

MAC

0329

		CD			
		00	01	11	10
AB=00	EF 00	m0	m4	m12	m8
	01	m1	m5	m13	m9
	11	m3	m7	m15	m11
	10	m2	m6	m14	m10

		CD			
		00	01	11	10
AB=10	EF 00	m32	m36	m44	m40
	01	m33	m37	m45	m41
	11	m35	m39	m47	m43
	10	m34	m38	m46	m42

		CD			
		00	01	11	10
AB=01	EF 00	m16	m20	m28	m24
	01	m17	m21	m29	m25
	11	m19	m23	m31	m27
	10	m18	m22	m30	m26

		CD			
		00	01	11	10
AB=11	EF 00	m48	m52	m60	m56
	01	m49	m53	m61	m57
	11	m51	m55	m63	m59
	10	m50	m54	m62	m58

15/06/2021

← mapa de
Karnaugh
(6 variáveis)

$$f(a, b, c, d) = \sum m(0, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15)$$

0000
0100
0101
0110
0111
1001
1010
1011
1111

1000
1110

ab \ cd	00	01	11	10
00	1			
01	1	1	1	1
11			1	1
10	1	1	1	1

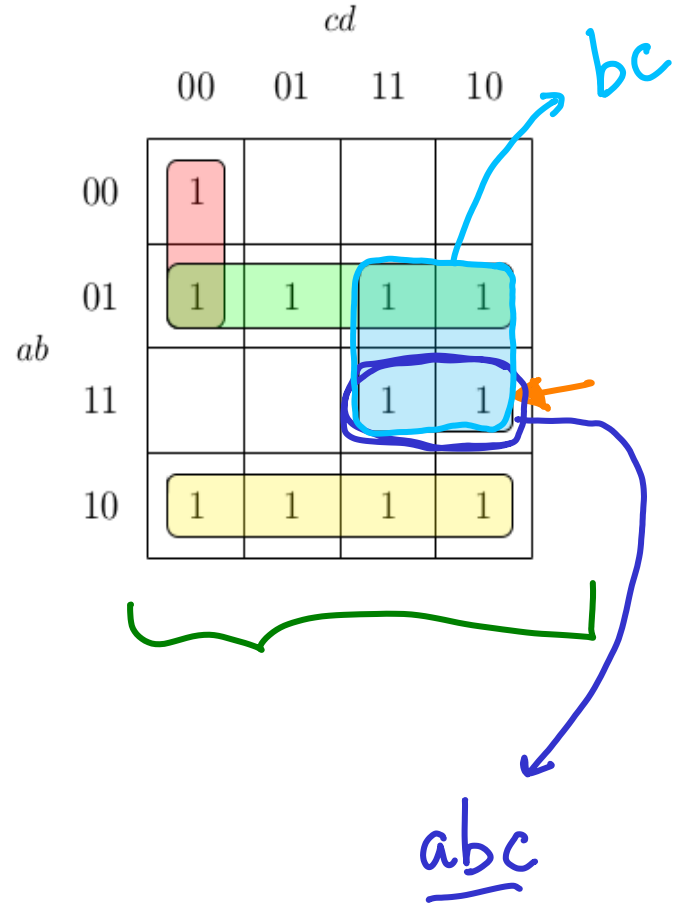
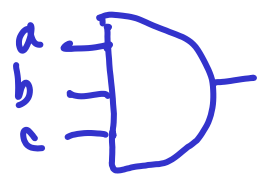
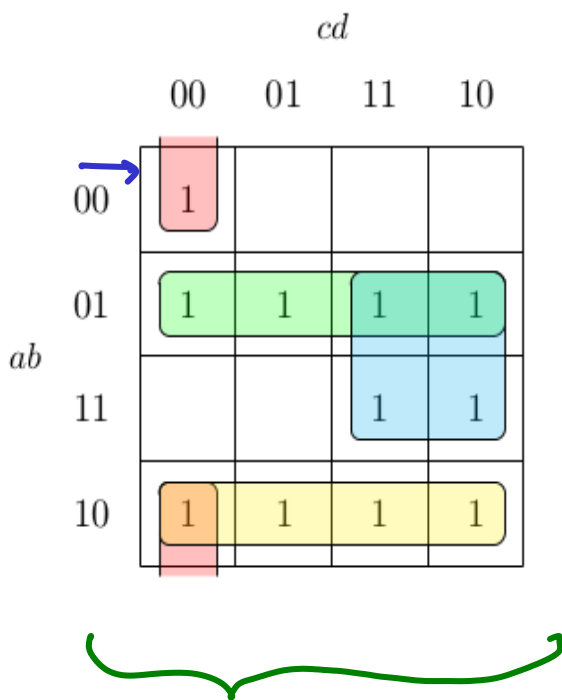
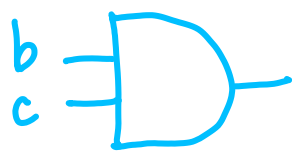
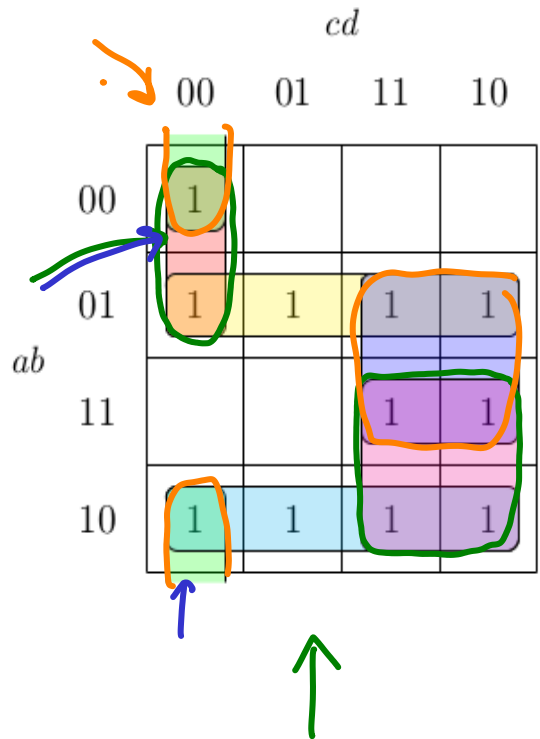
f

$$f(a, b, c, d) = \bar{a}b + a\bar{b} + \bar{a}\bar{c}\bar{d} + bc$$

$$f(a, b, c, d) = \bar{a}b + a\bar{b} + \bar{a}\bar{c}\bar{d} + ac$$

$$f(a, b, c, d) = \bar{a}b + a\bar{b} + \bar{b}\bar{c}\bar{d} + bc$$

$$f(a, b, c, d) = \bar{a}b + a\bar{b} + \bar{b}\bar{c}\bar{d} + ac$$



abc

Minimização POS

$$f(a,b,c) = \sum m(0,4,5,7)$$

$$\bar{f}(a,b,c) = \sum m(1,2,3,6)$$

001 010 011 110

a \ bc	00	01	11	10
0		1	1	1
1				1

\bar{f}

$$f = \bar{\bar{f}}$$

$$f(a,b,c) = \bar{\bar{a}c + b\bar{c}}$$

$$= (\bar{\bar{a}c}) \cdot (\overline{b\bar{c}})$$

$$= \underline{\underline{(a + \bar{c})(\bar{b} + c)}}$$

$$\bar{f}(a,b,c) = \bar{a}c + b\bar{c}$$

\bar{f}

a \ bc	00	01	11	10
0		0	0	0
1				0

A red arrow points from the '11' column header to the expression $a + \bar{c}$.
 A blue arrow points from the '10' column header to the expression $\bar{b} + c$.

↓

$$f(a, b, c) = (a + \bar{c})(\bar{b} + c)$$

Don't cares

$$f(a,b,c,d) = \sum_{m(1,3,7,11,15)} + d(0,2,5)$$

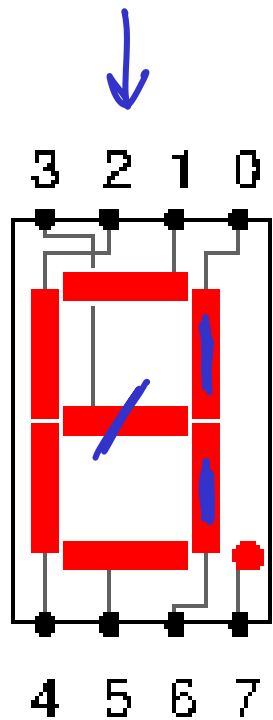
ab \ cd	00	01	11	10
00	x	1	1	x
01		x	1	
11			1	
10			1	

Diagram illustrating the Karnaugh map for the function $f(a,b,c,d)$. The map is a 4x4 grid with rows labeled 'ab' (00, 01, 11, 10) and columns labeled 'cd' (00, 01, 11, 10). The cells contain values: (00,00) is 'x', (00,01) is '1', (00,11) is '1', (00,10) is 'x', (01,01) is 'x', (01,11) is '1', (11,11) is '1', and (10,11) is '1'. Other cells are empty. A green box highlights the cells (00,01), (00,11), (01,01), and (01,11), labeled $\bar{a}d$. A pink box highlights the cells (00,11), (01,11), (11,11), and (10,11), labeled cd . An orange box highlights the cells (00,00), (00,01), (00,11), and (00,10), labeled $\bar{a}\bar{b}$.

$$f(a,b,c,d) = cd + \bar{a}d$$

$$= cd + \bar{a}\bar{b}$$

BCD - Binary coded decimal (0 a 9)



0
1
2
3
4
5
6
7
8
9

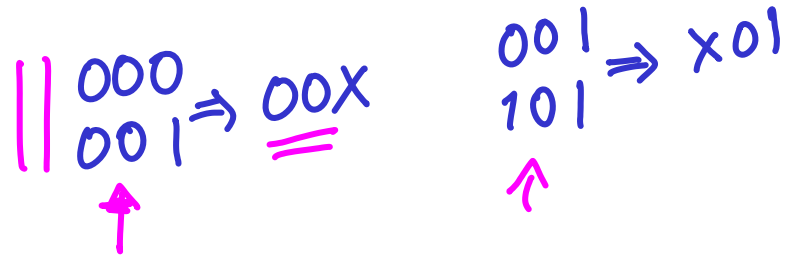
Entrada				Segmentos						
x_3	x_2	x_1	x_0	f_0	f_1	f_2	f_3	f_4	f_5	f_6
0	0	0	0	1	1	1	0	1	1	1
0	0	0	1	1	0	0	0	0	0	1
0	0	1	0	1	1	0	1	1	1	0
0	0	1	1	1	1	0	1	0	1	1
0	1	0	0	1	0	1	1	0	0	1
0	1	0	1	0	1	1	1	0	1	1
0	1	1	0	0	1	1	1	1	1	1
0	1	1	1	1	1	0	0	0	0	1
1	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	1	0	1	1
1	0	1	0	x	x	x	x	x	x	x
1	0	1	1	x	x	x	x	x	x	x
1	1	0	0	x	x	x	x	x	x	x
1	1	0	1	x	x	x	x	x	x	x
1	1	1	0	x	x	x	x	x	x	x
1	1	1	1	x	x	x	x	x	x	x



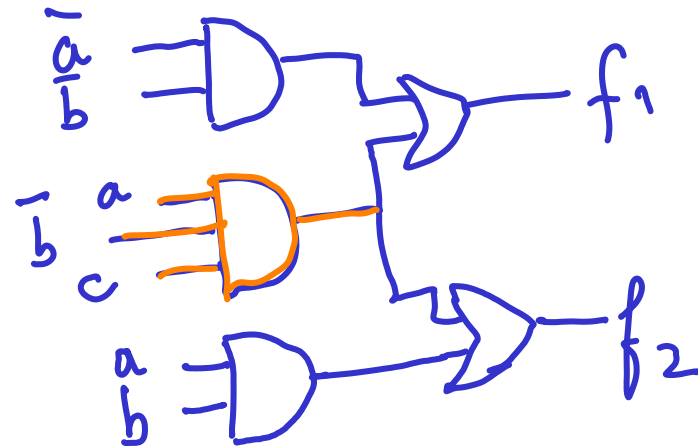
Minimização de múltiplas funções.

a	b	c	f ₁	f ₂
0	0	0	1	0
0	0	1	1	0
0	1	0	0	0
0	1	1	0	0
1	0	0	0	0
1	0	1	1	1
1	1	0	0	1
1	1	1	0	1

$$f_1(a,b,c) = \bar{a}\bar{b} + \bar{b}c = \bar{a}\bar{b} + \underline{abc}$$



$$f_2(a,b,c) = \underline{ab} + ac = \underline{ab} + \underline{abc}$$



a	b	c	f_1	f_2
0	0	0	1	0
0	0	1	1	0
0	1	0	0	0
0	1	1	0	0
1	0	0	0	0
1	0	1	1	1
1	1	0	0	1
1	1	1	0	1

a \ bc	00	01	11	10
0	1	1		
1		1		

f_1

a \ bc	00	01	11	10
0				
1		1	1	1

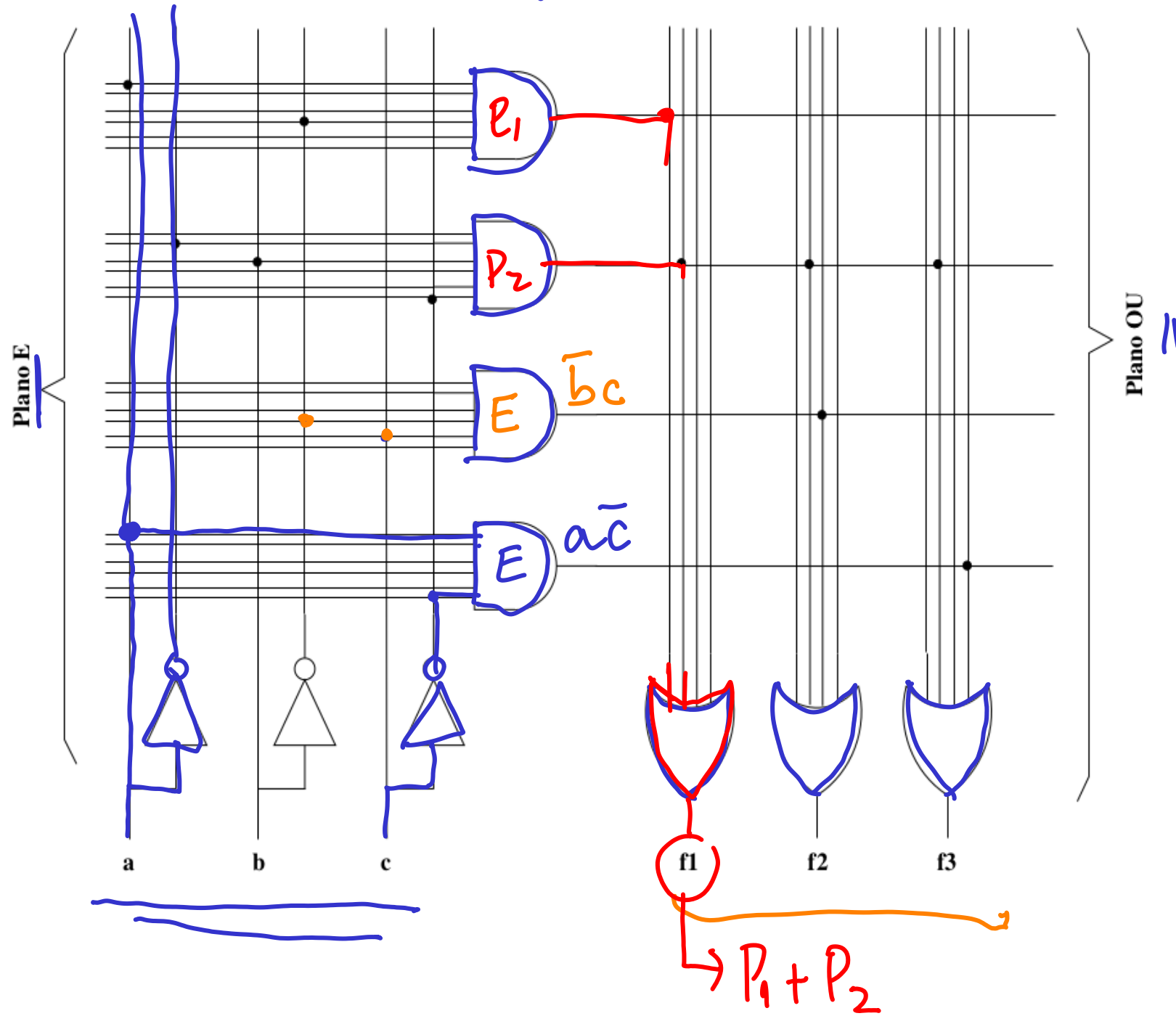
f_2

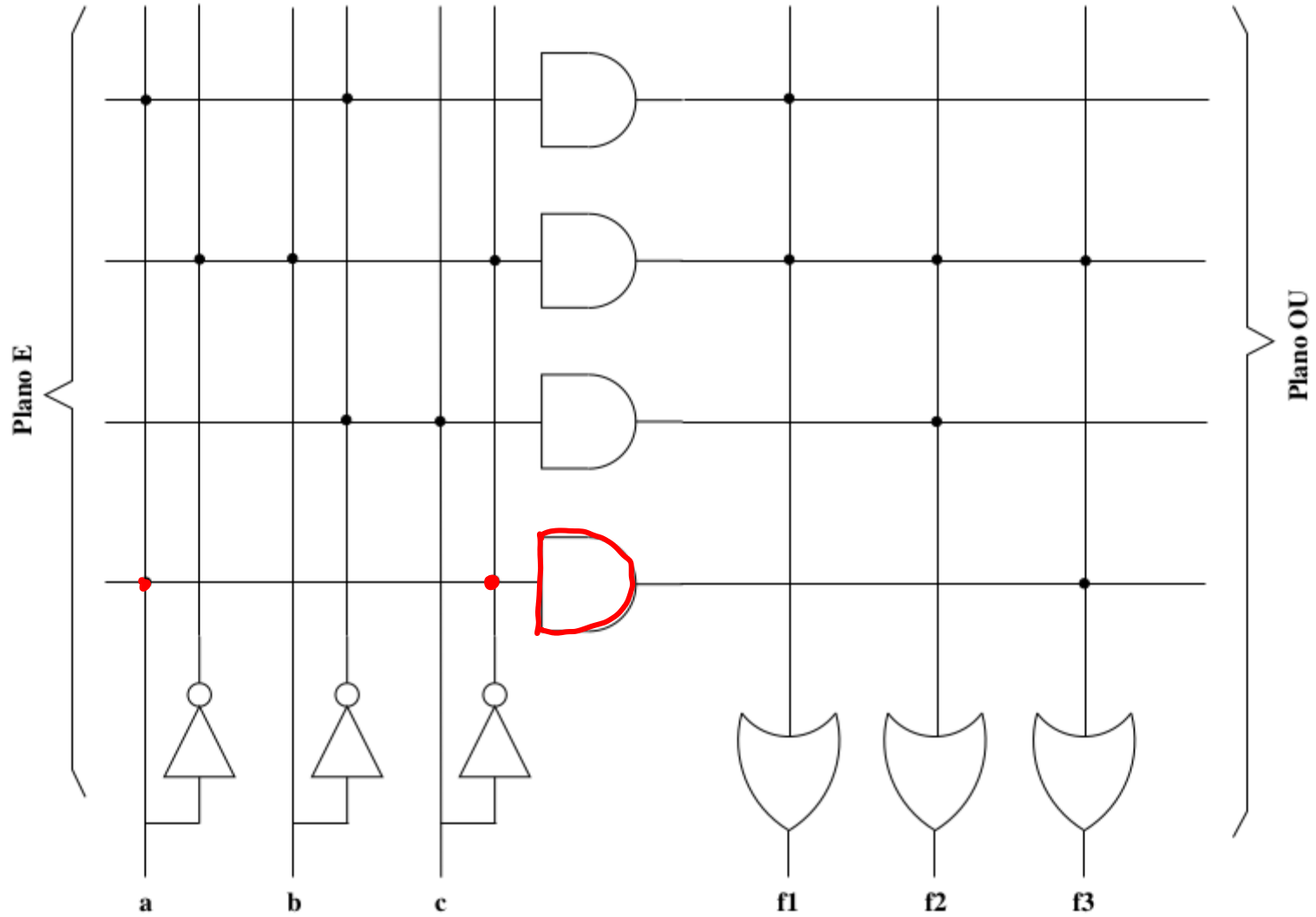
	1		

$f_1 \cdot f_2$

f_1
 f_2
 f_3
 $f_1 f_2$
 $f_1 f_3$
 $f_2 f_3$
 $f_1 f_2 f_3$

PLA - Programmable Logic Arrays





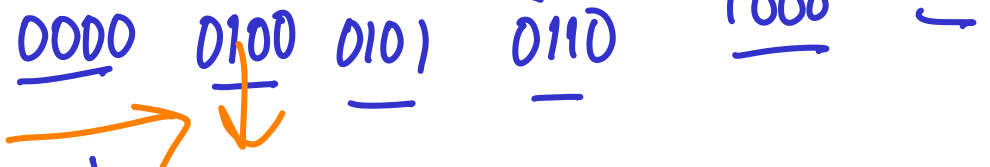
$$f(a,b,c) = \sum m(0,4,5,7)$$

A diagram showing the mapping of minterms to their binary representations. The minterms 0, 4, 5, and 7 are listed in a row. Below them are the binary strings 000, 100, 101, and 111. Lines connect each minterm to its corresponding binary string: 0 to 000, 4 to 100, 5 to 101, and 7 to 111.

$$\begin{array}{r} 000 \\ \hline 100 \\ \hline 101 \\ \hline 111 \end{array}$$

$$f(a,b,c,d) = \sum m(0,4,5,6,7,8,9,10,11,14,15)$$

$\overline{0111}$ $\overline{1010}$ $\overline{1110}$
 $\overline{1111}$



0000 •	0X00 •
0100 •	X000
1000 •	010X
0101 •	01X0
0110 •	100X
1001 •	10X0
1010 •	
0111 •	01X1
1011 •	011X
1110 •	X110
1111	10X1
	101X

01XX
=

$\bar{a}b\bar{c}$

+

$\bar{a}b$

$\bar{a}bc$

Algoritmo de Quine-
McCluskey
(ver notas de aula)