6.16

Q8 Q4 Q2 Q1 :	1010	1100	1110	Self correcting
Next state:	1011	1101	1111	
Next state:	0100	0100	0000	

$1010 \rightarrow 1011 \rightarrow 0100$
$1100 \rightarrow 1101 \rightarrow 0100$
$1110 \rightarrow 1111 \rightarrow 0000$

6.19

(a)

Present state	*Next state*	*Flip-flop inputs*			
$A_8\,A_4\,A_2\,A_1$	$A_8\,A_4\,A_2\,A_1$	$J_{A8}\,K_{A8}$	$J_{A4}\,K_{A4}$	$J_{A2}\,K_{A2}$	$J_{A1}\,K_{A1}$
0 0 0 0	0 0 0 1	0 x	0 x	0 x	1 x
0 0 0 1	0 0 1 0	0 x	0 x	1 x	x 1
0 0 1 0	0 0 1 1	0 x	0 x	x 0	1 x
0 0 1 1	0 1 0 0	0 x	1 x	x 1	x 1
0 1 0 0	0 1 0 1	0 x	x 0	0 x	1 x
0 1 0 1	0 1 1 0	0 x	x 0	1 x	x 1
0 1 1 0	0 1 1 1	0 x	x 0	x 0	1 x
0 1 1 1	1 0 0 0	1 x	x 1	x 1	x 1
1 0 0 0	1 0 0 1	x 0	0 x	0 x	1 x
1 0 0 1	0 0 0 0	x 1	0 x	0 x	x 1

$J_{A1} = 1$
$K_{A1} = 1$
$J_{A2} = A_1A'_8$
$K_{A2} = A_1$
$J_{A4} = A_1A_2$
$K_{A4} = A_1A_2$
$J_{A8} = A_1A_2A_4$
$K_{A8} = A_1$

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

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

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

$$D_{Q2} = \Sigma(1, 2, 5, 6)$$
$$D_{Q4} = \Sigma(3, 4, 5, 6)$$
$$D_{Q8} = \Sigma(7, 8)$$
Don't care: $d = \Sigma(10, 11, 12, 13, 14, 15)$

Simplifying with maps:
$D_{Q2} = Q_2Q'_1 + Q'_8Q'_2Q_1$
$D_{Q4} = Q_4Q'_1 + Q4Q'2 + Q'_4Q_2Q_1$
$D_{Q8} = Q_8Q'_1 + Q_4Q_2Q_1$

Using JK flip-flops is the most efficient.

6.21 **(a)**

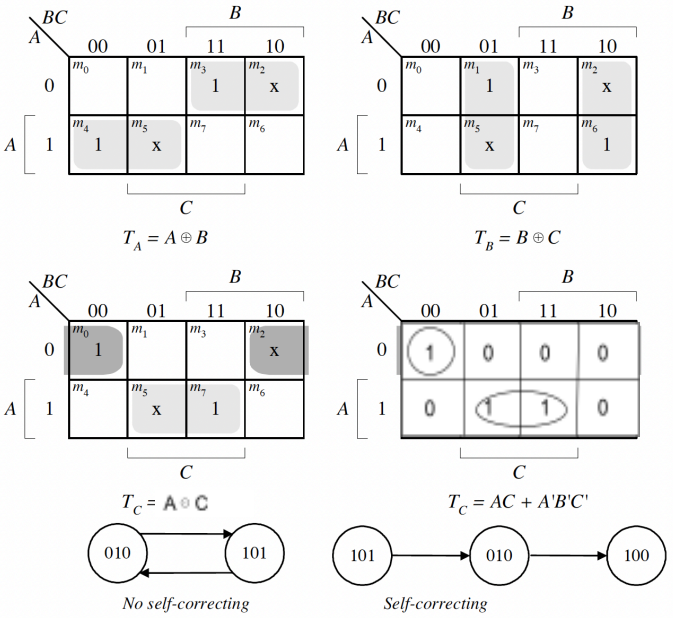
$$J_{A0} = LI_0 + L'C \qquad KA_0 = LI'_0 + L'C$$

(b)

$$J = [L(LI)']'(L + C) = (L' + LI)(L + C)$$
$$LI + L'C + LIC = LI + L'C \text{ (use a map)}$$
$$K = (LI)'(L + C) = (L' + I')(L + C) = LI' + L'C$$

6.24

Present state ABC	*Next state ABC*	*Flip-flop inputs* T_A	T_B	T_C
000	001	0	0	1
001	011	0	1	0
010	xxx	x	x	x
011	111	1	1	0
100	000	1	1	0
101	xxx	x	x	x
110	100	0	1	0
111	110	0	0	1

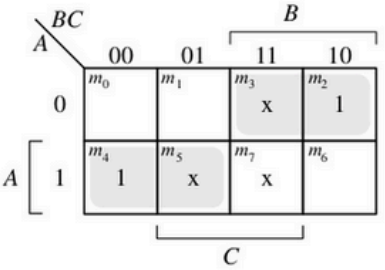


Present state			Next state			FF inputs		
A	B	C	A	B	C	TA	TB	TC
0	0	0	0	0	1	0	0	1
0	0	1	0	1	1	0	1	0

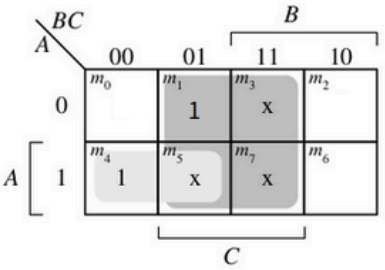
0	1	0	1	0	0	1	1	0
0	1	1	1	1	1	1	0	0
1	0	0	0	0	0	1	0	0
1	0	1	0	1	0	1	1	1
1	1	0	1	0	0	0	1	0
1	1	1	1	1	0	0	0	1

6.28

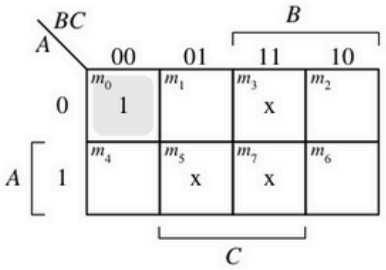
Present state ABC	*Next state ABC*
000	001
001	010
010	100
011	xxx
100	110
101	xxx
110	000
111	xxx



$D_A = A \oplus B$

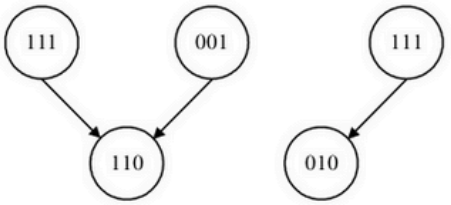


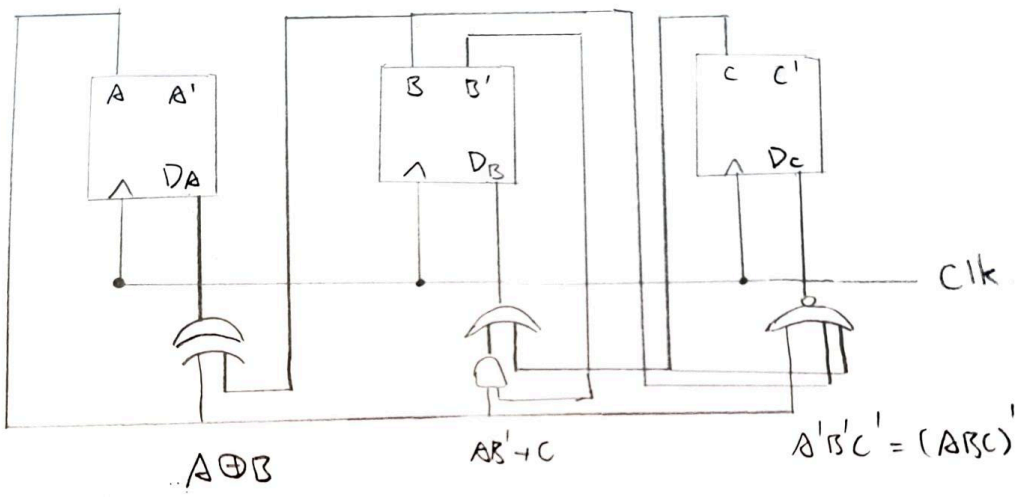
$D_B = AB' + C$



$D_C = A'B'C'$

Self-correcting




A
A'
DA
B
B'
DB
C
C'
DC
Clk
A⊕B
AB'+C
A'B'C' = (ABC)'