Logic Design 26/10/21

Τρίτη, 26 Οκτωβρίου 2021 16:46

Καλημέρα!

Χρόνια πολλά στη Δήμητρα κ' τον Δημήτρη!

Τι είπαμε την προηγούμενη φορά.

- ΕΛΑΧΙΣΤΟΡΩΝ $m_0 \dots m_7$
- ΜΕΓΙΣΤΟΡΩΝ $M_0 \dots M_8$

$m_0 = x'y'z'$ 1 → $xyz = 000$

$M_0 = x+y+z$ 0 → $xyz = 000$
1 → σε κάθε άλλο input

$m_0 = (M_0)'$

$m_i = (M_i)'$ $M_i = (m_i)'$

De Morgan

$$m_0' = (x'y'z')' = (x')' + (y')' + (z')' = x+y+z = M_0$$

ΚΑΘΕ ΣΥΝΑΡΤΗΣΗ

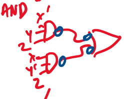
- Άθροισμα Ελαχιστόρων

Αθροίζοντας τους ελαχιστόρους που αντιστοιχούν στο "1" της συνάρτησης

x y z			F_1	F		
0 0 0	m_0	$x'y'z'$	0	0	M_0	$x+y+z$
0 0 1	m_1	$x'y'z$	0	1	M_1	$x+y+z'$
0 1 0	m_2	$x'yz'$	0	1	M_2	$x+y'+z$
0 1 1	m_3	$x'yz$	1	1	M_3	$x+y'+z'$
1 0 0	m_4	$xy'z'$	0	0	M_4	$x'+y+z$
1 0 1	m_5	$xy'z$	1	0	M_5	$x'+y+z'$
1 1 0	m_6	xyz'	0	1	M_6	$x'+y'+z$
1 1 1	m_7	xyz	0	0	M_7	$x'+y'+z'$

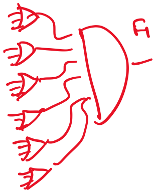
$F_1 = x'yz + xy'z$

NAND ✓



NOR ✓

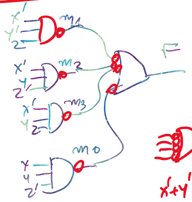
$F_1 = M_0 M_1 M_2 M_4 M_5 M_7$

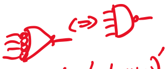


$F = m_1 + m_2 + m_3 + m_6 = \Sigma(1,2,3,6)$

$F = M_0 \cdot M_4 \cdot M_5 \cdot M_7 = \Pi(0,4,5,7)$

Άθροισμα Γινομένων

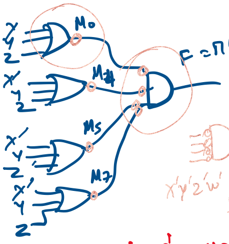




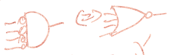
$x'+y'+z'+w' = (x \cdot y \cdot z \cdot w)'$
DEMORGAN

→ Υλοποίηση μόνο με πύλες NAND

Γινόμενο Αθροισμάτων

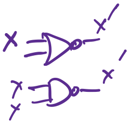


$F = \Pi(0,4,5,7)$



$x'y'z'w' = (x+y+z+w)'$
DEMORAN.

Υλοποίηση με πύλες NOR



Υλοποίηση NAND με NOR

$m_3 = xy$

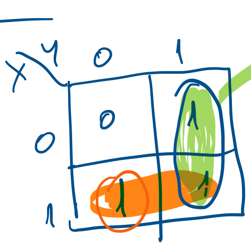
$\cancel{xy} + xy = xy$

Απλοποίηση συναρτήσεων Boole με χάρτες KARNAUGH
Καρνώ

$$f(x,y) = \underline{\underline{m_1+m_2+m_3 = x'y+xy'+xy}}$$

$x \backslash y$	0	1
0	$x'y'$ m_0	$x'y$ m_1
1	xy' m_2	xy m_3

x y	F
0 0	0
0 1	1
1 0	1
1 1	1



$x \backslash y$	0	1
0	0	1
1	1	1

$y + xy'$

$x+y$

$$m_1+m_3 = x'y+xy = (x'+x)\cdot y = y$$

$$m_2+m_3 = xy'+xy = x(y'+y) = x$$

y $\quad .x+x=x$

$$f = m_1+m_2+m_3 = m_1+m_2+m_3+m_3$$

x

$$= x+y$$

ΧΑΡΤΗΣ ΚΑΡΝΩ 3 ΜΕΤΑΒΛΗΤΩΝ $f(x,y,z)$

$x \backslash yz$	00	01	11	10
0	$x'y'z'$	$x'y'z$	$x'yz$	$x'yz'$
1	$xy'z'$	$xy'z$	xyz	xyz'

$x'y(z+z') = x'y$

$xz'(y'+y) = xz'$

$xz(y'y) = xz$

$x \backslash yz$	00	01	11	10
0	m_0	m_1	m_3	m_2
1	m_4	m_5	m_7	m_6

010 011 100 101

$$F = \Sigma(2,3,4,5)$$

$m_2+m_3+m_4+m_5$

$m_2 = x'yz$

$x \backslash yz$	00	01	11	10
0	0	0	$x'yz$ 1 m_3	$x'yz'$ 1 m_2

1	$xy'z'$ 1 m_4	$xy'z$ 1 m_5	0	0

$$F = x'yz' + x'yz + xy'z' + xy'z$$

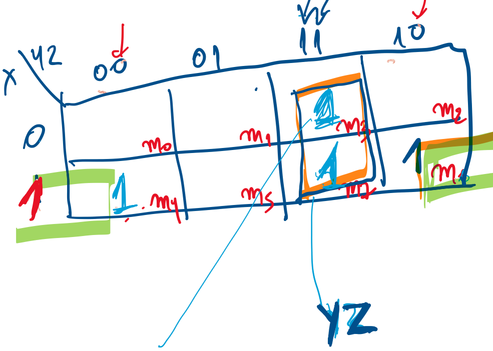
m_2 m_3 m_4 m_5

$$x'y + xy'$$

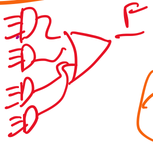
Στο πίνακα παίρνω δύο γειτονικούς άσσους δίνω απλοποίηση → 1 γινόμενο με 2 μεταβλητές

Επομένως η απλοποίηση

$$F(x,y,z) = \Sigma(3,4,6,7) = \boxed{m_3 + m_4 + m_6 + m_7 = yz + xz'}$$



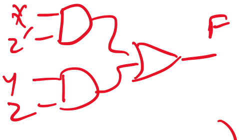
x \ yz	00	01	11	10
0	m_0	m_1	1 m_3	m_2
1	1 m_4	m_5	1 m_7	1 m_6



$(m_3 + m_7)$ — yz

$(m_4 + m_6)$ — xz'

$m_7 + m_6$

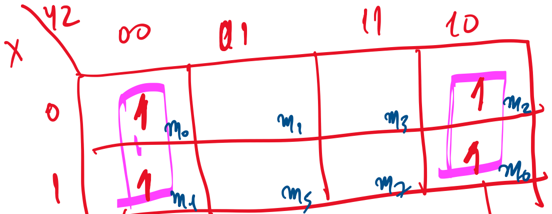


$$F = \Sigma(0,4,2,6)$$

Έχω καλύψει όλους τους 1σσους

$$yz + xz'$$

$$\boxed{= \cancel{y}z + x\cancel{z}' + xy}$$



x \ yz	00	01	11	10
0	1 m_0	m_1	m_3	1 m_2
1	1 m_4	m_5	m_7	1 m_6

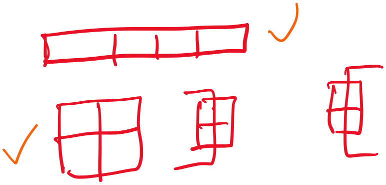
$$F = y'z' + yz'$$

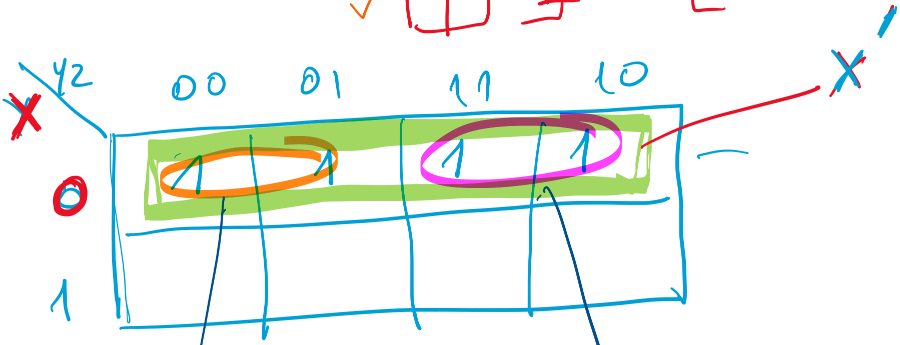
$$\boxed{y'z' + yz' = z'(y + \cancel{y'})}$$

$=1$

$= z'$

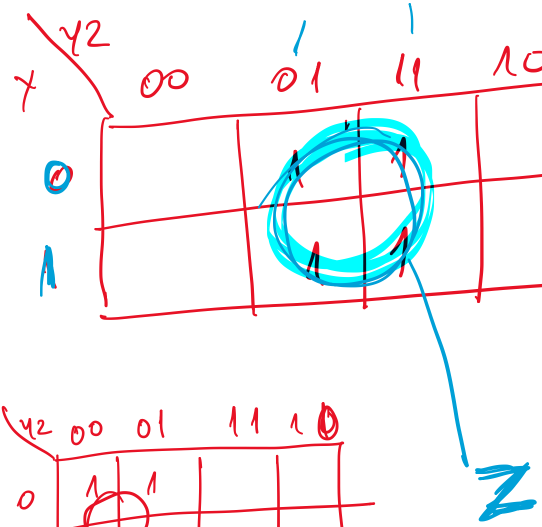
Γενικό τετράδα

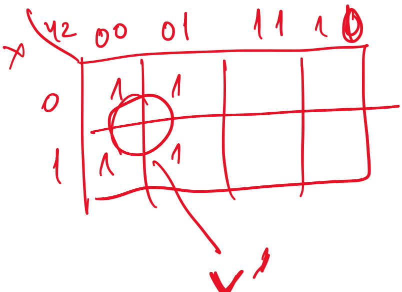


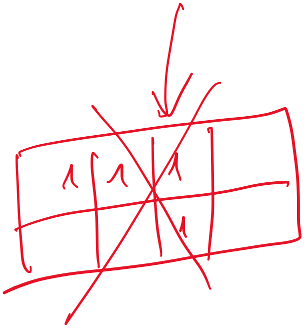


x'y'   x'y

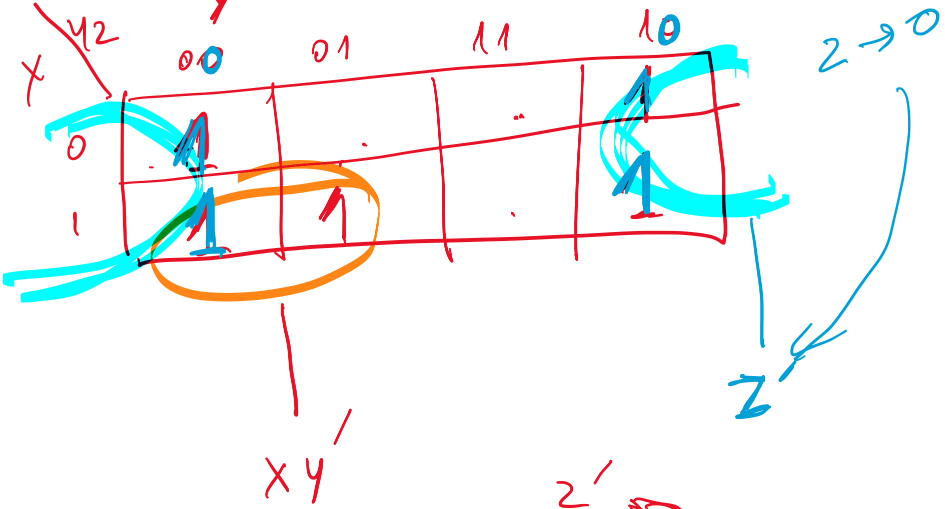
x'(y'+y)

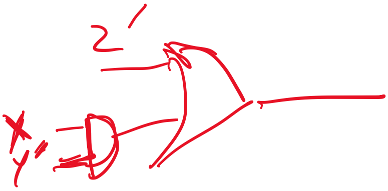




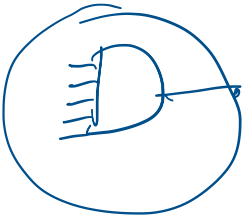


F = (0, 2, 4, 5, 6)



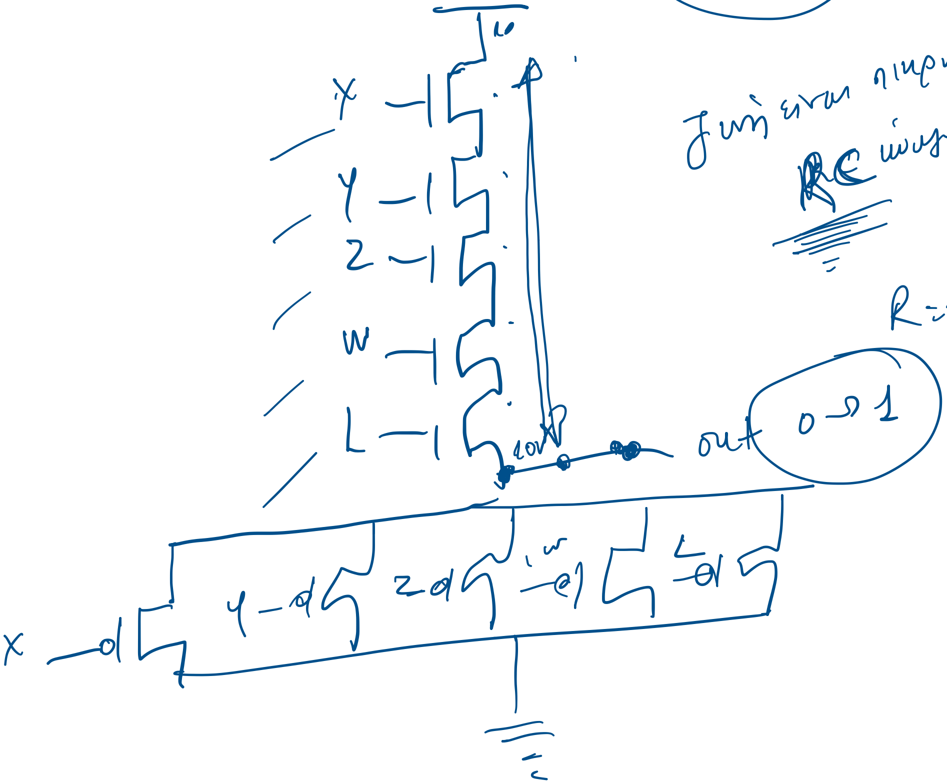


AND → 5 εισόδοι



Συνή είναι μικρή
RC ώματα

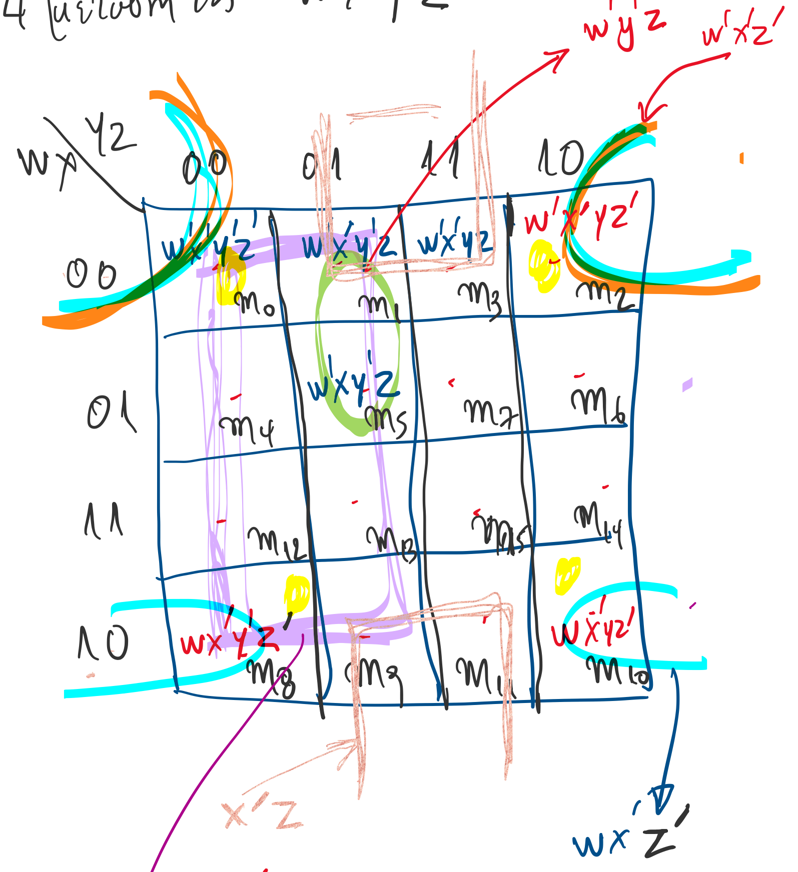
R=0



4 μεταβλητές wxyz

$2^4=16$ } 0 - - - 15

m_0 - - - m_{15}



wx \ yz	00	01	11	10
00	w'x'y'z' m_0	w'x'y'z m_1	w'x'yz m_3	w'x'yz' m_2
01	m_4	w'xy'z m_5	m_7	m_6
11	m_{12}	m_{13}	m_{15}	m_{14}
10	wx'y'z' m_8	m_9	m_{11}	wx'yz' m_{10}

$$w'x'z' + wx'z' = x'z'(w'+w) = x'z'$$

2 → 1 όρο με 3 μεταβλητές

4 → 1 όρο με 2 μεταβλητές

8 → 1 όρο με 1 μεταβλητή

y'

ΑΣΚΗΣΗ:

16 →

wx \ yz	00	01	11	10
00	1	1		1
01	1	1		1
11	1	1		1
10	1	1		

1. Άθροισμα γινομένων
2. Γινόμενο αθροισμάτων

?

3. NAND, NOR