Solución:

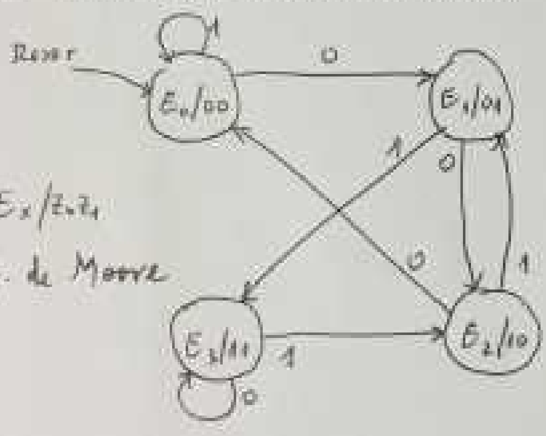
Grado en Ingeniería Informática. Tecnología de Computadores.
Convocatoria Ordinaria. Mayo de 2015

Solución:

a. Tabla de transiciones:

A	Q_0	Q_1	$\overline{Q_0}$	D_0	T_1	Q_0^+	Q_1^+
0	0	0	1	0	1	0	1
0	0	1	1	1	1	1	0
0	1	0	0	0	0	0	0
0	1	1	0	1	0	1	1
1	0	0	1	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	0	0	1	0	1
1	1	1	0	1	1	1	0

b. D. de Estados completo del circuito:



E_x/Z_0Z_1

A. de Moore

Secuencias para:

$A=0 \rightarrow \{E_0, E_1, E_2\}$ y $\{E_3\}$

$A=1 \rightarrow \{E_1, E_3, E_2\}$ y $\{E_0\}$

Ex.2: 1). $624_x = 774_8$

$$= (7\times 8^2 + 7\times 8^1 + 4\times 8^0)_{10}$$
$$= 508_{10}$$

$\because 508_{10} < 624_x < 774_8$

$\therefore 8 < x < 10$

$\therefore \boxed{x = 9}$ Because base can't be -ve or fractional.

Alternative,
$\Rightarrow$

$$624_x = 508_{10}$$
$$\therefore 6x^2 + 2x - 504 = 0$$
$$\therefore x = \frac{-1 \pm \sqrt{1^2 + 4\times 3\times 252}}{2\times 3}$$
$$= \frac{-1 \pm 55}{6} = \frac{54}{6}, \cancel{\frac{-56}{6}}$$
$$\therefore \boxed{x = 9}$$

2). $11010111_2 = 215_{10}$ natural binary.
$11000111_{SM} = -71_{10}$ Signed mag.
$11000111_{GRAY} = 10000101_{BIN}$ Gray-Bin.

3). $A = 0\ 100101_{2C} = +37$
$B = 1\ 100111_{2C} = -25$

Since B is -ve, therefore,
$B = (100111)_{2C} = (011001)_2 = 25.$

4).
$$
\begin{array}{r}
A+B = \quad 0\ 100101_{2C} \\
+1\ 100111_{2C} \\
\hline
\cancel{1}0\ 001100_{2C} \\
\hline
\end{array} = +12
$$

Extra carry, does not affect the result.

Carry is called the overflow when it changes the sign-bit. Practically, overflow will only occur when the two numbers have sign.

— x — x — x — x —

Ex. 4. Simplified form:

$F_1 = \sum(5, 7, 13, 15)$

$B_1B_0 \backslash A_1A_0$	00	01	11	10
00	0	0	0	0
01	0	1	1	0
11	0	1	1	0
10	0	0	0	0

$\Rightarrow F_1 = A_0 B_0$

$F_2 = \prod_4 (0, 1, 2, 3, 4, 5, 8, 10, 12, 15)$

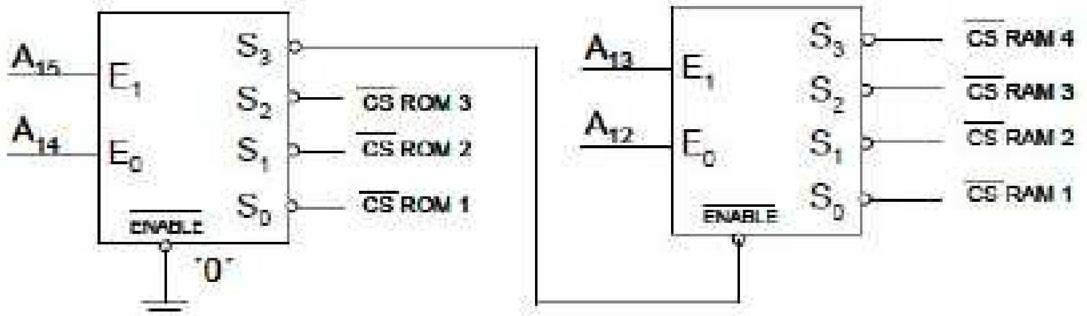
$= \sum_4 (6, 7, 9, 11, 13, 14)$

$B_1B_0 \backslash A_1A_0$	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	0	1	0	1
10	0	1	1	0

$\therefore F_2 = (\overline{A_0} A_1 B_0 + \overline{B_1} B_0 A_1 + B_1 \overline{B_0} A_0 + B_1 \overline{A_1} A_0)$

Solucion ejercicio 3

Memoria	Dirección	A_{15}	A_{14}	A_{13}	A_{12}	A_{11}	A_{10}	A_9	A_8	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0
RAM 4	Fin=FFFF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(4K)	Inicio=F000	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
RAM 3	Fin=EFFF	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
(4K)	Inicio=E000	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
RAM 2	Fin=DFFF	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
(4K)	Inicio=D000	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
RAM 1	Fin=CFFF	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1
(4K)	Inicio=C000	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROM 3	Fin=BFFF	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(16K)	Inicio=8000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROM 2	Fin=7FFF	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(16K)	Inicio=4000	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROM 1	Fin=3FFF	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(16K)	Inicio=0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Exercise 4 (1 point out of 10 points)

Implement the following logical functions using the programmable device PLA (programmable OR, AND, and XOR matrices) given in Fig.4.1 **NO simplification is required**. B1 is the most significant variable and A0 is the least significant variable.

$$F(B1, B0, A1, A0) = \sum_4 (5,7,13,15)$$

$$F(B1, B0, A1, A0) = \prod_4 (0,1,2,3,4,5,8,10,12,15)$$

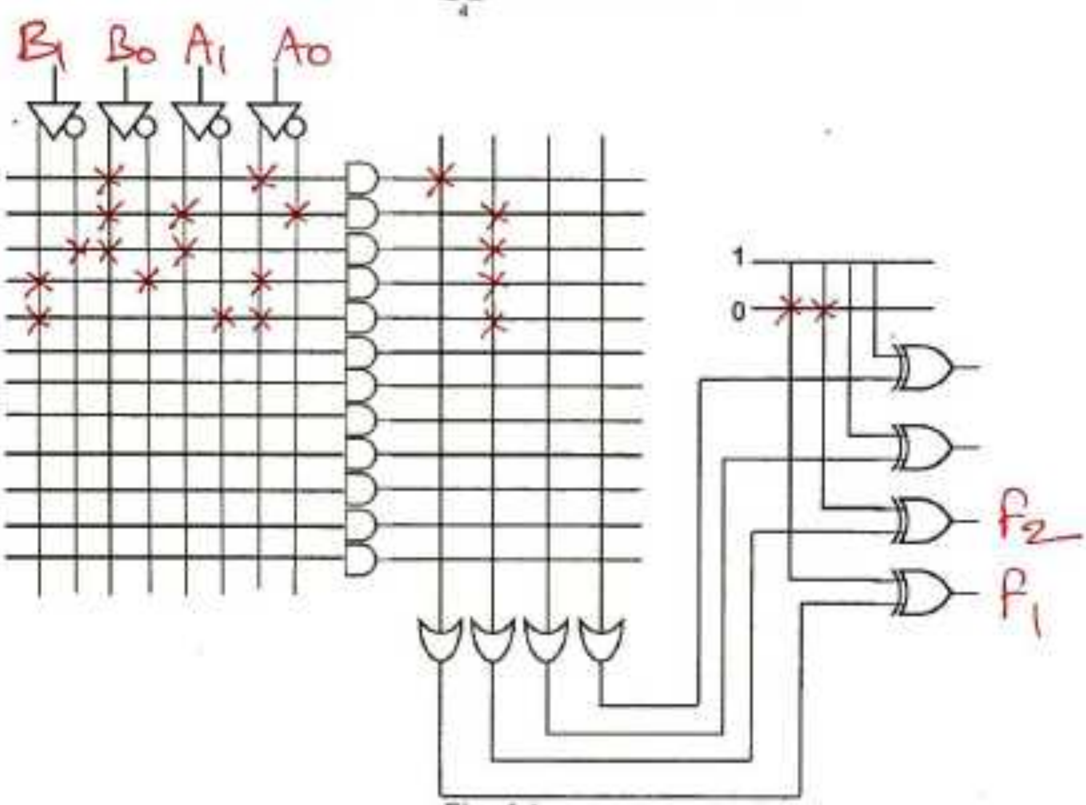

Fig. 4.1

It simplify the function:

$F_1 = A_0 B_0$

$F_2 = \overline{A_0} A_1 B_0 + \overline{B_1} A_1 B_0 + \overline{B_0} A_0 B_1 + \overline{A_1} A_0 B_1$

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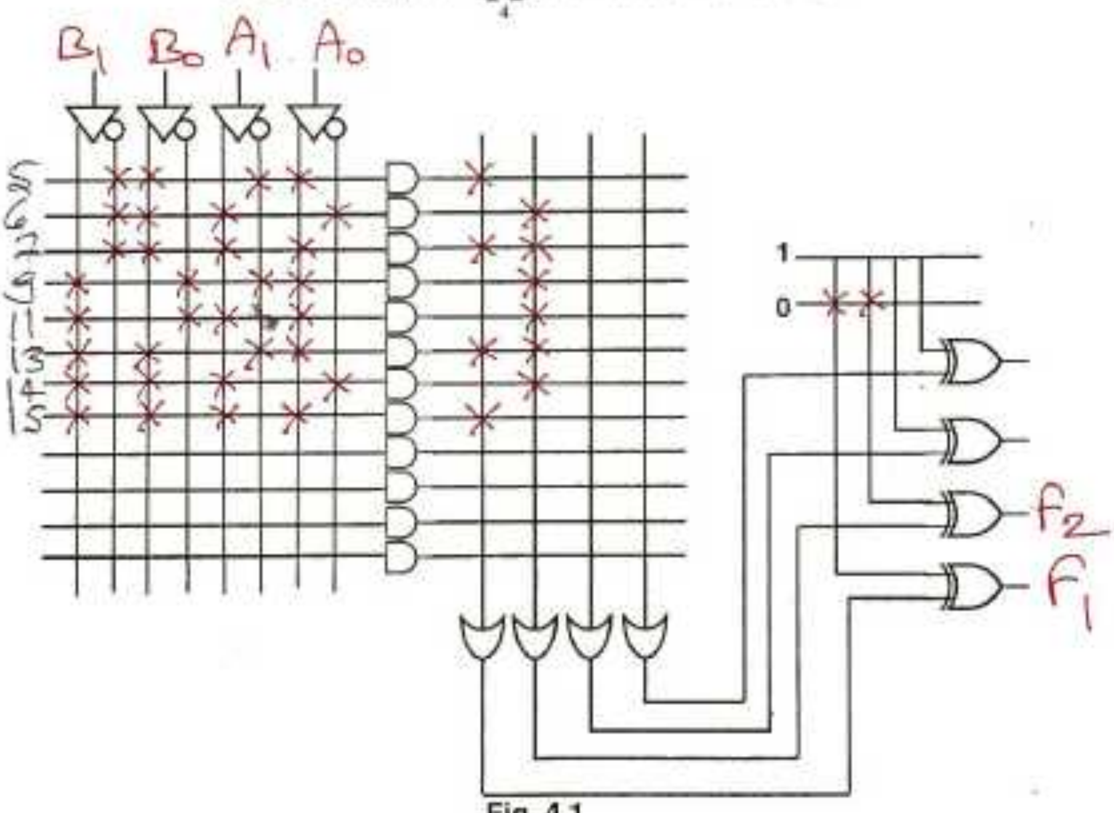


Fig. 4.1

$f_1 = F(B_1,B_0,A_1,A_0) = \sum_4(5,7,13,15)$

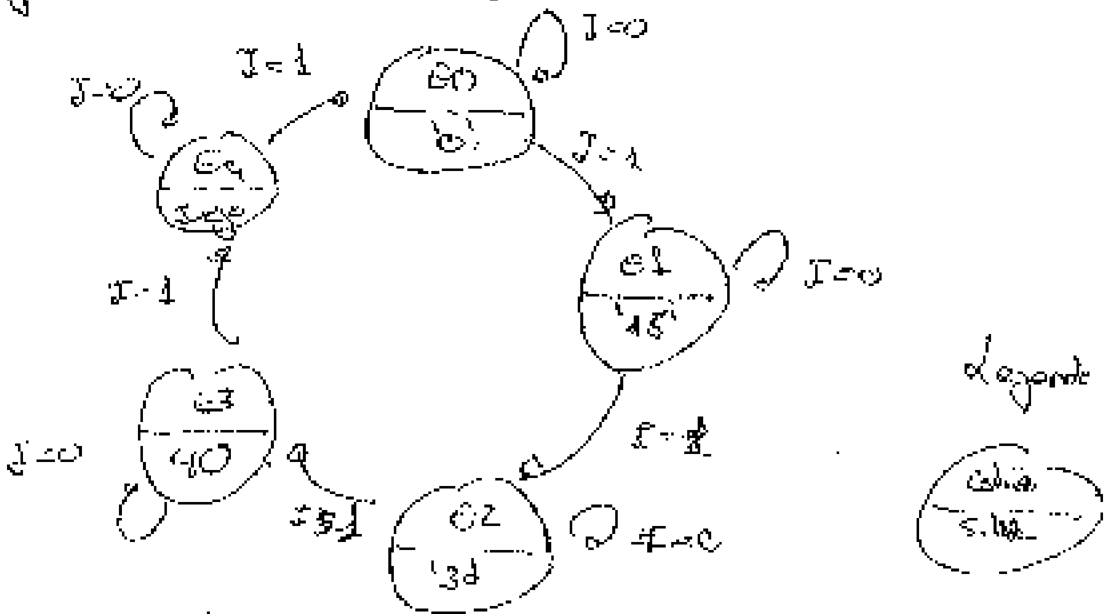
$f_2 = F(B_1,B_0,A_1,A_0) = \prod_4(0,1,2,3,4,5,8,10,12,15)$

$= \sum_4(6,7,9,11,13,14)$

Ejercicio II.1 Mayo 2015

① Diseñar la máquina de estados tipo Moore

El circuito secuencial se trata de un contador, con una única entrada Punto, "Inicio" es un reset y se codifica adecuadamente



② Tabla de codificación de estados

Tengo 5 estados como número de estados = $2^{\text{nº de biestables}}$
necesito 3 biestables

	Q_2	Q_1	Q_0
e0	0	0	0
e1	0	0	1
e2	0	1	0
e3	0	1	1
e4	1	0	0

Debemos codificar las salidas

	A_2	A_1	A_0
'0'	0	0	0
'15'	0	0	1
'30'	0	1	0
'40'	0	1	1
'Juego'	1	0	0

(3) Obtener la tabla de transiciones

	Q_2	Q_1	Q_0	I	Q_2^+	Q_1^+	Q_0^+	D_2	D_1	D_0	D_2	D_1	D_0
E0	0	0	0	0	0	0	0				0	0	0
	0	0	0	1	0	0	1				0	0	0
E1	0	0	1	0	0	0					0	0	1
	0	0	1	1	0	1	0				0	0	1
E2	0	1	0	0	0	1	0				0	1	0
	0	1	0	1	0	1	1				0	1	0
E3	0	1	1	0	0	1	1				0	1	1
	0	1	1	1	1	0	0				0	1	1
E4	1	0	0	0	1	0	0				1	0	0
	1	0	0	1	1	0	0				1	0	0
	1	0	1	0	X	X	X						
	1	0	1	1	X	X	X						
	1	1	0	0	X	X	X						
	1	1	0	1	X	X	X						
	1	1	1	0	X	X	X						
	1	1	1	1	X	X	X						

(4) Expresiones reducidas en suma de productos

D_2

Q_2Q_1 \ Q_0I	00	01	11	10
00				
01			1	
11	X	X	X	X
10	1		X	X

D_1

Q_2Q_1 \ Q_0I	00	01	11	10
00			1	
01	1	1		1
11	X	X	X	X
10			X	X

D_0

Q_2Q_1 \ Q_0I	00	01	11	10
00		1		1
01		1		1
11	X	X	X	X
10			X	X

$D_2 = Q_2 \bar{I} + Q_1 Q_0 I$ $D_1 = Q_1 \bar{Q}_0 + Q_0 I \bar{Q}_1 + Q_1 Q_0 \bar{I}$ $D_0 = Q_0 I + Q_1 \bar{Q}_0 I$

(5) Obtener la expresión ~~reducida~~ en suma de productos de '0', '40' en función de (A_1, A_2, ... A_n

El bloque C_1 C_2 es un decodificador 3 : 5. Usando la tabla del apartado 2 observamos

'0' $= \bar{A}_2 \cdot \bar{A}_1 \cdot \bar{A}_0$

'40' $= \bar{A}_2 \cdot A_1 \cdot \bar{A}_0$

$$\boxed{F_{0+40} = \bar{A}_2 \cdot \bar{A}_1 \cdot \bar{A}_0 + \bar{A}_2 \cdot A_1 \cdot \bar{A}_0}$$

Solución ejercicio 5 parte 2