Práct

6.1 Contador síncrono módulo 10:

Contenido la tabla de excitación:

ND	Q_3	Q_2	Q_1	Q_0	Q_3^+	Q_2^+	Q_1^+	Q_0^+	D_3	D_2	D_1	D_0
0	0	0	0	0	1	0	0	1	1	0	0	1
1	0	0	0	1	0	0	0	0	0	0	0	0
2	0	0	1	0	0	0	0	1	0	0	0	1
3	0	0	1	1	0	0	1	0	0	0	1	0
4	0	1	0	0	0	0	1	1	0	0	1	1
5	0	1	0	1	0	1	0	0	0	1	0	0
6	0	1	1	0	0	1	0	1	0	1	0	1
7	0	1	1	1	0	1	1	0	0	1	1	0
8	1	0	0	0	0	1	1	1	0	1	1	1
9	1	0	0	1	1	0	0	0	1	0	0	0
10	1	0	1	0	-	-	-	-	-	-	-	-
11	1	0	1	1	-	-	-	-	-	-	-	-
12	1	1	0	0	-	-	-	-	-	-	-	-
13	1	1	0	1	-	-	-	-	-	-	-	-
14	1	1	1	0	-	-	-	-	-	-	-	-
15	1	1	1	1	-	-	-	-	-	-	-	-

$D_i = Q_i^+$

Por el teorema de Shannon se tiene que las funciones de excitación son

$$D_3 = \sum m(0, 9) + d(10, 11, 12, 13, 14, 15)$$

$$D_2 = \sum m(5, 6, 7, 8) + d(10, 11, 12, 13, 14, 15)$$

$$D_1 = \sum m(3, 4, 7, 8) + d(10, 11, 12, 13, 14, 15)$$

$$D_0 = \sum m(0, 2, 4, 6, 8) + d(10, 11, 12, 13, 14, 15)$$

Construyo los mapas de Karnaugh pertinentes:

D_3

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	1 (0)	1	3	2
01	4	5	7	6
11	– (12)	– (13)	– (15)	– (14)
10	8	1 (9)	– (11)	– (10)

$p_1 = (0)$

$p_2 = (9, 11, 13, 15)$

D_2

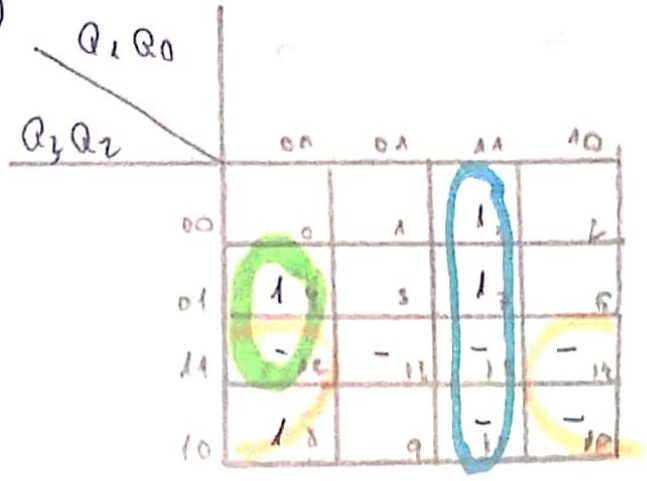
Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	0	1	3	2
01	4	1 (5)	1 (7)	1 (6)
11	– (12)	– (13)	– (15)	– (14)
10	1 (8)	9	– (11)	– (10)

$p_1 = (8, 10, 12, 14)$

$p_2 = (5, 7, 13, 15)$

$p_3 = (6, 7, 14, 15)$

(D1)

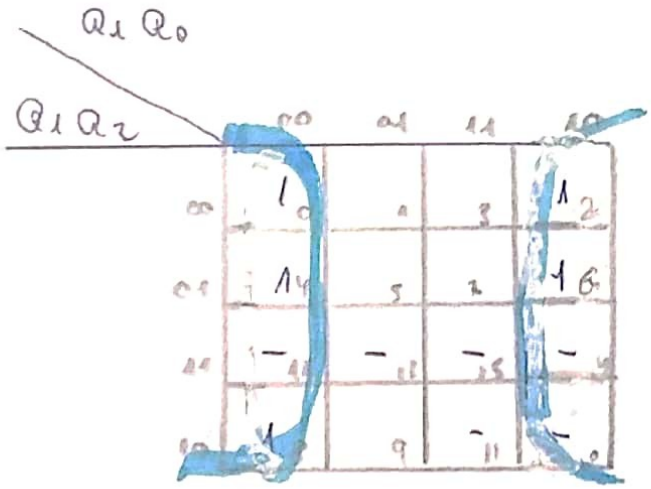


$P_1 = (3, 7, 15, 11)$

$P_2 = (4, 12)$

$P_3 = (12, 8, 10, 14)$

(D0)



$P_1 = (0, 4, 8, 12, 2, 6, 14, 10)$

Calcular

(D3)

Q_3	Q_2	Q_1	Q_0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1
Q_3	/	/	Q_0

$Q_3 \cdot Q_0$

Q_3	Q_2	Q_1	Q_0
0	0	0	0
$\bar{Q}_3$	$\bar{Q}_2$	$\bar{Q}_1$	$\bar{Q}_0$
$\bar{Q}_3 \cdot \bar{Q}_2$	$\bar{Q}_1$	$\bar{Q}_0$	

$D_3 = \bar{Q}_3 \cdot \bar{Q}_2 \cdot \bar{Q}_1 \cdot \bar{Q}_0 + Q_3 \cdot Q_0$

(D2)

Q_3	Q_2	Q_1	Q_0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

$Q_3 \; / \; / \; \overline{Q_0}$

$Q_3 \overline{Q_0}$

Q_3	Q_2	Q_1	Q_0
0	1	0	1
0	1	1	1
1	1	0	1
1	1	1	1

$/ \; Q_2 \; / \; Q_0$

$Q_2 Q_0$

Q_3	Q_2	Q_1	Q_0
0	1	1	0
0	1	1	1
1	1	1	0
1	1	1	1

$/ \; Q_2 \; Q_1 \; /$

$Q_2 \cdot Q_1$

$$D_2 = Q_3 \cdot \overline{Q_0} + Q_2 \cdot Q_0 + Q_2 \cdot Q_1$$

(D1)

Q_3	Q_2	Q_1	Q_0
0	0	1	1
0	1	1	1
1	1	1	1
1	0	1	1

$/ \; / \; Q_1 \; Q_0$

$Q_1 \cdot Q_0$

Q_3	Q_2	Q_1	Q_0
0	1	0	0
1	1	0	0

$/ \; Q_2 \; \overline{Q_1} \; \overline{Q_0}$

$Q_2 \overline{Q_1} \overline{Q_0}$

Q_3	Q_2	Q_1	Q_0
1	0	0	0
1	1	0	0
1	0	1	0
1	1	1	0

$Q_3 \; / \; / \; \overline{Q_0}$

$Q_3 \overline{Q_0}$

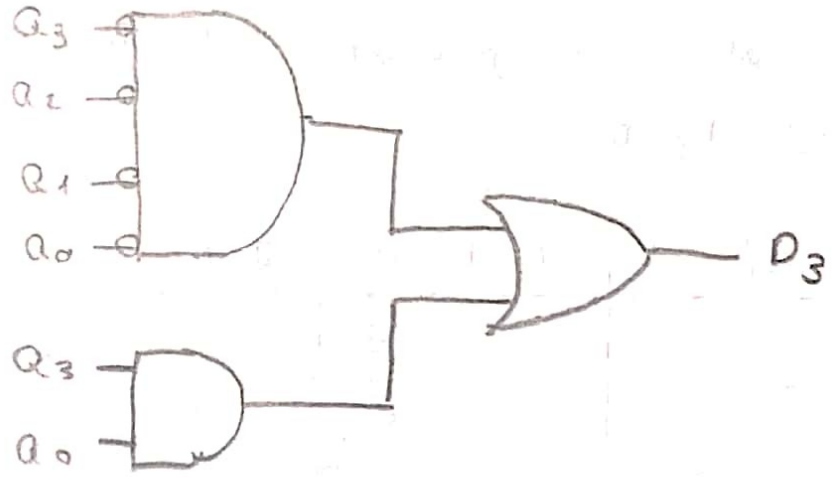
$$D_1 = Q_1 \cdot Q_0 + Q_2 \overline{Q_1} \overline{Q_0} + Q_3 \overline{Q_0}$$

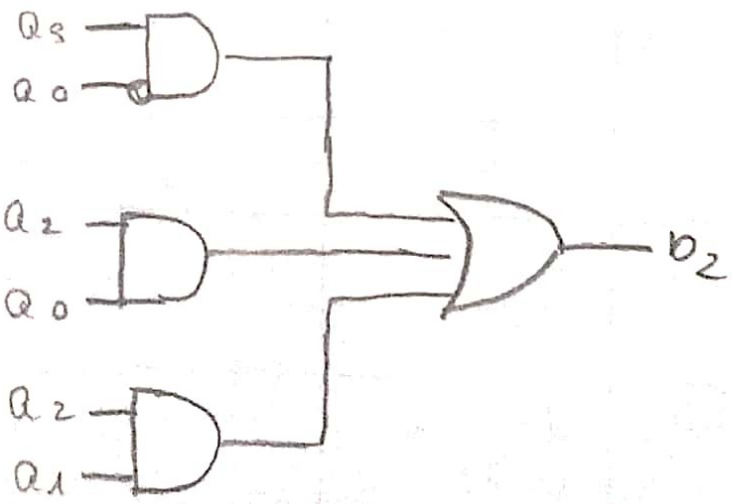
D_0

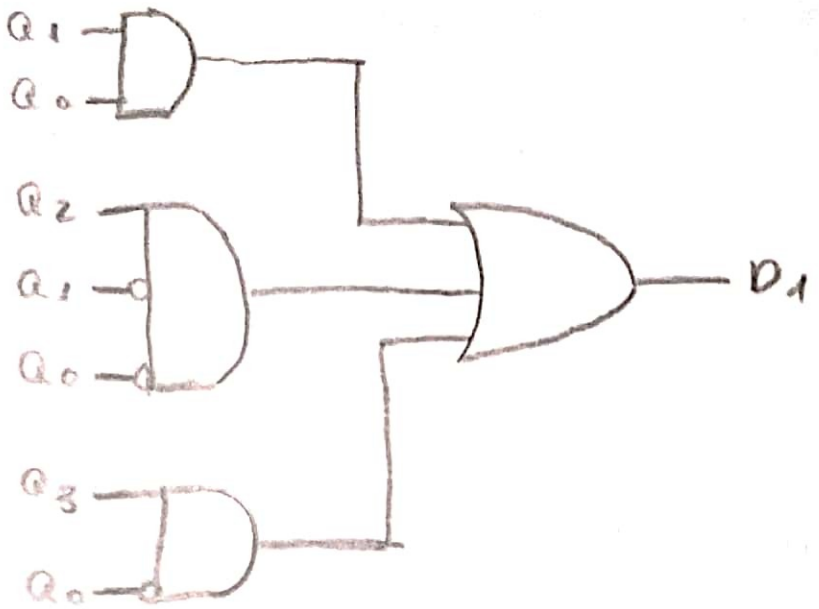
Q_3	Q_2	Q_1	Q_0
0	0	0	0
0	0	0	0
1	0	0	0
1	1	0	0
0	0	1	0
0	1	1	0
1	1	1	0
1	0	1	0
1	1	1	$\overline{Q_0}$

$D_0 = \overline{Q_0}$

Circuito AND / OR







6.2. Generador de secuencia síncrono:

Construyo la tabla de excitación del generador (3 salidas $Q_2 Q_1 Q_0$)
He optado por los biestables tipo D:

ND	Q_2	Q_1	Q_0	Q_2^+	Q_1^+	Q_0^+	D_2	D_1	D_0	Z_1	Z_0
0	0	0	0	0	0	1	0	0	1	0	0
1	0	0	1	0	1	0	0	1	0	0	1
2	0	1	0	0	1	1	0	1	1	1	1
3	0	1	1	1	0	0	1	0	0	0	0
4	1	0	0	0	0	0	0	0	0	1	0
5	1	0	1	-	-	-	-	-	-	-	-
6	1	1	0	-	-	-	-	-	-	-	-
7	1	1	1	-	-	-	-	-	-	-	-
							$D_i = Q_i^+$				

Por el th. Shannon, planteamos las funciones siguientes:

$$D_2 = \sum m(3) + d(5,6,7)$$

$$D_1 = \sum m(1,2) + d(5,6,7)$$

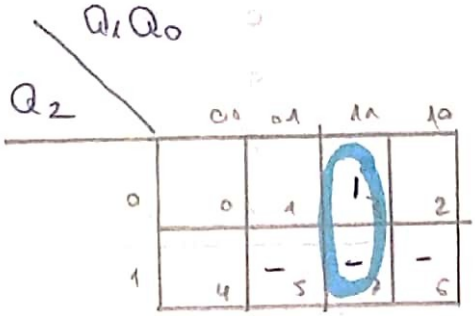
$$D_0 = \sum m(0,2) + d(5,6,7)$$

$$Z_1 = \sum m(2,4) + d(5,6,7)$$

$$Z_0 = \sum m(1,2) + d(5,6,7)$$

Contruyo los mapas de Karnaugh pertinentes para minimizar las funciones:

D_2



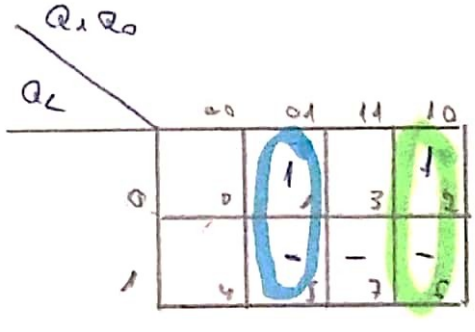
$p_1 = (3,7)$

Q_2	Q_1	Q_0
0	∅	1
1	1	1
/	Q_1	Q_0

$Q_1 \cdot Q_0$

$$D_2 = Q_1 \cdot Q_0$$

Z_0 // D_1



$p_1 = (1,5)$

$p_2 = (2,6)$

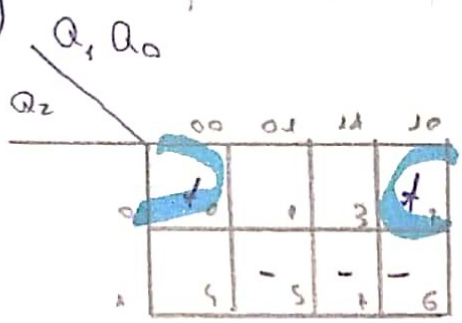
Q_2	Q_1	Q_0
0	1	0
1	1	0
/	Q_1	$\overline{Q_0}$

Q_2	Q_1	Q_0
0	0	1
1	0	1
/	$\overline{Q_1}$	Q_0

$$D_2 = \overline{Q_1} \cdot Q_0 + Q_1 \cdot \overline{Q_0}$$

$$Z_0 = \overline{Q_1} \cdot Q_0 + Q_1 \cdot \overline{Q_0}$$

(D0)

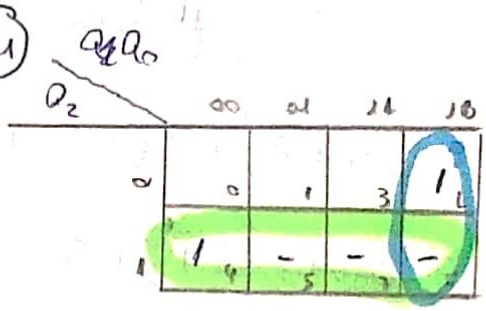


$f_0 = (0, 2)$

Q_2	Q_1	Q_0
0	0	0
0	1	0
$\overline{Q_2}$	/	$\overline{Q_0}$

$D_0 = \overline{Q_2}\,\overline{Q_0}$

(Z1)



$f_1 = (2, 6)$

$f_2 = (4, 5, 7, 6)$

Q_2	Q_1	Q_0
0	1	0
1	1	0
/	Q_1	$\overline{Q_0}$

Q_2	Q_1	Q_0
1	0	0
1	0	1
1	1	1
1	1	0
Q_2	/	/

$D_1 = Q_1 \cdot \overline{Q_0} + Q_2$