

# Diseño de Máquinas Secuenciales (Parte II)

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# Ejemplo 1: Secuencia 1100

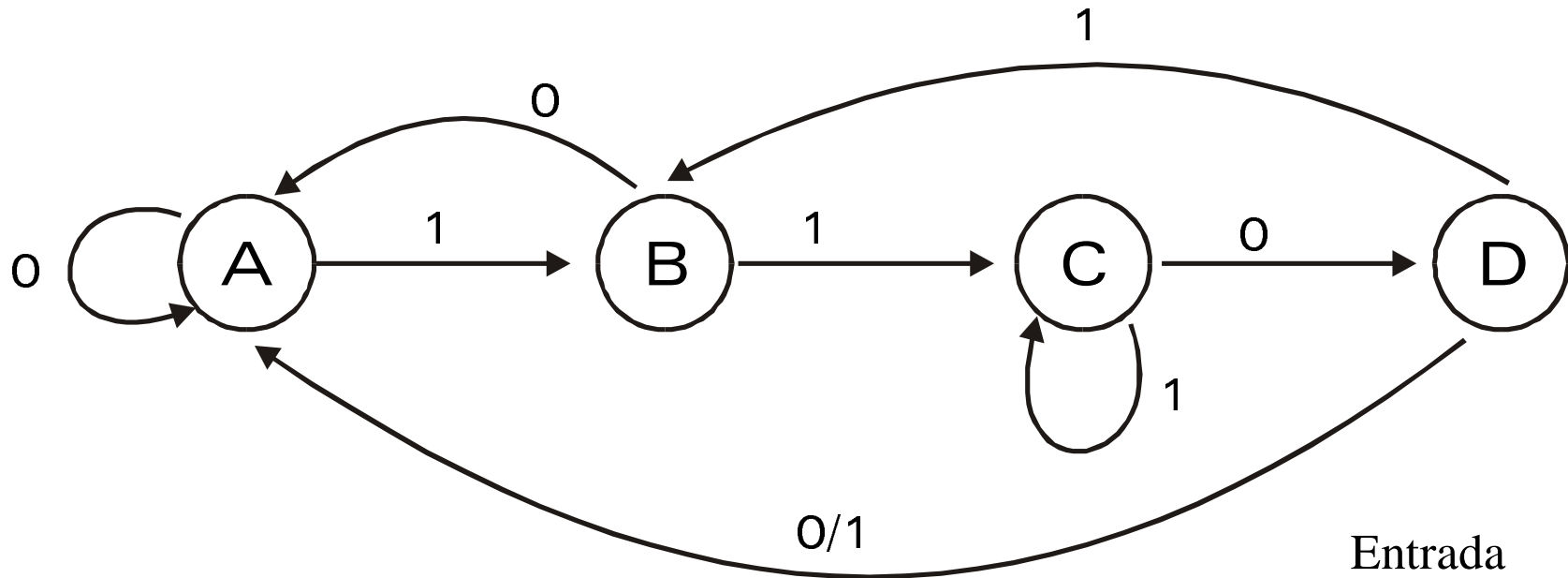


Tabla de estados/salida

Estado	Entrada	
	0	1
A	A	B
B	A	C
C	D	C
D	A/1	B

Estado\*/Salida

# Asignación de Estado

Estado	Q1Q0
A	00
B	01
C	11
D	10

← Estado inicial

## Tabla de transición/salida

Q1Q0	X	
	0	1
00	00	01
01	00	11
11	10	11
10	00/1	01

Q1\*Q0\*/Z

# Selección del tipo de flip flop

$$ff \quad D \Rightarrow Q^* = D$$

Q	Q*	D
0	0	0
0	1	1
1	0	0
1	1	1

$$ff \quad JK \Rightarrow Q^* = J \cdot \bar{Q} + \bar{K} \cdot Q$$

Q	Q*	J	K
0	0	0	-
0	1	1	-
1	0	-	1
1	1	-	0

$$ff \quad T \Rightarrow Q^* = T \cdot \bar{Q} + \bar{T} \cdot Q$$

Q	Q*	T
0	0	0
0	1	1
1	0	1
1	1	0

# Ec. de Excitación/Salida

D1

		X	
		0	1
Q1Q0	00	0	0
	01	0	1
	11	1	1
	10	0	0

D0

		X	
		0	1
Q1Q0	00	0	1
	01	0	1
	11	0	1
	10	0	1

Z

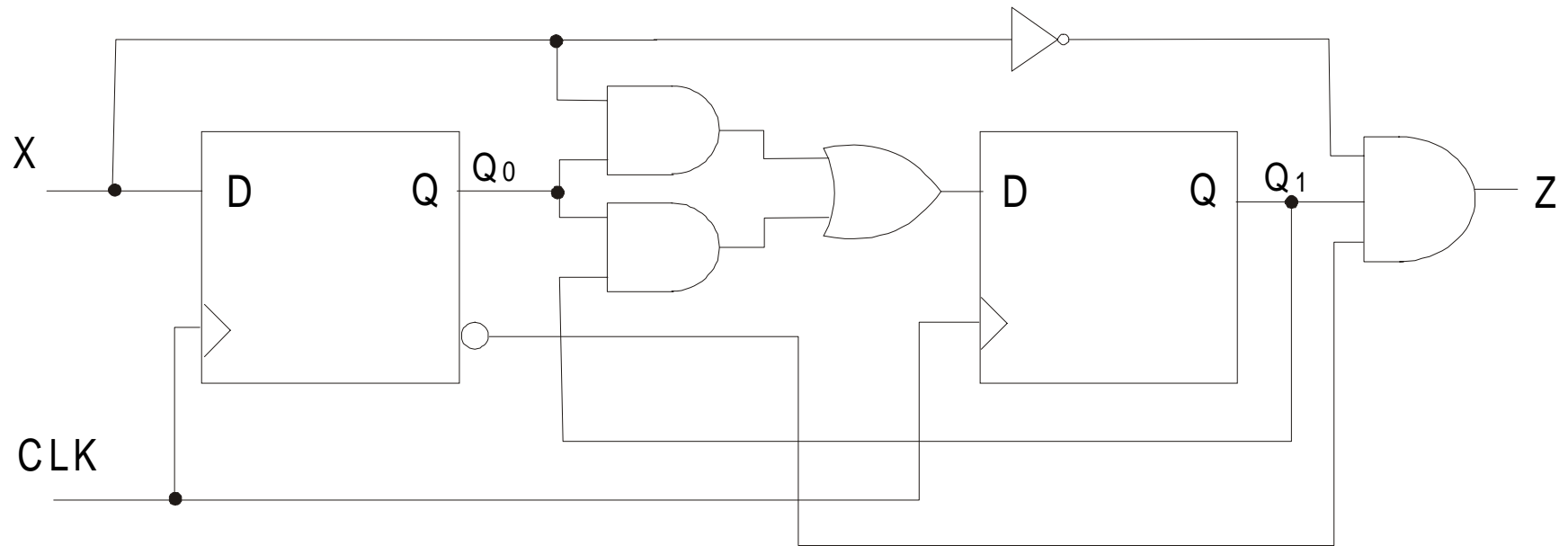
		X	
		0	1
Q1Q0	00	0	0
	01	0	0
	11	0	0
	10	1	0

$$D_1 = X \cdot Q_0 + Q_1 \cdot Q_0$$

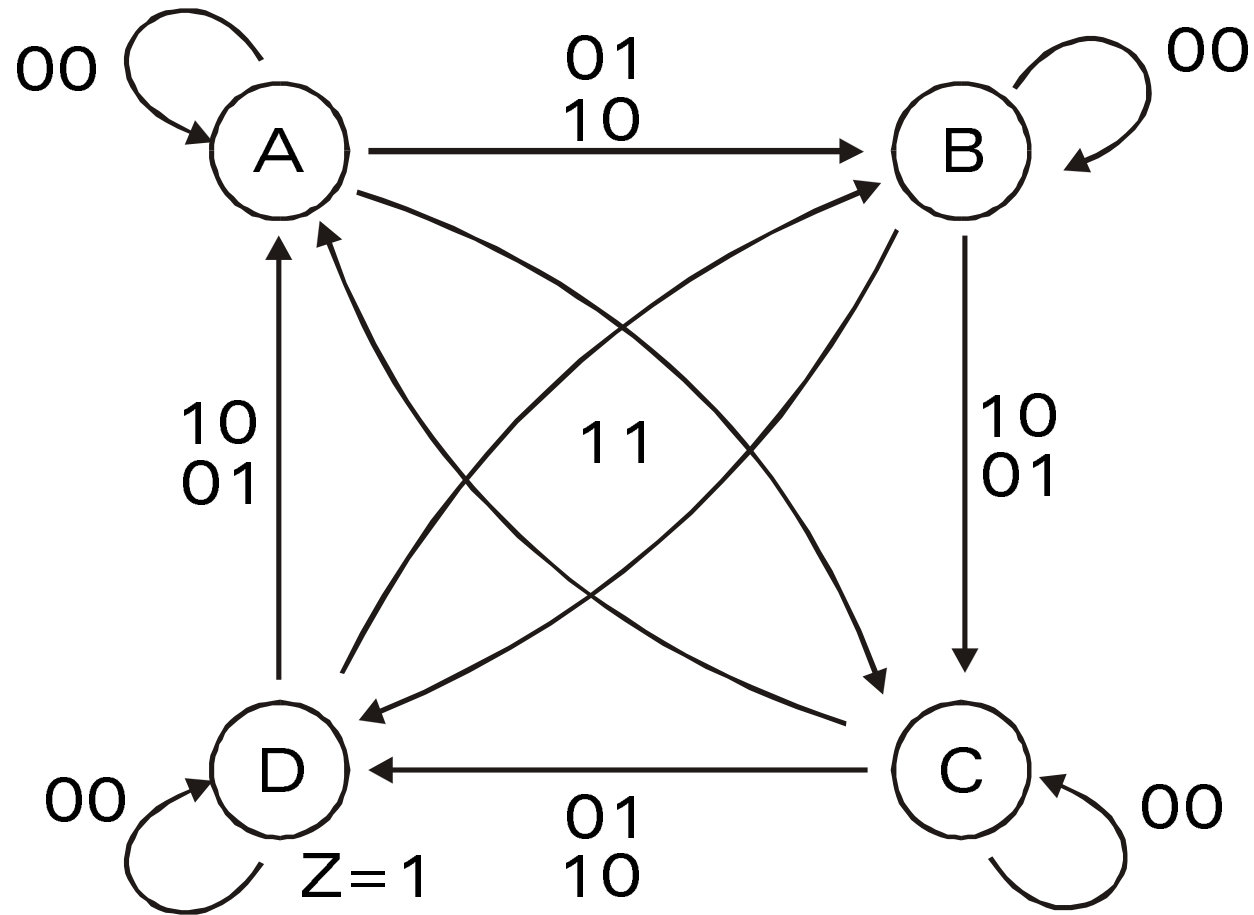
$$D_0 = X$$

$$Z = \overline{X} \cdot Q_1 \cdot \overline{Q_0}$$

# Diagrama circuital



## Ejemplo 2: Múltiplos de 4



## Tabla de estados/salida

Estado	00	01	10	11	Z
A	A	B	B	C	0
B	B	C	C	D	0
C	C	D	D	A	0
D	D	A	A	B	1

## Asignación de Estado

Estado	Q1Q0
A	00
B	01
C	10
D	11

← Estado inicial



# Tabla de transición/salida

XY					
Q <sub>1</sub> Q <sub>0</sub>	00	01	11	10	Z
00	00	01	10	01	0
01	01	10	11	10	0
11	11	00	01	00	1
10	10	11	00	11	0

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

Seleccionamos  
ff JK

Q	Q*	J	K
0	0	0	-
0	1	1	-
1	0	-	1
1	1	-	0

# Ecuaciones de Excitación

XY		X			
		0	1	0	1
Q1Q0	J0	-	-	-	-
	Q1	-	-	-	-
		0	1	0	1
		Y			

Q0

XY		X			
Q1Q0	K0	-	-	-	-
		0	1	0	1
		0	1	0	1
		-	-	-	-
		Y			

Q1

Q0

$$J_0 = K_0 = X \cdot \overline{Y} + \overline{X} \cdot Y$$

# Ecuaciones de Excitación

XY		X			
Q <sub>1</sub> Q <sub>0</sub>	J <sub>1</sub>	0	0	1	0
	0	1	1	1	1
	-	-	-	-	-
	-	-	-	-	-
		Y			

Diagram illustrating the Karnaugh map for the J<sub>1</sub> excitation equation. The map is a 4x4 grid with columns labeled X and rows labeled Y. The output values are 0, 1, or -. The map is partitioned into four groups of four cells each, labeled Q<sub>0</sub>, Q<sub>1</sub>, Q<sub>2</sub>, and Q<sub>3</sub> on the right side. The groups are defined by blue brackets: Q<sub>0</sub> (top row), Q<sub>1</sub> (second row), Q<sub>2</sub> (third row), and Q<sub>3</sub> (bottom row).

XY		X			
Q <sub>1</sub> Q <sub>0</sub>	K <sub>1</sub>	-	-	-	-
	-	-	-	-	-
	0	1	1	1	1
	0	0	1	0	0
		Y			

Diagram illustrating the K<sub>1</sub> excitation equation. The map is a 4x4 grid with columns labeled X and rows labeled Y. The output values are -, 0, or 1. The map is partitioned into four groups of four cells each, labeled Q<sub>0</sub>, Q<sub>1</sub>, Q<sub>2</sub>, and Q<sub>3</sub> on the right side. The groups are defined by blue brackets: Q<sub>0</sub> (top row), Q<sub>1</sub> (second row), Q<sub>2</sub> (third row), and Q<sub>3</sub> (bottom row).

$$J_1 = K_1 = X \cdot Y + X \cdot Q_0 + Y \cdot Q_0$$

## Ecuación de Salida

Q <sub>1</sub> Q <sub>0</sub>	Z
00	0
01	0
11	1
10	0

$$Z = Q_1 \cdot Q_0$$

# Diagrama circuital

