

# Laboratório 7: (resolução)

## Exercício 22: Biestáveis JK, T e D

a) A partir de um flip-flop JK implemente um flip-flop do tipo T (entrada T e saída QT)

		Source		
		Target		
T	Q <sub>T</sub>	Q' <sub>T</sub>	J	K
0	0	0	0	X
0	1	1	X	0
1	0	1	1	X
1	1	0	X	1

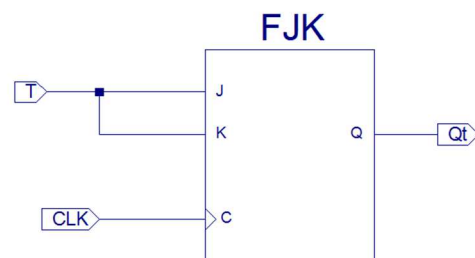
J	K	Q' <sub>JK</sub>	Q <sub>JK</sub>	Q' <sub>JK</sub>	J	K
0	0	Q	0	0	0	X
0	1	0	0	1	1	X
1	0	1	1	0	X	1
1	1	Q̄	1	1	X	0

T	0	1
Q <sub>T</sub>	0	1
1	X	X

$$J = T$$

T	0	1
Q <sub>T</sub>	X	X
1	0	1

$$K = T$$

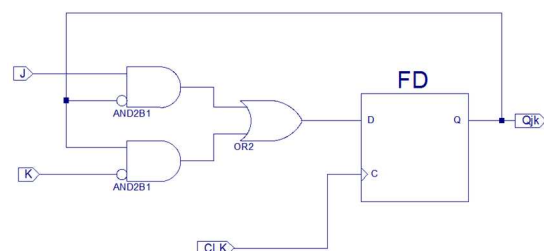


b) A partir de um flip-flop D implemente um flip-flop do tipo JK (entradas J e K, saída QJK)

		Source		
		Target		
J	K	Q <sub>jk</sub>	Q' <sub>jk</sub>	D
0	0	0	0	0
0	0	1	1	1
0	1	0	0	0
0	1	1	0	0
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	0	0

J	K	0	0	1	1
Q <sub>jk</sub>	0	0	0	1	1
1	1	1	0	0	1

$$D = J \cdot \overline{Q_{jk}} + \overline{K} \cdot Q_{jk}$$



c) A partir de um flip-flop T implemente um flip-flop do tipo D (entrada D, saída QD)

Source		Target		T
D	Q <sub>D</sub>	Q <sub>D</sub>	Q <sub>D</sub>	
0	0	0	0	0
0	1	0	0	1
1	0	1	1	1
1	1	1	1	0

D \ Q <sub>D</sub>	0	1
0	0	1
1	1	0

$$T = D \cdot \overline{Q_D} + \overline{D} \cdot Q_D = D \oplus Q_D$$

