BÀI TẬP MẠCH TUẦN TỰ - MÁY TRẠNG THÁI

Sách Principle of Digital Design

6.1 a) Width 5ns and Period 20ns

$$F = \frac{1}{T} = \frac{1}{20.10^{-9}} = 50\ MHz$$

$$\text{Duty Circle} = \frac{\text{Width}}{\text{Period}} = \frac{5}{20} = 25\%$$

b) Width 10ns and Period 100ns

$$F = \frac{1}{T} = \frac{1}{100.10^{-9}} = 10MHz.$$

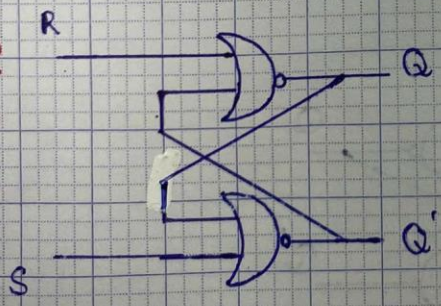
$$\text{Duty Circle} = \frac{\text{Width}}{\text{Period}} = \frac{10}{100} = 10\%$$

c) Width 100ns and Period 1ns

$$F = \frac{1}{T} = \frac{1}{10^{-9}} = 1\ GHz.$$

$$\text{Duty Circle} = \frac{\text{Width}}{\text{Period}} = \frac{100}{1\ (GHz)} = 10000\%$$

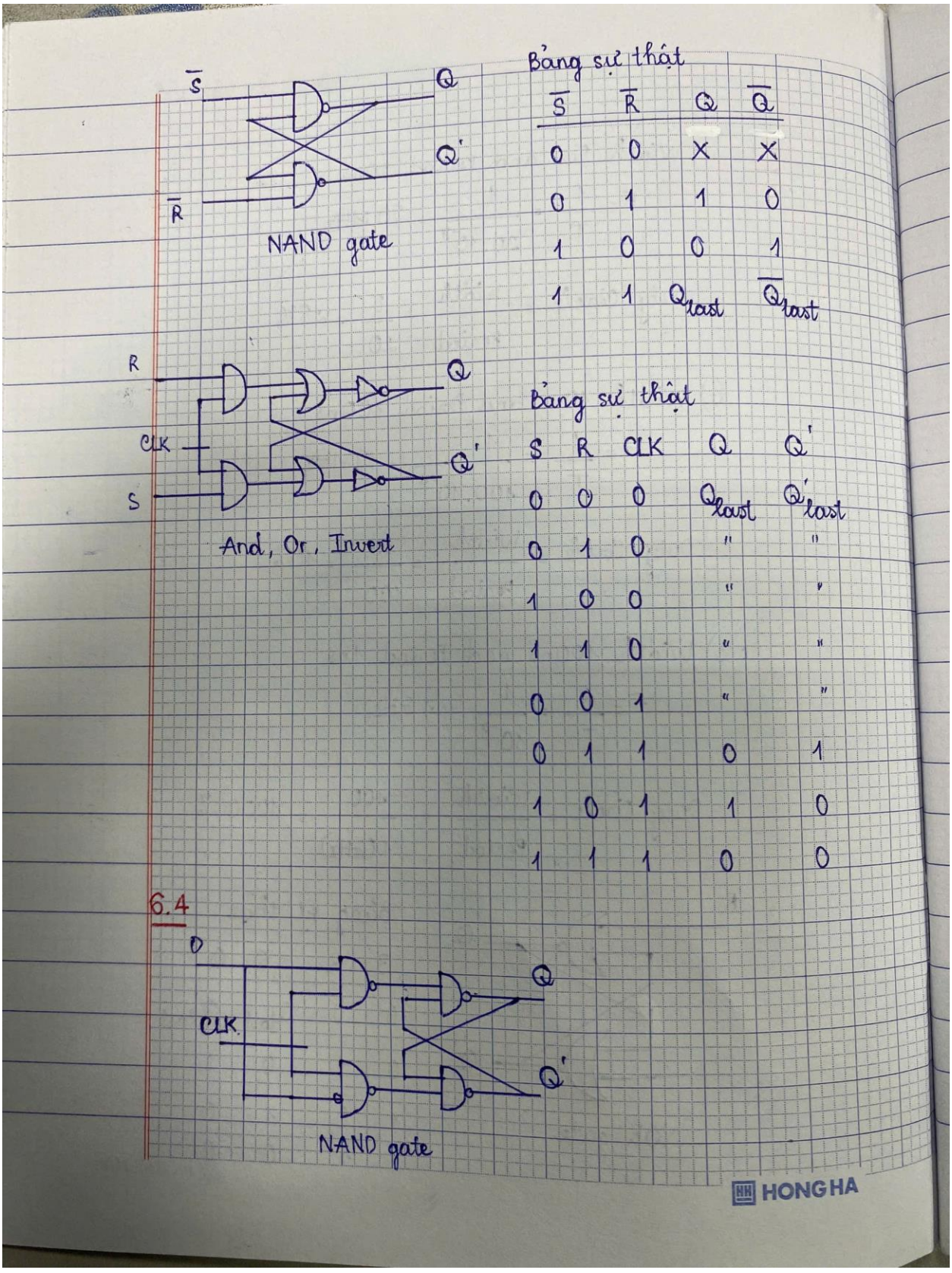
6.3



NOR gate

Bảng sự thật

S	R	Q	Q'
0	0	Q_{last}	Q'_{last}
0	1	0	1
1	0	1	0
1	1	0	0



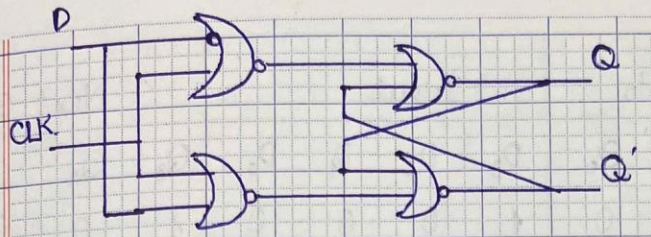
Bảng sự thật

$\overline{S}$	$\overline{R}$	Q	$\overline{Q}$
0	0	X	X
0	1	1	0
1	0	0	1
1	1	Q_{last}	$\overline{Q}_{last}$

Bảng sự thật

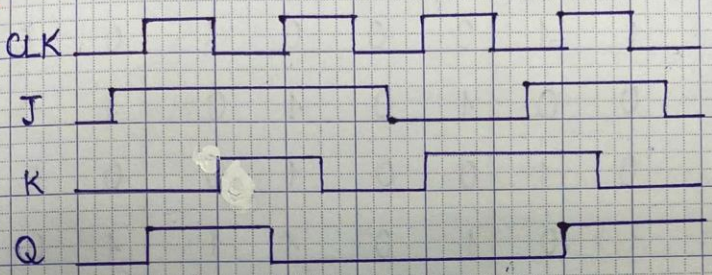
S	R	CLK	Q	Q'
0	0	0	Q_{last}	Q'_{last}
0	1	0	"	"
1	0	0	"	"
1	1	0	"	"
0	0	1	"	"
0	1	1	0	1
1	0	1	1	0
1	1	1	0	0

6.4



NOR gate.

6.6



6.7

FF - D : $Q_{next} = D$

FF - T : $Q_{next} = TQ' + T'Q$

FF - SR : $Q_{next} = S + R'Q$

FF - JK : $Q_{next} = JQ' + K'Q$

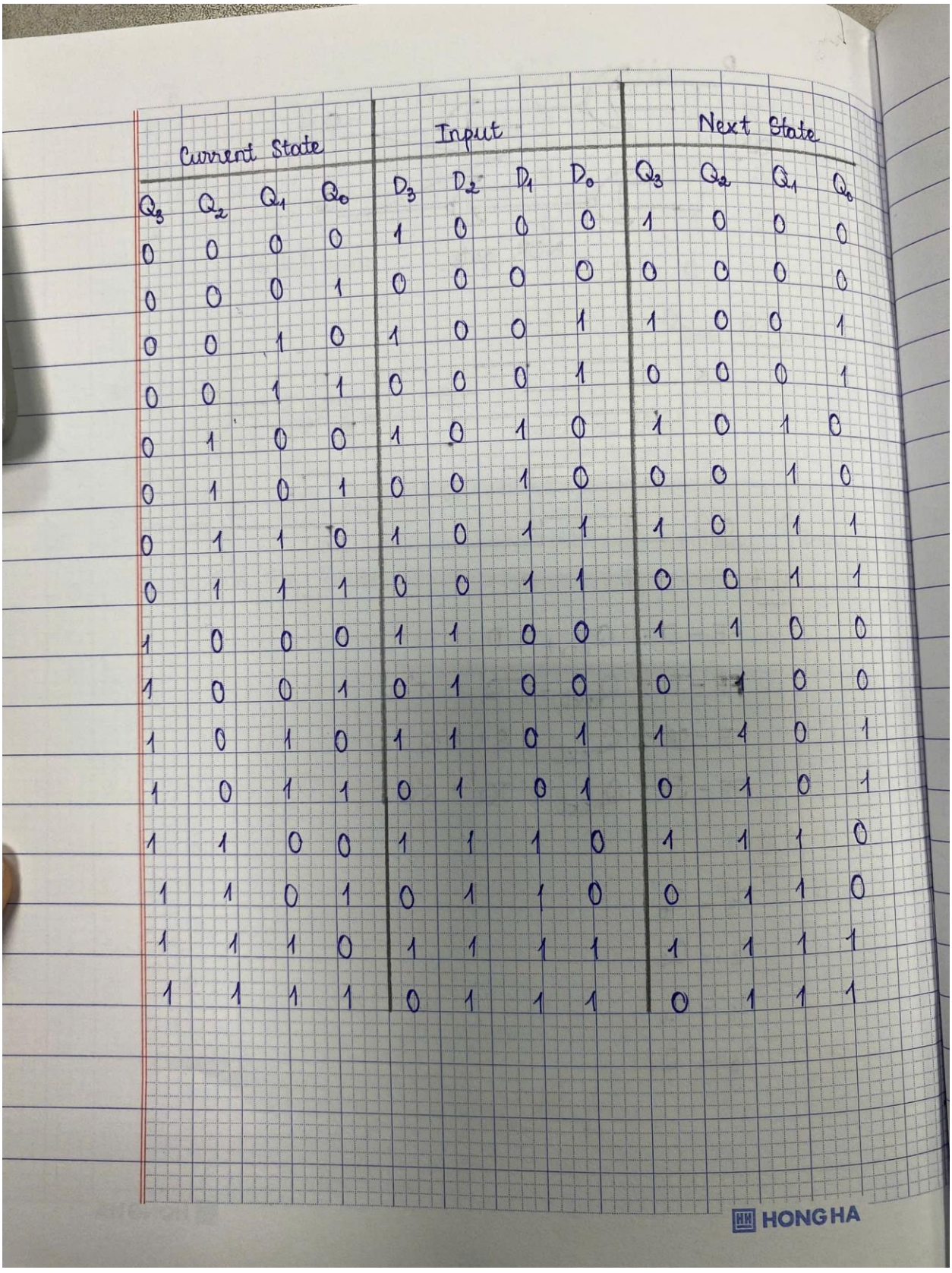
6.9

$D_3 = Q_0'$

$D_2 = Q_3$

$D_1 = Q_2$

$D_0 = Q_1$



Current State				Input				Next State			
Q_3	Q_2	Q_1	Q_0	D_3	D_2	D_1	D_0	Q_3	Q_2	Q_1	Q_0
0	0	0	0	1	0	0	0	1	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	1	1	0	0	1
0	0	1	1	0	0	0	1	0	0	0	1
0	1	0	0	1	0	1	0	1	0	1	0
0	1	0	1	0	0	1	0	0	0	1	0
0	1	1	0	1	0	1	1	1	0	1	1
0	1	1	1	0	0	1	1	0	0	1	1
1	0	0	0	1	1	0	0	1	1	0	0
1	0	0	1	0	1	0	0	0	1	0	0
1	0	1	0	1	1	0	1	1	1	0	1
1	0	1	1	0	1	0	1	0	1	0	1
1	1	0	0	1	1	1	0	1	1	1	0
1	1	0	1	0	1	1	0	0	1	1	0
1	1	1	0	1	1	1	1	1	1	1	1
1	1	1	1	0	1	1	1	0	1	1	1

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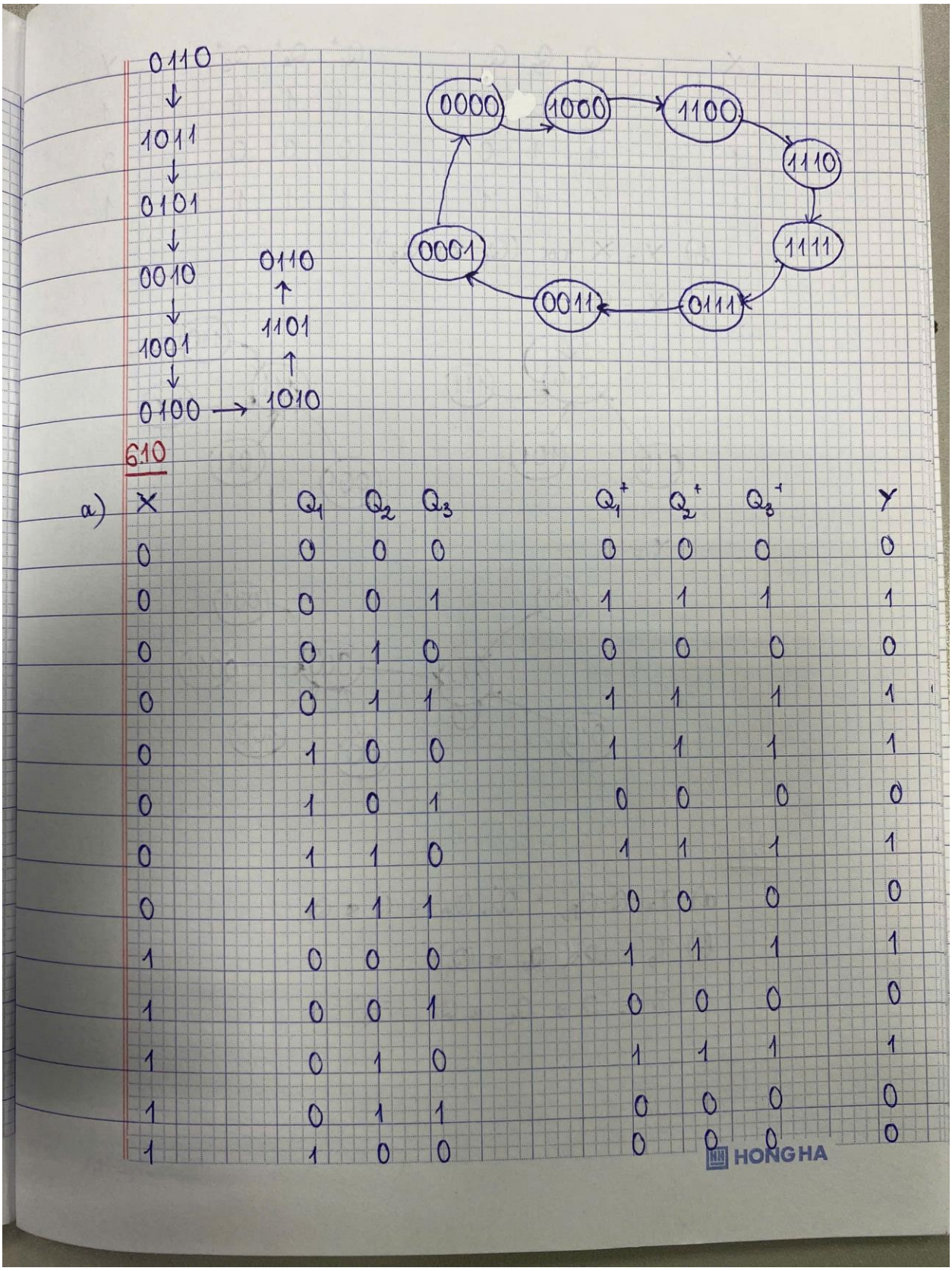


6.10

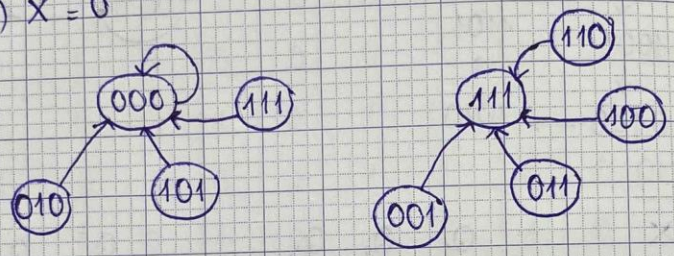
a)

X	Q_1	Q_2	Q_3	Q_1^+	Q_2^+	Q_3^+	Y
0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1
0	0	1	0	0	0	0	0
0	0	1	1	1	1	1	1
0	1	0	0	1	1	1	1
0	1	0	1	0	0	0	0
0	1	1	0	1	1	1	1
0	1	1	1	0	0	0	0
1	0	0	0	1	1	1	1
1	0	0	1	0	0	0	0
1	0	1	0	1	1	1	1
1	0	1	1	0	0	0	0
1	1	0	0	0	0	0	0

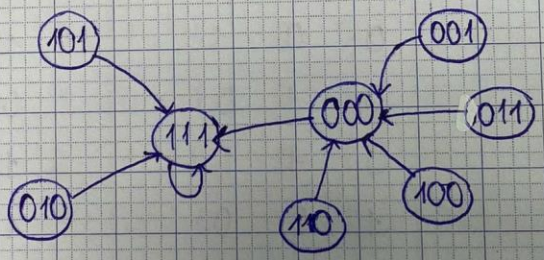
X	Q_1	Q_2	Q_3	Q_1^+	Q_2^+	Q_3^+	Y
1	1	0	1	1	1	1	1
1	1	1	0	0	0	0	0
1	1	1	1	1	1	1	1

b) $Y = X \text{ xor } (Q_1 \text{ xor } Q_3)$

c) $X = 0$



$X = 1$



6.11

a) $T = Q.Q_n' + Q'.Q_n = Q \otimes Q_n$

b) $T_0 = (D \otimes Q_0 \otimes Q_1)'$

$T_1 = D \otimes Q_0 \otimes Q_1 = T_0'$

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D	Q_0	Q_1	T	Q_{0n}	Q_{1n}
0	0	0	0	0	1
0	0	1	1	1	1
0	1	0	1	0	1
0	1	1	0	1	0
1	0	0	1	1	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	0	0	0

$Q_{0n} = D'Q_1 + Q_0'Q_1 + DQ_1'$

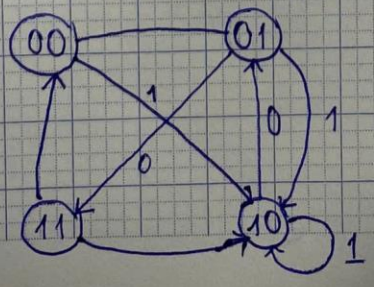
$= D \otimes Q_1 + Q_0'Q_1$

$Q_{1n} = D'Q_0' + D'Q_1'$

c) $Y_1 = Q_0$, $Y_0 = Q_1$

Q_1	Q_0	Y_1	Y_0
0	0	0	0
0	1	1	0
1	0	0	1
1	1	1	1

d)



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