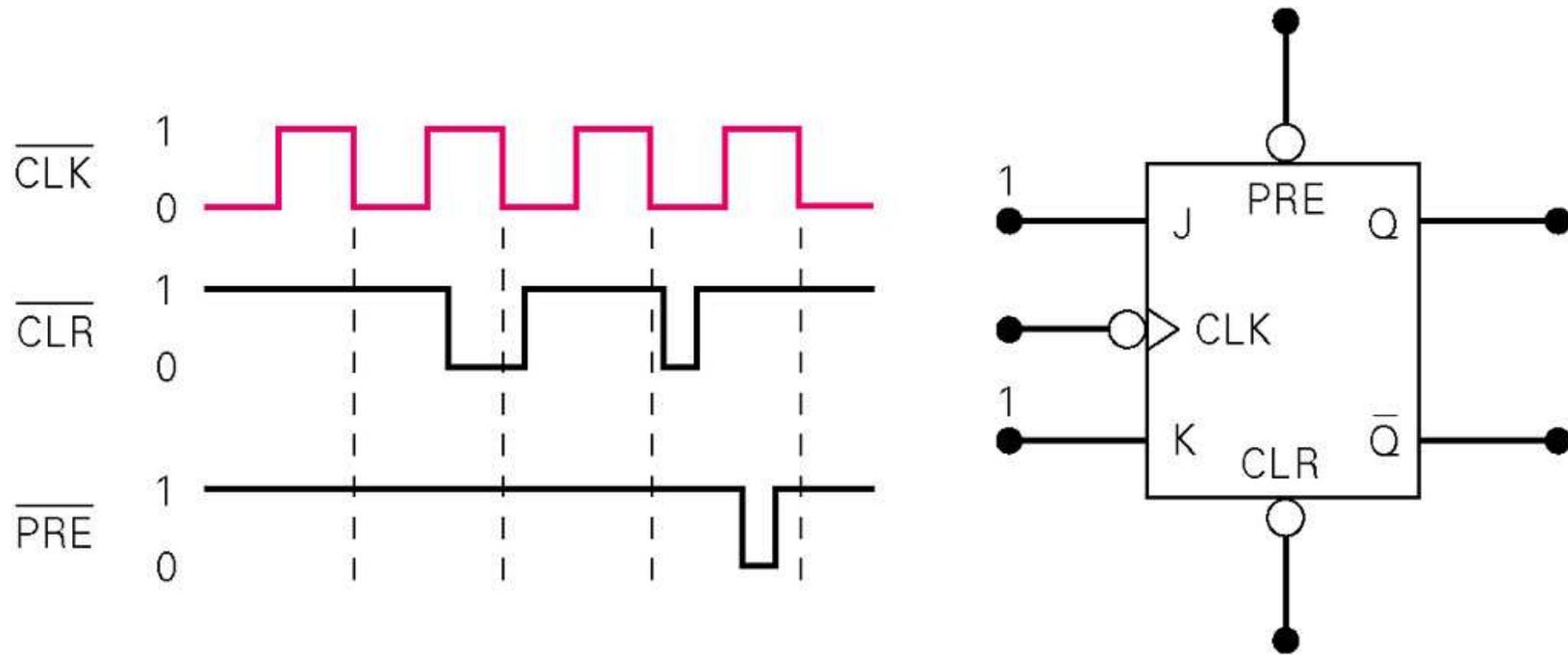


FIGURA 5-70 Diagrama de conexão para o Problema 5-24.

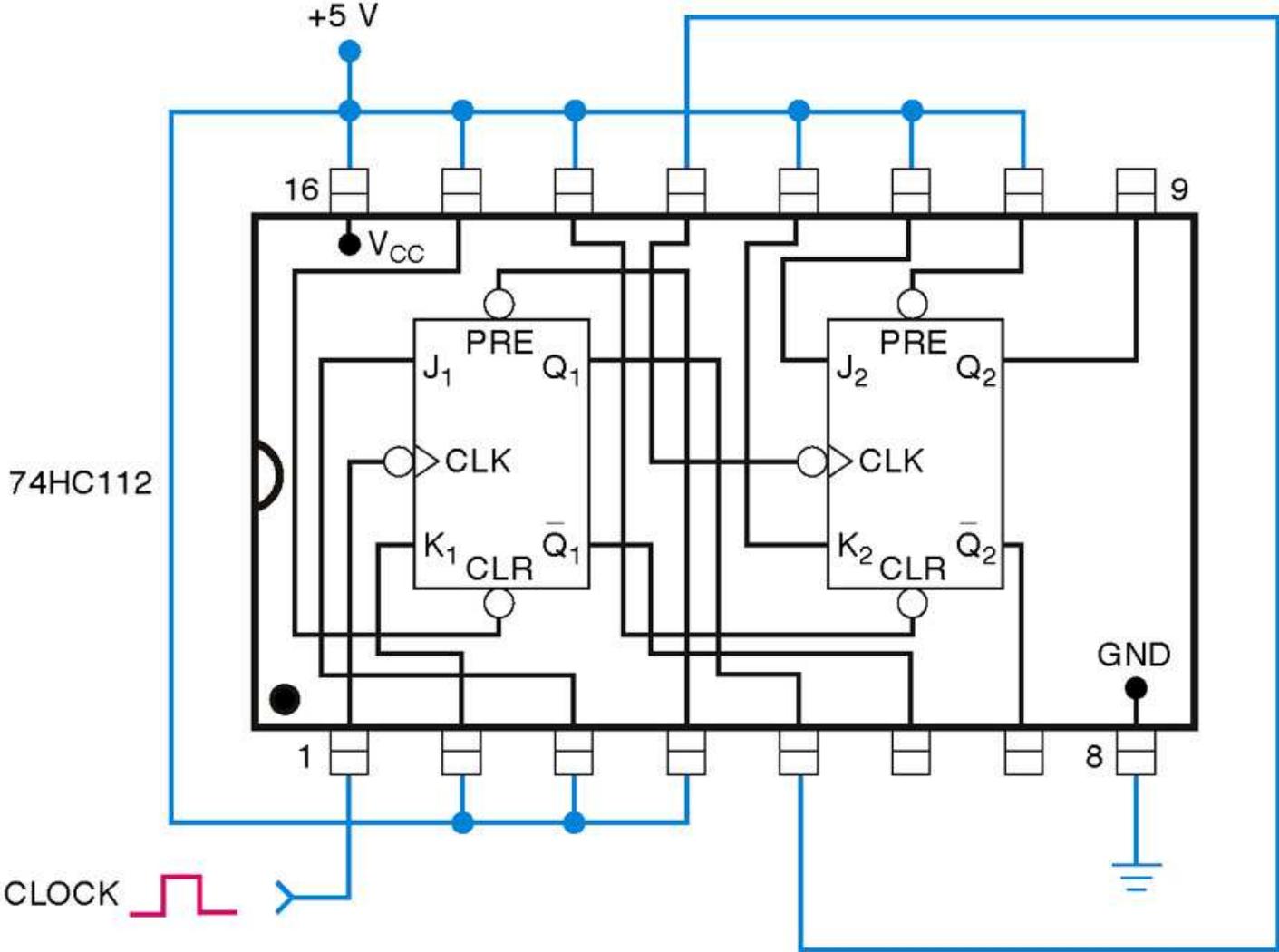


FIGURA 5-71 Problema 5-26.

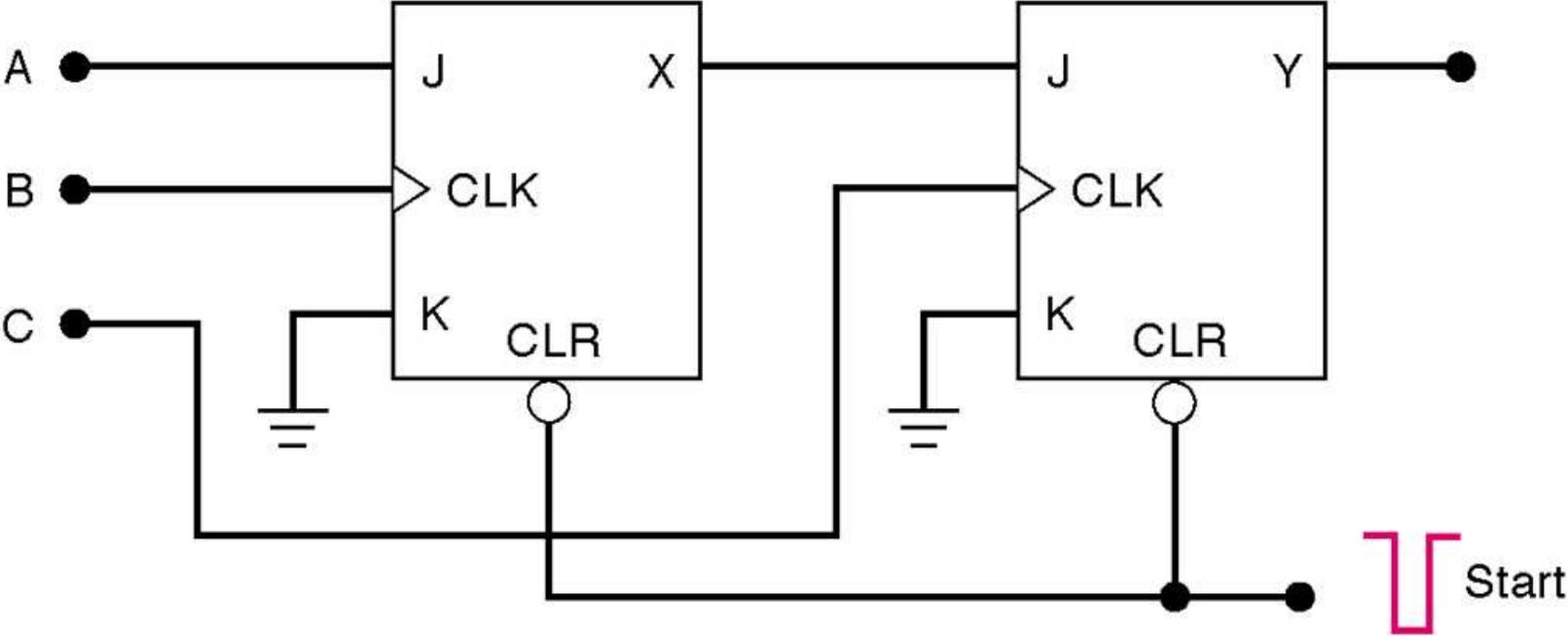


FIGURA 5-72 Problema 5-40.

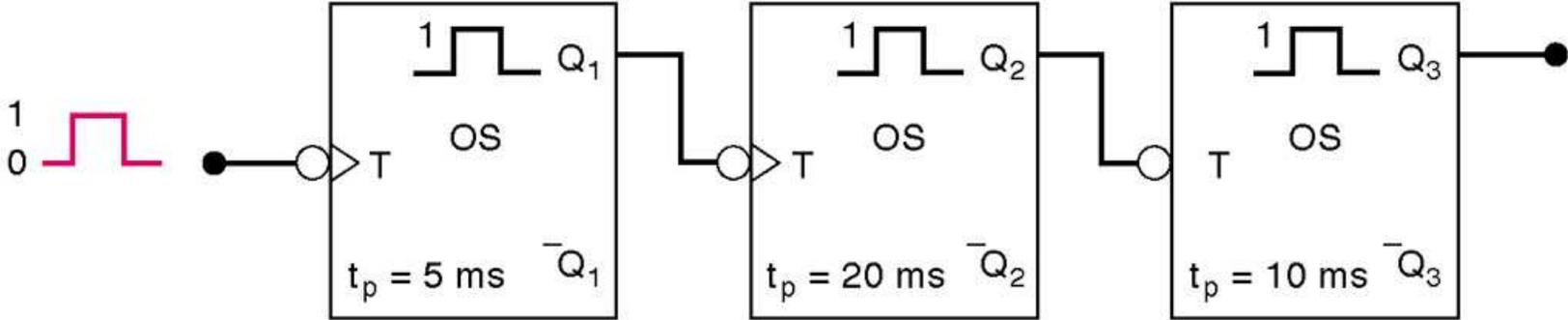


FIGURA 5-73 Problema 5-41.

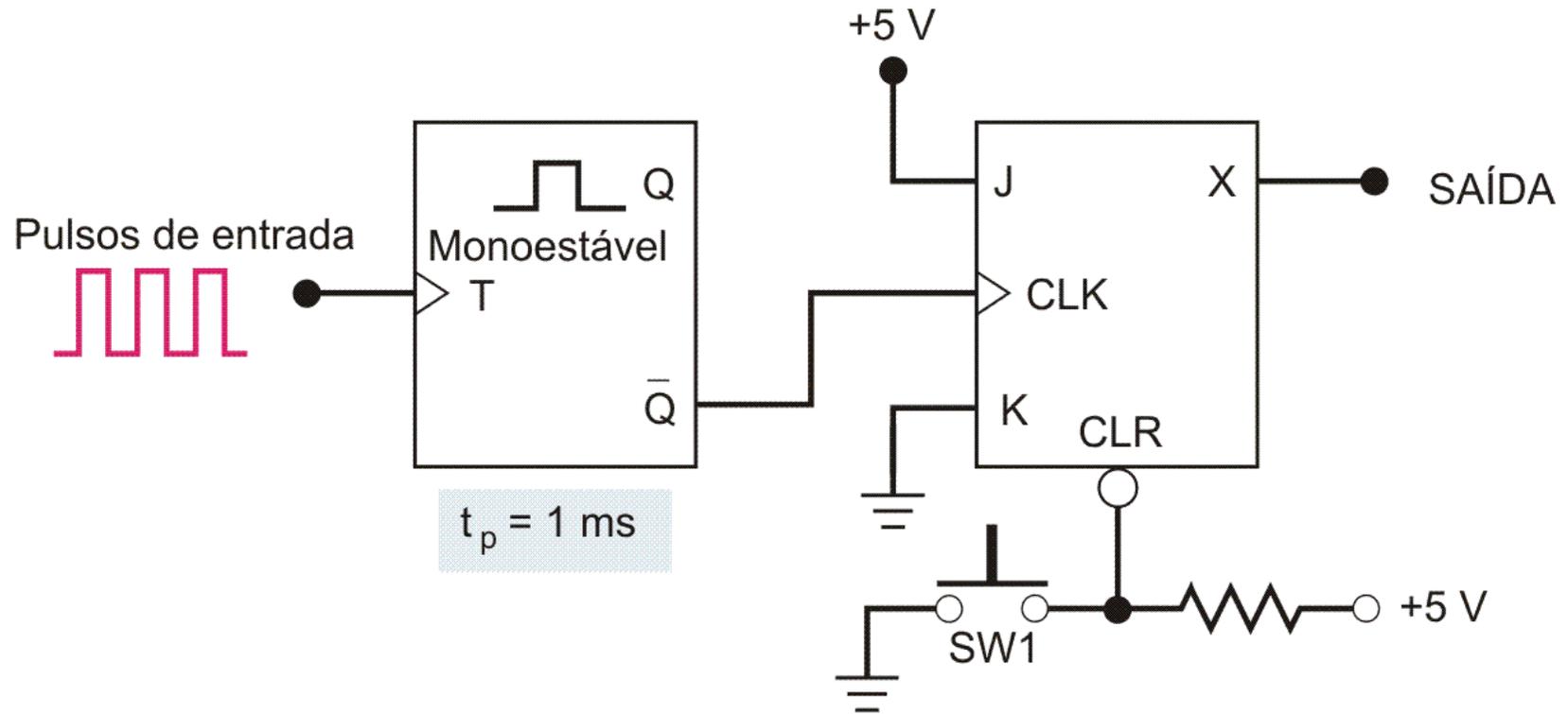


FIGURA 5-74 Problema 5-44.

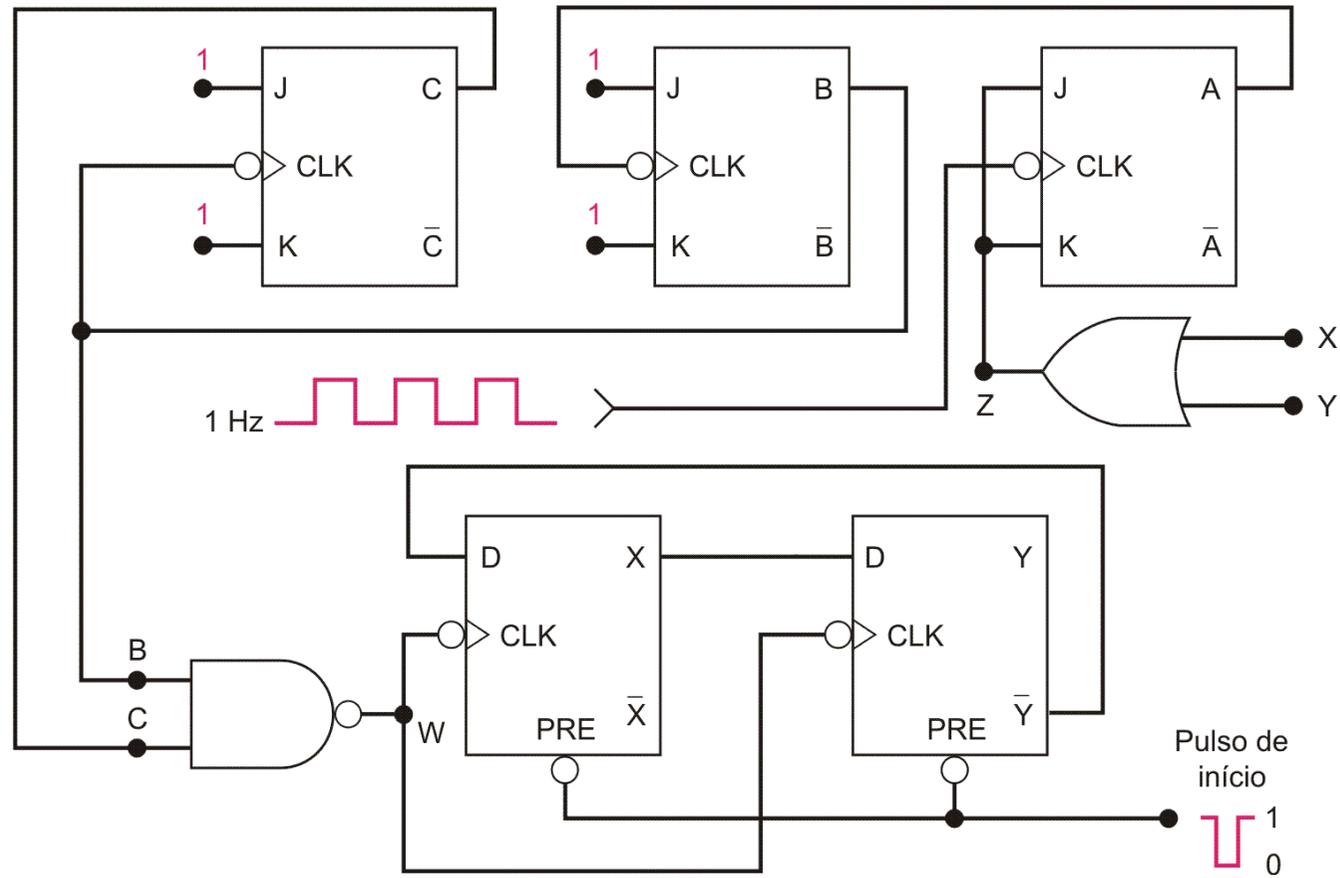


FIGURA 5-75 Problema 5-48.

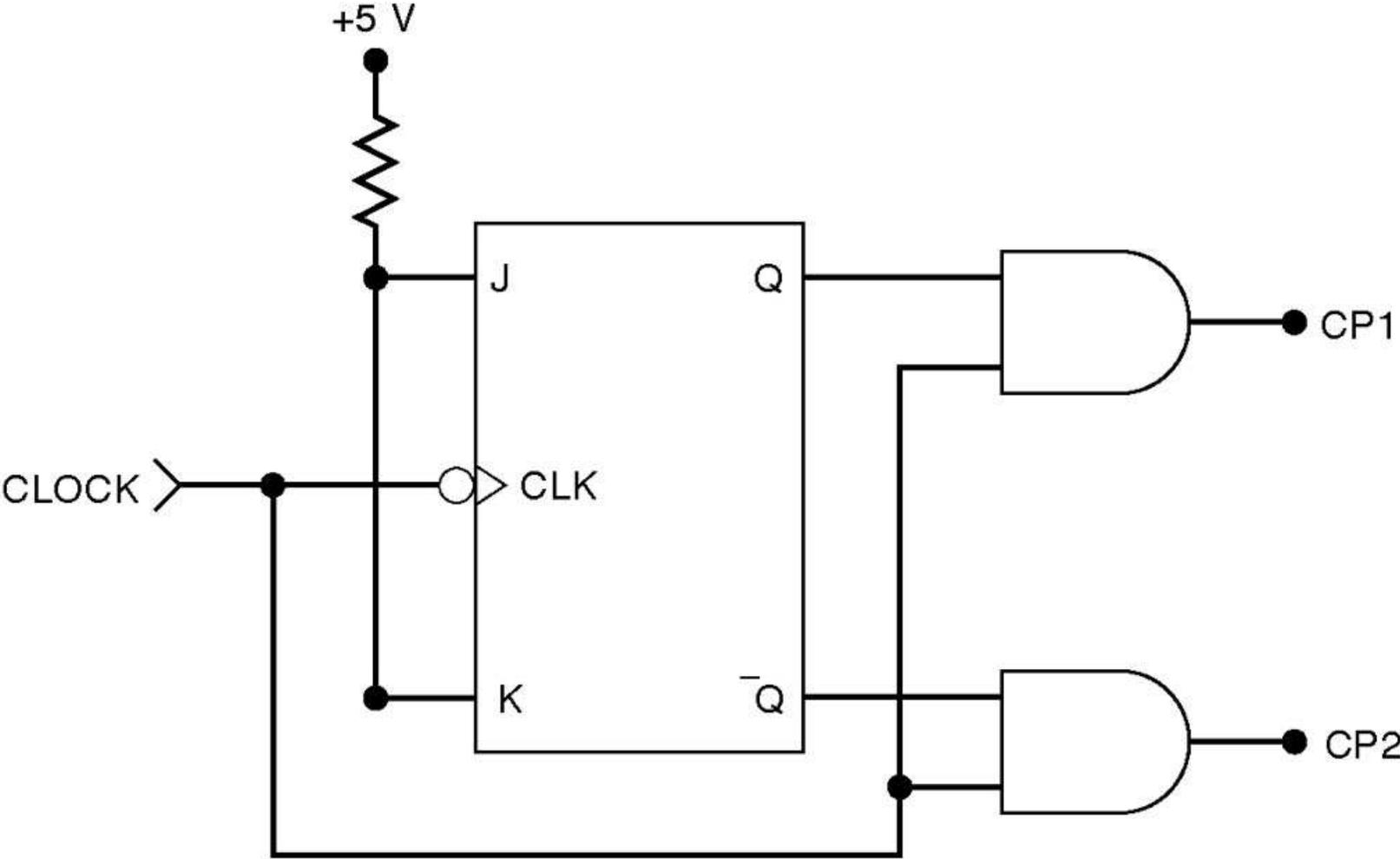


FIGURA 5-76 Problema 5-49.

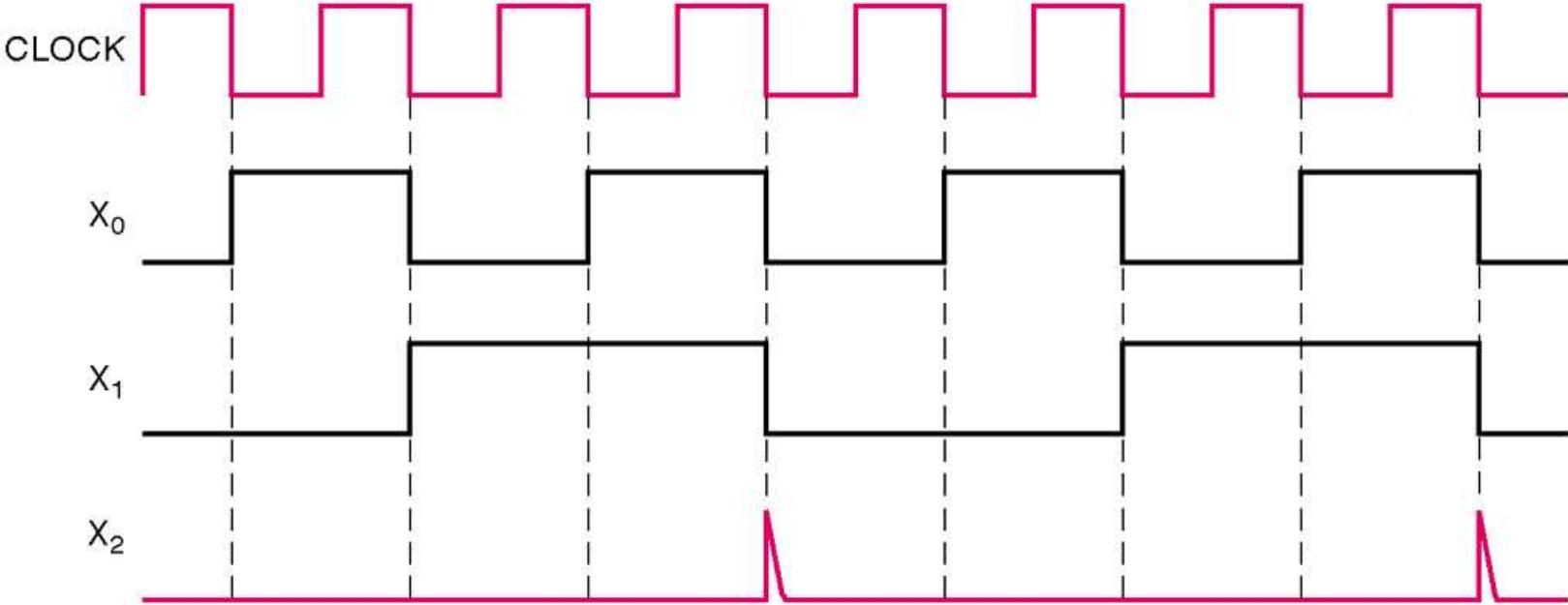


FIGURA 5-77 Problema 5-54.

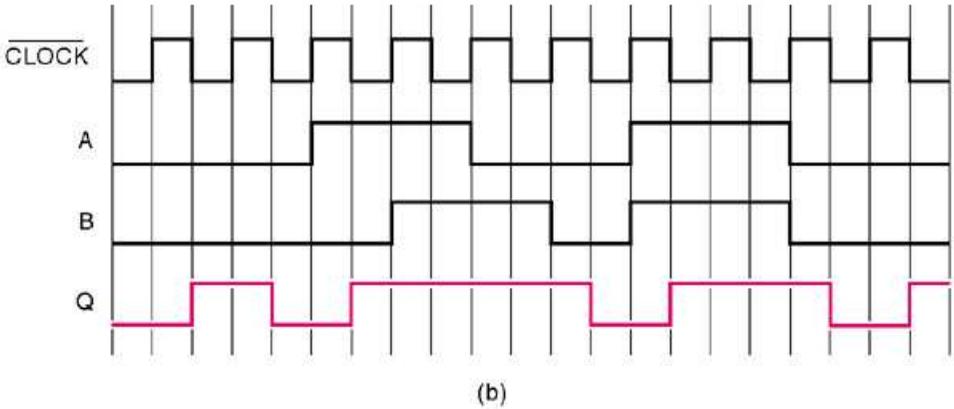
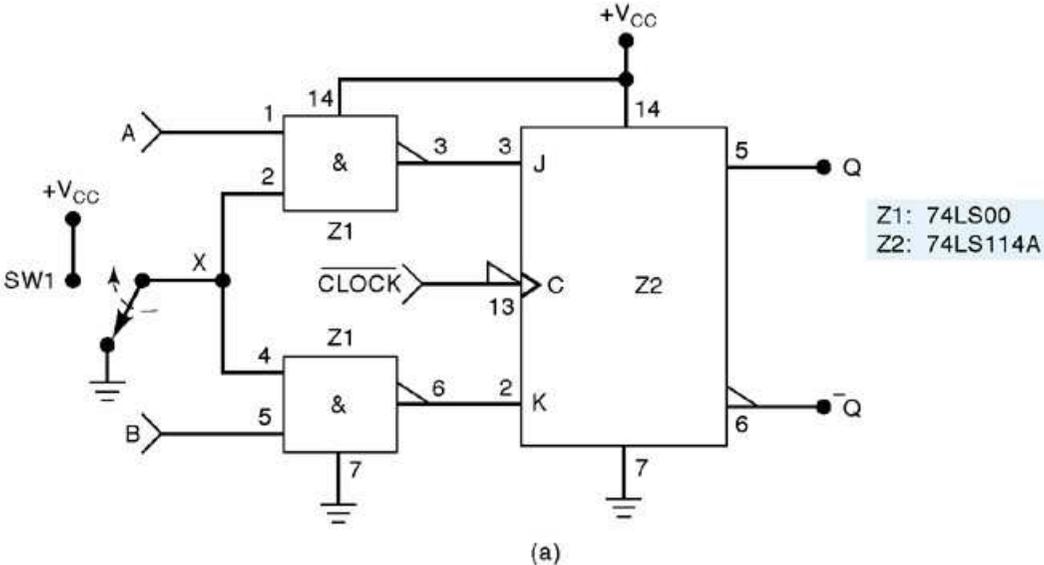


FIGURA 5-78 Problemas 5-55 e 5-56.

