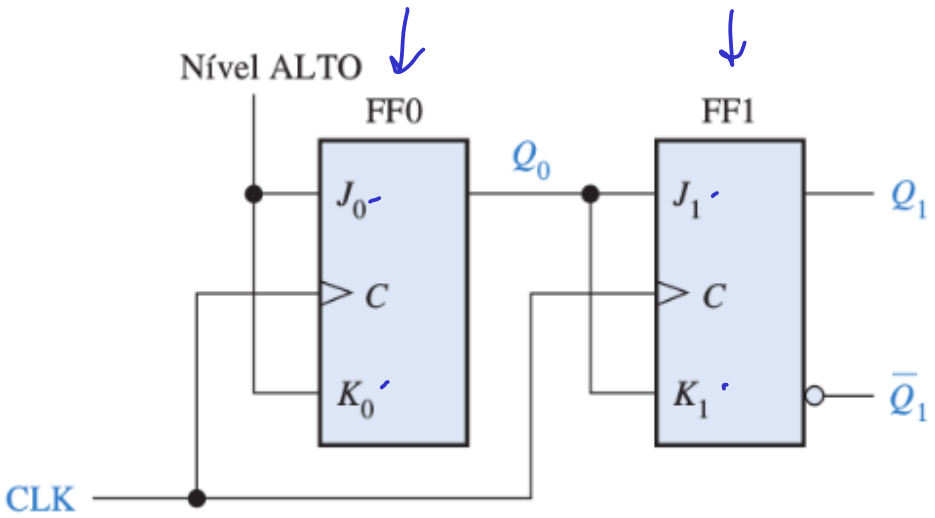
MAC0329 25/06/2020

BOM DIA!



J	K	Q	Q^*
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

$Q^* = ? \quad J\overline{Q} + \overline{K}Q$

JK \ Q	0	1
00	0	1 — $\overline{K}Q$
01	0	0
11	1	0
10	1	1

$J\overline{Q}$

1) Sinais do J e K

$J_0 = K_0 = 1$

$J_1 = K_1 = Q_0$

2) Equação do próximo estado

$Q_0^* = J_0\overline{Q}_0 + \overline{K}_0 Q_0$

$= 1\,\overline{Q}_0 + 0\,Q_0 = \overline{Q}_0$

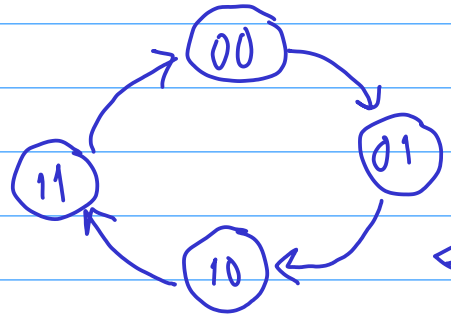
$Q_1^* = J_1\overline{Q}_1 + \overline{K}_1 Q_1$

$= Q_0\overline{Q}_1 + \overline{Q}_0 Q_1 = Q_0 \oplus Q_1$

3) Tabela de transição de estados

$Q_1 Q_0$	$Q_1^* Q_0^*$
0 0	0 1
0 1	1 0
1 0	1 1
1 1	0 0

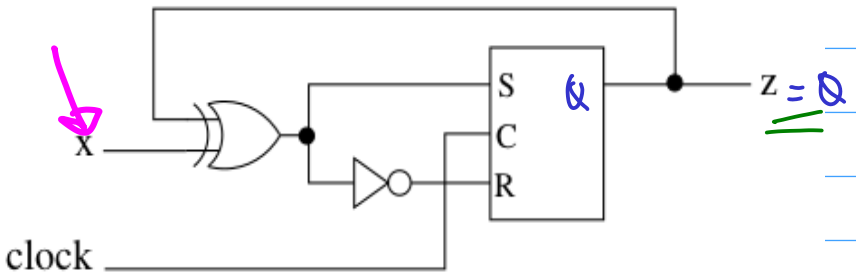
4) Diagrama de Trans. Estados



← contador de 2 bits módulo 2^2

$S=R=1 \Rightarrow$ don't care

$$Q^* = S + Q\bar{R}$$



1) Sinal de S e R

$S = x \oplus Q$

$R = \overline{x \oplus Q} = \bar{S}$

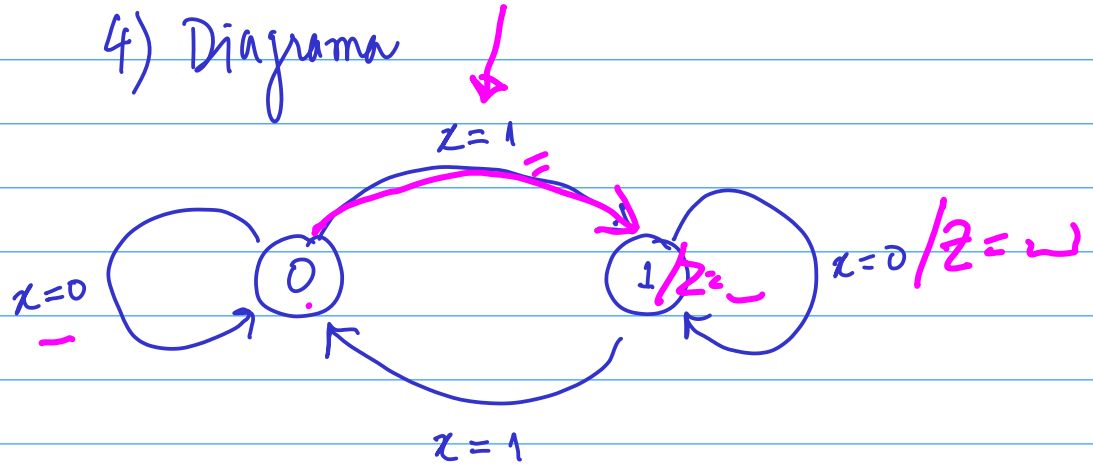
2) Próximo estado Q^*

$$Q^* = \underbrace{x \oplus Q}_{S} + Q\overline{(x \oplus Q)} = x \oplus Q = S$$
$$+ QS = S$$

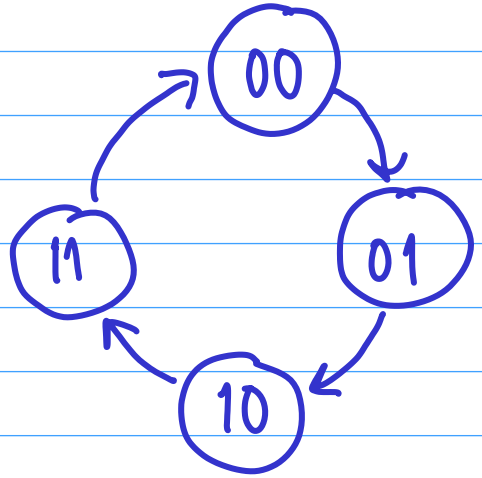
3) Tabela de Trans. Est.

Q	Q^*/z	
	x=0	x=1
0	0/0	1/1 → Q^*/z
1	1/1	0/0

4) Diagrama



Projeto de circuitos sequenciais

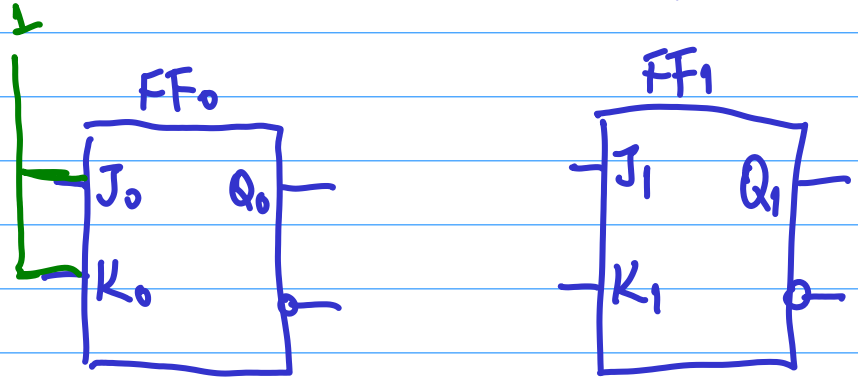
① 

Q_1	Q_0	Q_1^*	Q_0^*
0	0	0	1
0	1	1	0
1	0	1	1
1	1	0	0

$Q \to Q^*$	J	K
0 → 0	0	x
0 → 1	1	x
1 → 0	x	1
1 → 1	x	0

$Q_0^* = f_0(Q_0, Q_1)$ $\quad Q_1^* = f_1(Q_0, Q_1)$

② Quantos FFs ? 2 flip-flops



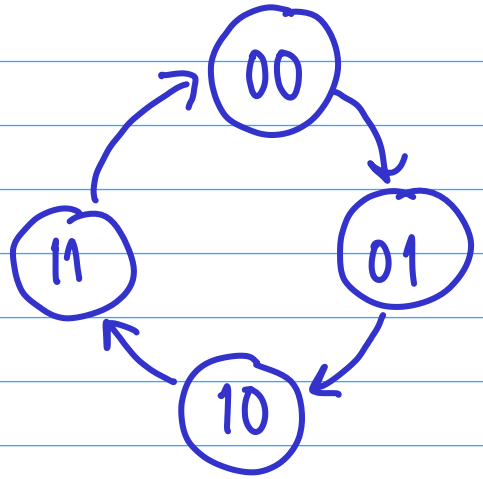
Q_1 \ Q_0	0	1
0	1	x
1	1	x

$J_0 = 1$

Q_1 \ Q_0	0	1
0	x	1
1	x	1

$K_0 = 1$

Projeto de circuitos sequenciais

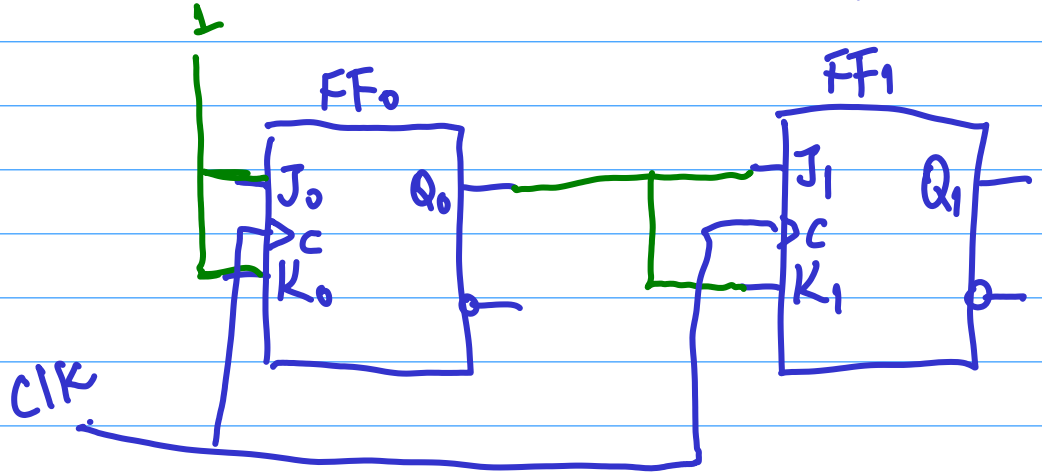
① 

Q_1 Q_0	Q_1^*	Q_0^*
0 0	0	1
0 1	1	0
1 0	1	1
1 1	0	0

$Q \to Q^*$	J	K
0 → 0	0	x
0 → 1	1	x
1 → 0	x	1
1 → 1	x	0

$Q_0^* = f_0(Q_0, Q_1)$ $\quad Q_1^* = f_1(Q_0, Q_1)$

② Quantos FFs ? 2 flip-flops

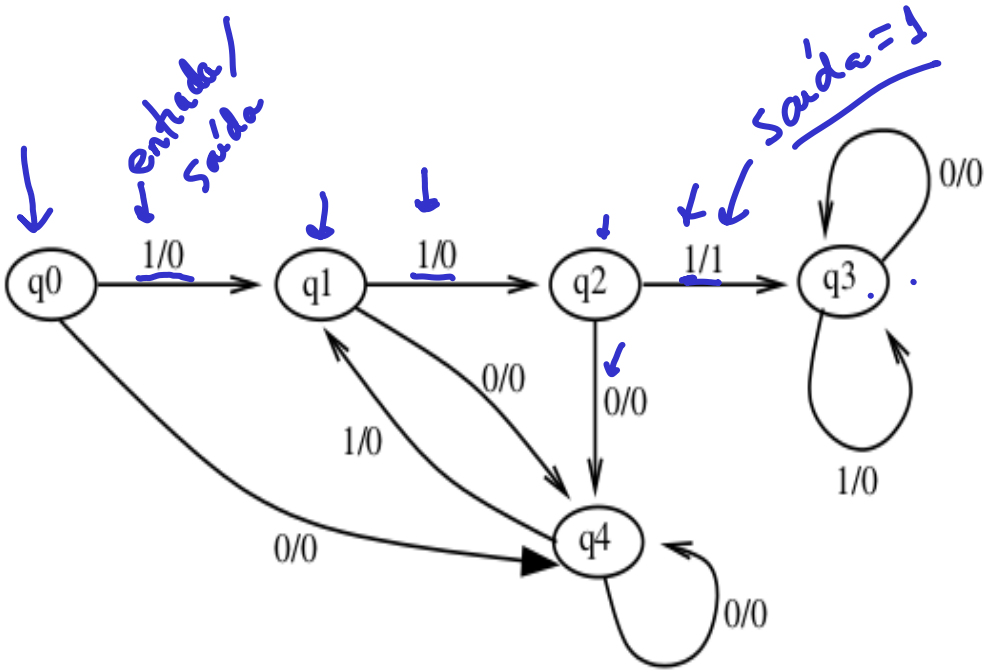


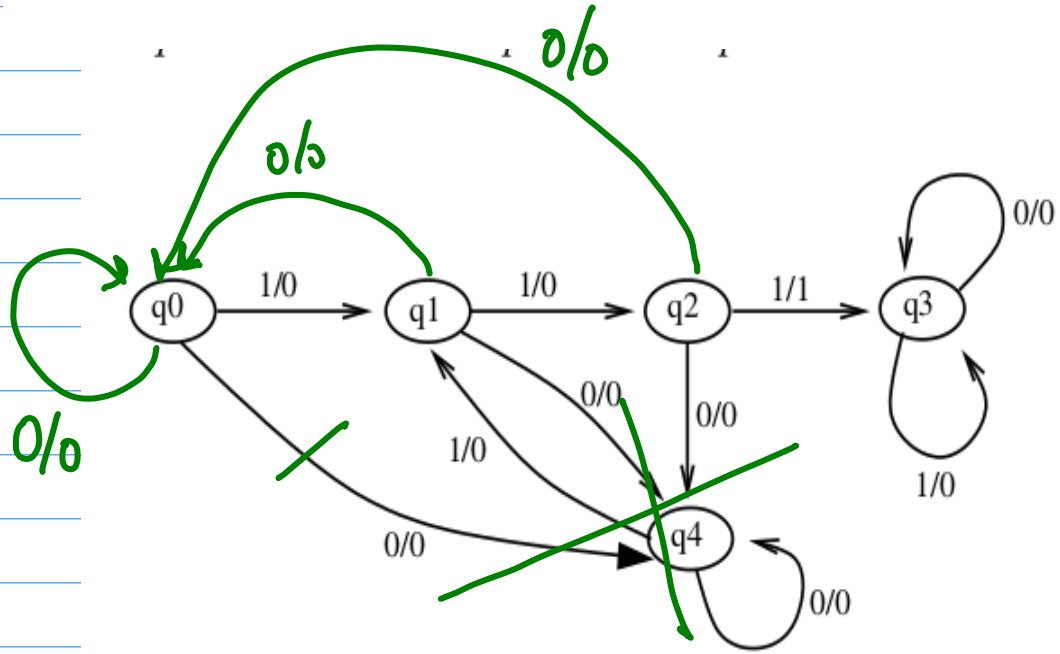
Q_1 \ Q_0	0	1
0	0	1
1	x	x

$J_1 = Q_0$

Q_1 \ Q_0	0	1
0	x	x
1	0	1

$K_1 = Q_0$





Estado atual	*Próx. estado/saída*	
	$x = 0$	$x = 1$
q_0	$q_0/0$	$q_1/0$
q_1	$q_0/0$	$q_2/0$
q_2	$q_0/0$	$q_3/1$
q_3	$q_3/0$	$q_3/0$
q_4	$q_4/0$	$q_1/0$

Estado atual	Próximo estado x=0	Próximo estado x=1
a	a/0	c/0
b	a/0	d/1
c	a/0	b/0
d	d/0	d/0

Estados	Associação 1	Associação 2	Associação 3
a	00	00	00
b	01	11	10
c	11	01	01
d	10	10	11

x 1

x 1

Associação 3 — $Q_1^* Q_0^*$

	$Q_1 Q_0$	x=0	x=1
a	00	00	01
b	10	00	11
c	01	00	10
d	11	11	11

$Q_1 Q_0$ \ x	0	1
00		—
01		
11		
10		

$Q_1 Q_0$ \ x	0	1
00	—	
01		
11		
10		

$J_1 =$

$K_1 =$

Estado atual	Próximo estado $x=0$	Próximo estado $x=1$
a	a / 0	c / 0
b	a / 0	d / 1
c	a / 0	b / 0
d	d / 0	d / 0

$Q \to Q^*$	J	K
$0 \to 0$	0	x
$0 \to 1$	1	x
$1 \to 0$	x	1
$1 \to 1$	x	0

$$Z = x Q_1 \bar{Q}_0$$

Associação 3

	$Q_1 Q_0$	$x=0$ ($Q_1^* Q_0^*$)	$x=1$
a	00	00	01
b	10	00	11
c	01	00	10
d	11	11	11

Q_1Q_0 \ x	0	1
00	0	0
01	0	1
11	x	x
10	x	x

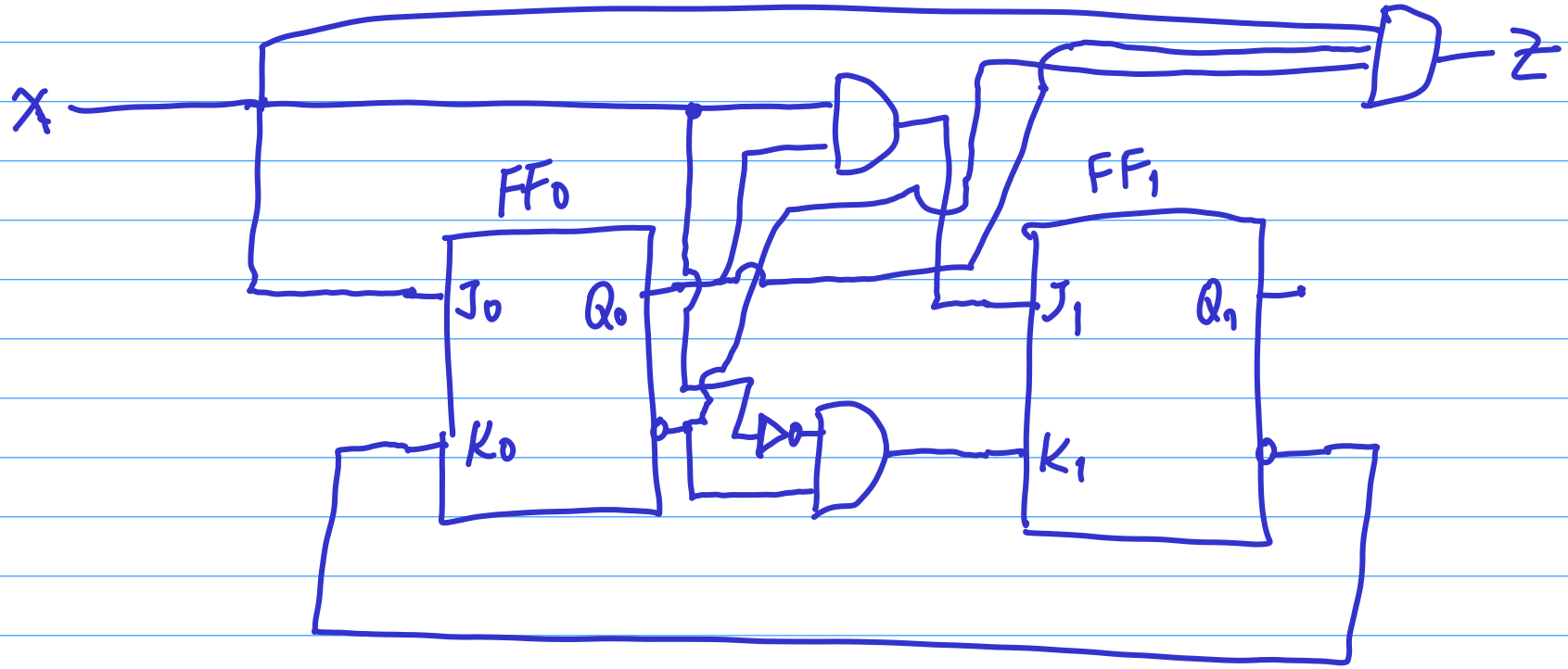
$$J_1 = Q_0 x$$

Q_1Q_0 \ x	0	1
00	x	x
01	x	x
11	0	0
10	1	0

$$K_1 = \bar{Q}_0 \bar{x}$$

$J_0 = x$ $\quad J_1 = xQ_0 \quad Z = xQ_1\bar{Q}_0$

$K_0 = \bar{Q}_1 \quad K_1 = \bar{x}\bar{Q}_0$



Mealy → saída depende de Q e de X

Moore → saída depende de Q

Máquina de estados

$(Q, q_0, \Sigma, O, \delta, \lambda)$

- Q: conj. estados
- Σ: alf. entrada
- O: alf. saída
- δ: transição de est. $\delta: Q \times \Sigma \to Q$
- λ: $\lambda: Q \times \Sigma \to O$ ou $\lambda: Q \to O$