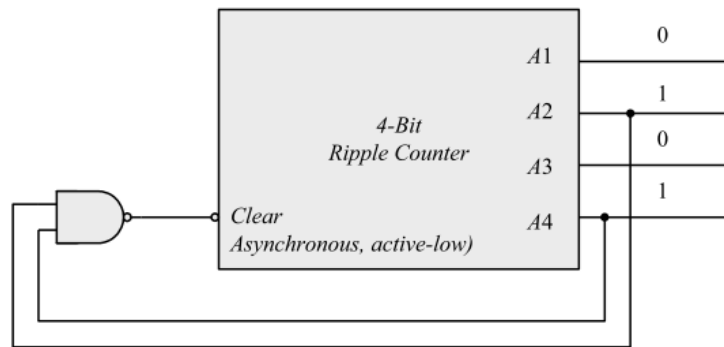


**ITI1100A & IT1500**  
**Assignment # 6**  
**Solutions**

- 6.11**    **(a)** A count down counter.  
**(b)** A count up counter.

**6.13**



- 6.19**    **(b)** From the state table in Table 6.5:

$$D_{Q1} = Q'_1$$

$$D_{Q2} = \sum (1, 2, 5, 6)$$

$$D_{Q4} = \sum (3, 4, 5, 6)$$

$$D_{Q8} = \sum (7, 8)$$

$$\text{Don't care: } d = \sum (10, 11, 12, 13, 14, 15)$$

Simplifying with maps:

$$D_{Q2} = Q_2Q'_1 + Q'_8Q'_2Q_1$$

$$D_{Q4} = Q_4Q'_1 + Q_4Q'_2 + Q'_4Q_2Q_1$$

$$D_{Q8} = Q_8Q'_1 + Q_4Q_2Q_1$$

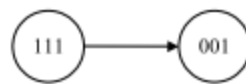
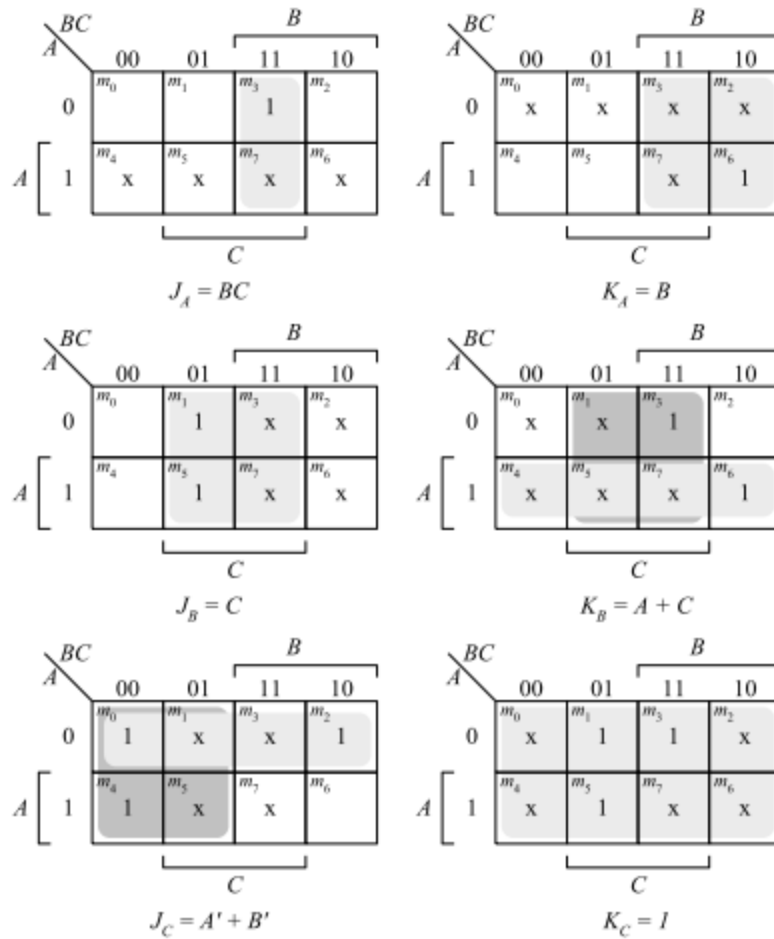
(a)

Present state	Next state	Flip-flop inputs			
		$J_{A_8} K_{A_8}$	$J_{A_4} K_{A_4}$	$J_{A_2} K_{A_2}$	$J_{A_1} K_{A_1}$
0000	0001	0 x	0 x	0 x	1 x
0001	0010	0 x	0 x	1 x	x 1
0010	0011	0 x	0 x	x 0	1 x
0011	0100	0 x	1 x	x 1	x 1
0100	0101	0 x	x 0	0 x	1 x
0101	0110	0 x	x 0	1 x	x 1
0110	0111	0 x	x 0	x 0	1 x
0111	1000	1 x	x 1	x 1	x 1
1000	1001	x 0	0 x	0 x	1 x
1001	0000	x 1	0 x	0 x	x 1

$$\begin{aligned} J_{A_1} &= 1 \\ K_{A_1} &= 1 \\ J_{A_2} &= A_1 A_8' \\ K_{A_2} &= A_1 \\ J_{A_4} &= A_1 A_2 \\ K_{A_4} &= A_1 A_2' \\ J_{A_8} &= A_1 A_2' A_4 \\ K_{A_8} &= A_1 \end{aligned}$$

$$d(A_8, A_4, A_2, A_1) = \Sigma (10, 11, 12, 13, 14, 15)$$

Present state <i>ABC</i>	Next state <i>ABC</i>	Flip-flop inputs					
		$J_A$	$K_A$	$J_B$	$K_B$	$J_C$	$K_C$
000	001	0	x	0	x	1	x
001	010	0	x	1	x	x	1
010	011	0	x	x	0	1	x
011	100	1	x	x	1	x	1
100	100	x	0	0	0	1	x
101	110	x	0	1	x	x	1
110	000	x	1	x	1	0	x
111	xxx	x	x	x	x	x	x



Self-correcting