

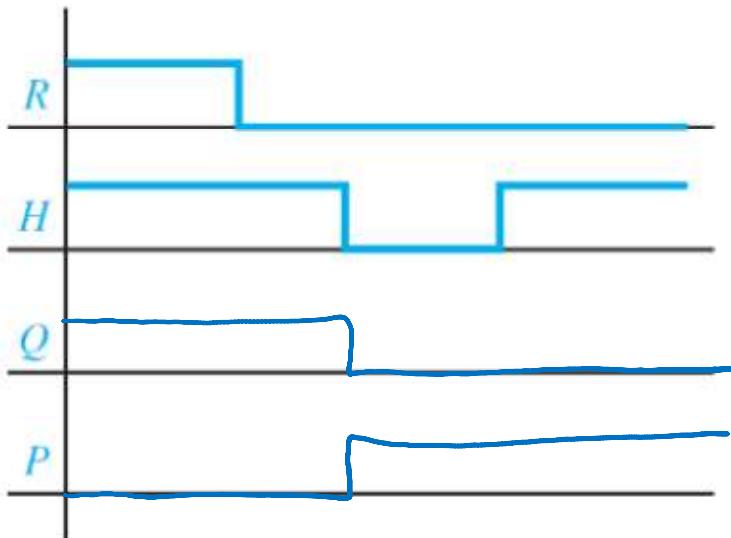
III.2 a) $R=1$ and $H=0$ cannot occur at the same time

R	H	Q	Q^+
0	0	0	0
0	1	0	0
1	0	0	X
1	1	0	X

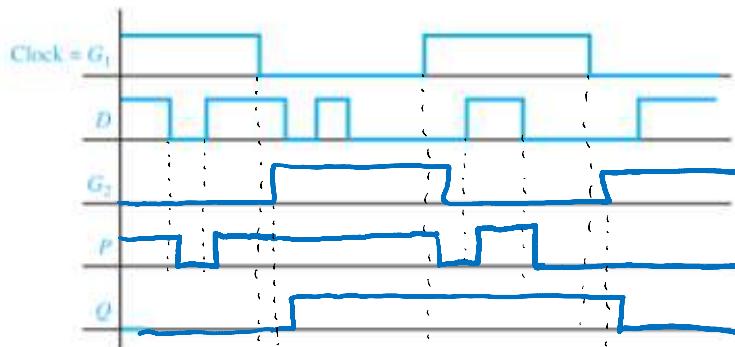
$R \cdot H$	00	01	11	10
Q	0	0	1	X
0	0	0	1	X
1	0	1	1	X

$$Q^+ = R + H Q$$

c)



III.5 The inverter must be moved from G_1 to G_2



A	B	Q	Q^+
0	0	0	0
0	1	1	0
1	0	0	0
1	1	0	0

$A \cdot B$	00	01	11	10
Q	0	0	1	0
0	0	0	1	0
1	0	1	1	1

$$Q^+ = AB + BQ + AQ$$

$$Q^+ = AB + Q(A+B) - \frac{NAND}{NAND}$$

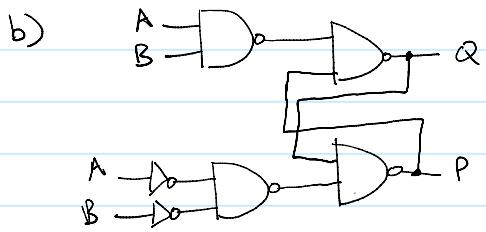
$$= (A' \cdot B') \cdot (A + B')$$

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

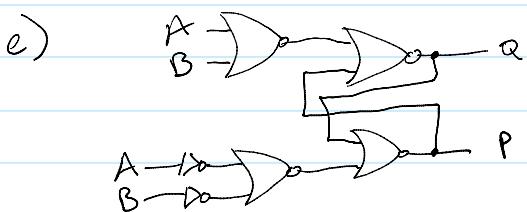


$$Q^+ = AB + Q(A+B) \quad -\text{NAND}$$

$$Q^+ = (A'+B')(Q'+AB') \quad -\text{NOR}$$



- c) $AB = 01$ to 10 could cause Q to change if the inverter delays are significant enough
- d) $P = Q' + AB$ in all states, but does not strictly provide Q'



- c) Same as above
- d) $P = Q'(A'+B')$ in all states but does not strictly provide Q'

11.15

a)

$$\begin{aligned} Q^+ &= [P + (M+N+G)']' \\ &= P'(M+N+G) \\ &= [Q'(N+G+M'N'G')]' (M+N+G) \\ &= [Q + (N'G'(M+N+G))] (M+N+G) \\ &= (Q + MN'G') (M+N+G) \\ &= Q(M+N+G) + MN'G' \end{aligned}$$

$$\begin{aligned} P &= [Q + (N+G+(M+N+G)')']' \\ &= Q'(N+G+(M+N+G)') \\ &= Q'(N+G+M'N'G') \end{aligned}$$

b)

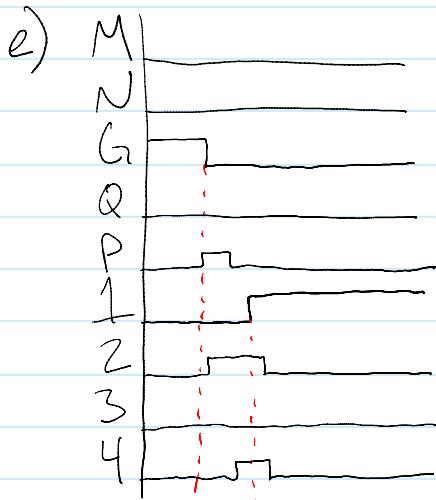
Pres. state	Next State (Q^+)							
	MNG							
Q	000	001	010	011	100	101	110	111
0	0	0	0	0	1	0	0	0
1	0	1	1	1	1	1	1	1

c) No restrictions

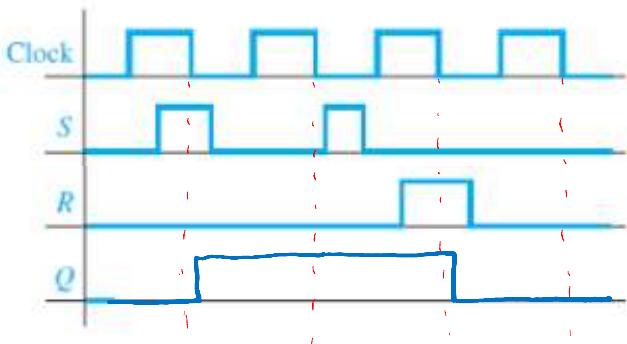
d) $P = Q[N+G+M'N'G'] = Q'[N+G+M]$

$$d) P = Q [N + G + M'N'G'] = Q'[N + G + M]$$

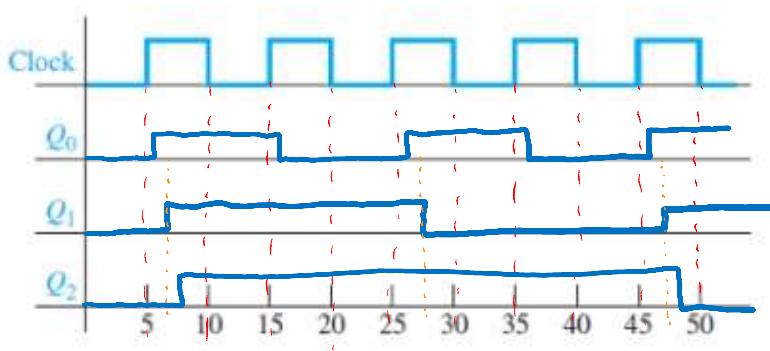
For all stable states, $P = Q'$.



11.21



11.24



12.7

A	B	C	A^*	B^*	C^*
0	0	0	X	X	X
0	0	1	0	1	1
0	1	0	1	1	0
0	1	1	0	1	0

A^*

	AB	C	00	01	11	10
0	X		1	1	0	
1	0	0	0	1	1	

B^*

	AB	C	00	01	11	10
0	X		1	1	0	
1	0	0	1	1	1	

$$A^* = BC' + AC$$

$$B^* = A' + BC'$$

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

	AB	00	01	11	10
C					
0	X	1	1	0	0
1	1	1	0	0	0

$$B^+ = A' + BC'$$

	AB	00	01	11	10
C					
0	X	0	1	1	0
1	1	0	1	0	0

$$C^+ = A'B' + AC' + AB$$

- 000 will go to 011

b)	T_A	AB	00	01	11	10
			X	1	0	1
0			1	0	0	0
1			0	0	0	0

$$T_A = B'C' + A'C$$

	T_B	AB	00	01	11	10
			X	0	0	0
0			1	0	1	0
1			0	1	0	0

$$T_B = A'B' + ABC$$

	T_C	AB	00	01	11	10
			X	0	1	1
0			1	0	1	0
1			0	1	0	1

$$T_C = AB' + AC' + A'BC$$

- 000 will go to 110

12.8

$A \ B \ C$	$A^+ \ B^+ \ C^+$
0 0 0	X X X
0 0 1	0 1 1
0 1 0	1 1 0
0 1 1	0 1 0
1 0 0	0 0 1
1 0 1	1 0 0
1 1 0	1 1 1
1 1 1	1 0 1

	A^+	AB	00	01	11	10
			X	1	1	0
0			1	0	1	1
1			0	0	1	1

	B^+	AB	00	01	11	10
			X	1	1	0
0			1	1	1	0
1			0	0	0	0

	C^+	AB	00	01	11	10
			X	0	1	1
0			1	0	1	0
1			0	0	1	0

a)	J_A	AB	00	01	11	10
			X	1	X	X
0			1	0	0	X
1			0	0	X	X

$$J_A = C'$$

$$K_A = B'C'$$

	K_A	AB	00	01	11	10
			X	1	0	1
0			1	X	X	0
1			X	X	0	0

$$J_B = C'$$

$$K_B = B'C'$$

	J_B	AB	00	01	11	10
			X	X	X	0
0			1	X	X	0
1			0	1	X	0

$$J_B = A'$$

$$K_B = AC$$

S_C	1	U	X	X	0
S_A	00	01	11	10	
0	X	0		1	1
1	X	X	X	X	

K_C	1	X	0	1	X
K_B	00	01	11	10	
0	X		X	X	X
1	0	1	0	1	

$$K_B = AC$$

$$J_C = A$$

$$K_C = A'B + AB'$$

At 000: $J_A = 1 \quad K_A = 1$

$$J_B = 1 \quad K_B = 0$$

$$J_C = 0 \quad K_C = 0$$

$\xrightarrow{\hspace{10em}}$ 000 goes to 110

S_A	00	01	11	10
0	X	1	X	0
1	0	0	X	X

R_A	00	01	11	10
0	X	0	0	1
1	X	X	0	0

$$S_A = A'C'$$

$$R_A = B'C'$$

S_B	00	01	11	10
0	X	X	X	0
1	1	X	0	0

R_B	00	01	11	10
0	X	0	0	X
1	0	0	1	X

$$S_B = A'$$

$$R_B = AC$$

S_C	00	01	11	10
0	X	0	1	1
1	X	0	X	0

R_C	00	01	11	10
0	X	X	0	0
1	0	1	0	1

$$S_C = AC'$$

$$R_C = A'B + AB'C$$

At 000: $S_A = 1 \quad R_A = 1$

$$S_B = 1 \quad R_B = 0$$

$$S_C = 0 \quad R_C = 0$$

$\xrightarrow{\hspace{10em}}$ 000 goes to 010