

Gbegbe Decale Jacques

Clotlawa

#300094197

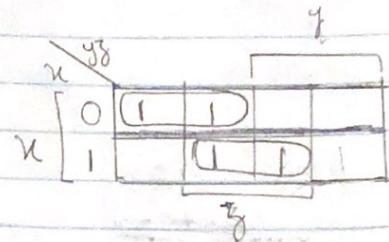
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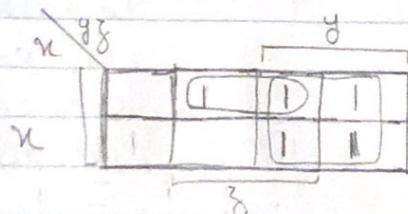
Exercice 3-2

a) $F(x, y, z) = \Sigma(0, 1, 5, 7)$

$$F = x'y' + xz$$

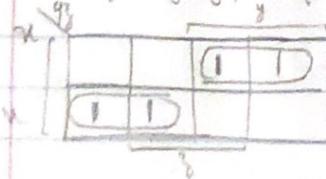


b) $F(x, y, z) = \Sigma(1, 2, 3, 6, 7)$



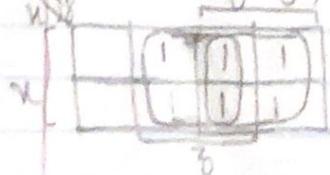
$$F = y + x'z$$

c) $F(x, y, z) = \Sigma(2, 3, 4, 5)$



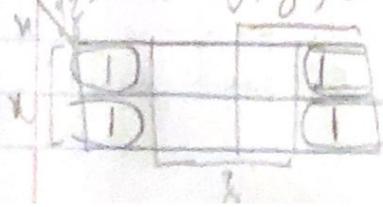
$$F = x'y + xy'$$

d) $F(x, y, z) = \Sigma(1, 2, 3, 5, 6, 7)$



$$F = y + z$$

e) $F(x, y, z) = \Sigma(0, 2, 4, 6)$



$$F = x'z' + xz' \Rightarrow F = z'$$

f) $F(x,y,z) = \Sigma(3,4,5,6,7)$

x	\overline{y}	\overline{z}	$\overline{1}$	$\overline{0}$	$\overline{1}$	$\overline{1}$	$\overline{0}$	$\overline{1}$
x	\overline{y}	\overline{z}	0	1	0	1	0	1
x	\overline{y}	\overline{z}	1	0	1	0	1	0
x	\overline{y}	\overline{z}	1	1	1	0	1	1

$$F = yz + x$$

Exercise 3-4

a) $F(x,y,z) = \Sigma(2,3,6,7)$

x	\overline{y}	\overline{z}	$\overline{1}$	$\overline{1}$	$\overline{1}$	$\overline{0}$	$\overline{1}$
x	\overline{y}	\overline{z}	0	1	0	1	0
x	\overline{y}	\overline{z}	1	0	1	0	1
x	\overline{y}	\overline{z}	1	1	1	0	1

$$F = y$$

b) $F(A,B,C,D) = \Sigma(4,6,7,15)$

AB	CD	0	1	3	2			
A	B	D	0	1	1	0	1	2
A	B	1	0	0	1	1	0	1
A	B	1	1	1	0	1	1	1
A	B	1	1	0	1	1	0	1
A	B	1	0	1	1	0	1	1
A	B	0	1	1	1	1	0	1
A	B	0	0	0	1	1	1	0
A	B	0	0	1	0	1	1	1

$$F = A'B'D' + BCD$$

c) $F(A,B,C,D) = \Sigma(3,7,11,13,14,15)$

AB	CD	0	1	3	2			
A	B	D	0	1	1	0	1	2
A	B	1	0	0	1	1	0	1
A	B	1	1	1	0	1	1	1
A	B	1	1	0	1	1	0	1
A	B	1	0	1	1	0	1	1
A	B	0	1	1	1	1	0	1
A	B	0	0	0	1	1	1	0
A	B	0	0	1	0	1	1	1

$$F = CB + ABD + ABC$$

d) $F(w,x,y,z) = \Sigma(2,3,12,13,14,15)$

wx	\overline{y}	\overline{z}	$\overline{1}$	$\overline{0}$	$\overline{1}$	$\overline{1}$	$\overline{0}$	$\overline{1}$
wx	\overline{y}	\overline{z}	0	1	0	1	0	1
wx	\overline{y}	\overline{z}	1	0	1	0	1	0
wx	\overline{y}	\overline{z}	1	1	1	0	1	1

$$F = w'x'y + w'x$$

Hilary

e) $F(w, x, y, z) = \Sigma(11, 12, 13, 14, 15)$

0	1	0	1
1	0	1	1
0	1	1	1

$$F = w'x + w'yz$$

f) $F(w, x, y, z) = \Sigma(8, 10, 12, 13, 14)$

0	1	0	1
1	0	1	1
0	1	1	1

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

$$F = w'z' + w'xy'$$

g) $F(w, x, y, z) = \Sigma(0, 1, 4, 5, 10, 11, 14, 15)$

$wx \cancel{yz}$

0	1	0	1
1	0	1	1
0	1	1	1

$$F = w'y' + w'y$$

h) $F(w, x, y, z) = \Sigma(2, 3, 6, 7, 8, 9, 12, 13)$

$wx \cancel{yz}$

0	1	1	1
1	0	1	1
0	1	0	1

$$F = w'y + w'yz$$

Exercice 3-5

a) $F(w, x, y, z) = \Sigma(1, 4, 5, 6, 12, 14, 15)$

$wx \cancel{yz}$

0	1	0	1
1	0	1	0
0	1	0	1

$$F = w'z' + wxy + w'yz$$

b) $F(A, B, C, D) = \Sigma(2, 3, 6, 7, 12, 13, 14)$

AB
CD

		1	1
	1	1	1
1	1	1	1
1	1	1	1

$$F = ABC' + A'C + BCD'$$

c) $F(w, x, y, z) = \Sigma(1, 3, 4, 5, 6, 7, 9, 11, 13, 15)$

w, yz

	1	1	
1	1	1	1
1	1	1	1
1	1	1	1

$$F = z + w'x'$$

d) $F(A, B, C, D) = \Sigma(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$

AB
CD

0			0
	0	1	1
1	1	1	1
1	1	1	1

$$F = A'C'D' + A'CD' + BD + AB'D'$$

$$F = A'D' + BD + AB'D'$$

Exercise 3-8

a) $w'y + yz + xy'z$

w, yz

		1	
		1	1
1	1	1	1
1	1	1	1

$$F = \Sigma(3, 5, 6, 7)$$

b) $C'D + ABC' + ABD' + A'B'D$

AB
CD

	1	1	
	1	1	1
1	1	1	1
1	1	1	1

$$F = \Sigma(1, 3, 5, 9, 12, 13, 14)$$

Hilroy

c) $wyz + w'x' + wxz'$

1	1	1	1
1		1	1
		1	
			1

$$F = \Sigma(0, 1, 2, 3, 7, 11, 12, 14, 15)$$

d) $A'B + A'CD + B'CD + BC'D$

1	1	1	1
1		1	1
		1	

$$F = \Sigma(3, 4, 5, 6, 7, 11, 12)$$

Exercice 3-10

a) $F(w, x, y, z) = \Sigma(0, 2, 5, 7, 8, 10, 12, 13, 14, 15)$

0	0	0	0
1	1	1	1
0	1	1	0
1	0	0	0

Essentials: $xz, x'z'$

$$F = wz + w'z' + wx$$

b) $F(A, B, C, D) = \Sigma(0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$

0	0	0	0
1	0	0	0
0	1	0	0
1	1	1	1

Essentials: $AC, A'BD, B'D'$

$$F = AC + B'D + A'BD + B'C$$

c) $F(A, B, C, D) = \Sigma(1, 3, 4, 5, 10, 11, 12, 13, 14, 15)$

0	0	0	0
0	1	0	0
1	0	0	0
1	1	1	1

Essentials: AC, BC'

$$F = BC' + AC + A'BD$$

d) $F(w, x, y, z) = \Sigma(0, 1, 4, 5, 6, 7, 9, 11, 14, 15)$

$wx'yz$

1	1		
1		1	1
	1	1	
		1	1

Essentials: $w'y$

$$F = w'y + xy + w'x'z$$

e) $F(A, B, C, D) = \Sigma(0, 1, 3, 4, 8, 9, 10, 13, 15)$

$AB'CD$

1	1		
1		1	
	1	1	
		1	1

Essentials: $B'C'$, $AB'D'$

$$F = AB'D' + B'C' + ABD + A'CD$$

f) $F(w, x, y, z) = \Sigma(0, 4, 2, 4, 5, 6, 7, 10, 15)$

$wx'yz$

1	1		1
1		1	1
	1	1	
		1	1

Essentials: $w'y$, $x'yz$, xyz

$$F = w'y + x'yz + xyz + w'x$$

Exercise 3-15

a) $F(x, y, z) = \Sigma(0, 1, 4, 5, 6)$

$d(x, y, z) = \Sigma(2, 3, 7)$

$wxyz$

1	1	x	x
1	1	x	1
		1	1

$$F = 2^0 = 1$$

$$F = \Sigma(0, 1, 2, 3, 4, 5, 6, 7)$$

b) $F(A, B, C, D) = \Sigma(0, 6, 8, 13, 14)$

$d(A, B, C, D) = \Sigma(2, 4, 10)$

$AB'CD$

1		x	
x	1		
	1	1	
		1	x

$$F = B'D' + CD' + ABC'D$$

$$F = \Sigma(0, 2, 6, 8, 10, 13, 14)$$

$$c) F(A,B,C,D) = \Sigma(5,6,7,12,14,15)$$

$$d(A,B,C,D) = \Sigma(3,9,11,15)$$

AB

		X	
	1	1 1	
1	1	1 1	
	X	X	

$$F = BC + ABD + A'BD$$

$$F = \Sigma(5,6,7,12,14,15)$$

$$d) F(A,B,C,D) = \Sigma(4,12,7,2,10)$$

$$d(A,B,C,D) = \Sigma(0,6,8)$$

AB

X			1
1	1	1	X
1	1	X	1
X			1

$$F = C'D' + B'D' + ABC$$

$$F = \Sigma(0,2,4,6,7,8,10,12)$$

Exercice 3-16

$$a) F(A,B,C,D) = AC'D' + A'C + ABC + AB'C' + A'C'D'$$

AB

1	1	1	1
1	1	1	1
1	1	0	1
X			1

$$F = (C + D')' = (C'D)'$$

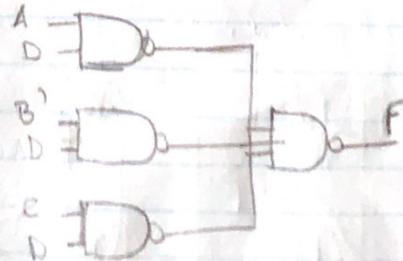


$$b) F(A,B,C,D) = A'B'C'D + CD + AC'D$$

AB

	1	1	
	1	1	1
	1	1	0
	1	1	0

$$F = AD + B'D + CD = ((AD)' + (B'D)' + (CD)')'$$

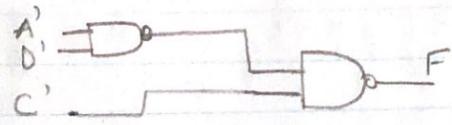


$$c) F(A, B, C, D) = (A' + C' + D')(A' + C')(C' + D')$$

$$AB \backslash CD$$

	1	1	1	1
	1	1	1	1
	1	1	1	1
	1	1	1	1
	1	1	1	1

$$F = C' + A'D' = (C(A'D'))'$$

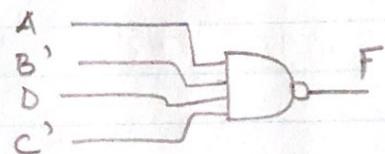


$$d) F(A, B, C, D) = A' + B + D' + B'C$$

$$AB \backslash CD$$

	1	1	1	1
	1	1	1	1
	1	1	1	1
	1	1	1	1
	1	1	1	1

$$F = A' + B + D' + C = (AB'DC')'$$

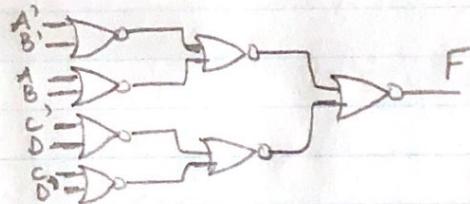


Exercise 3-18

$$a) F(A, B, C, D) = (A \oplus B)'(C \oplus D)$$

$$AB \backslash CD$$

	1	1	1
	1	1	1
	1	1	1



$$\begin{aligned} F &= (A \oplus B)'(C \oplus D) \\ &= (A'B + AB')'(CD' + C'D) \\ &= ABCD' + ABC'D + A'B'CD' + A'B'C'D \end{aligned}$$

$$\begin{aligned} F' &= (AB + A'B')' + (CD' + C'D)' \\ &= ((A' + B')' + (A + B')')' + ((C' + D')' + (C + D')')' \end{aligned}$$

$$\begin{aligned} b) F &= (AB + A'B')(C'D + CD') \\ &= ((AB)'(A'B')')'((C'D)'(CD')')' \\ &= (((AB)'(A'B')')'((C'D)'(CD')')')' \end{aligned}$$

