

Sistemas Digitales Minimización (Parte I)

Prof. Luis Araujo

Escuela de Ingeniería Eléctrica



Minimización

- Minimización Algebraica

$$(T9) X + X \cdot Y = X$$

$$(T9') X \cdot (X + Y) = X$$

$$(T10) X \cdot Y + X \cdot \bar{Y} = X$$

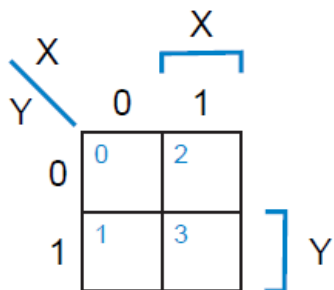
$$(T10') (X + Y) \cdot (X + \bar{Y}) = X$$

Minimización

- Minimización a través de Mapas de Karnaugh

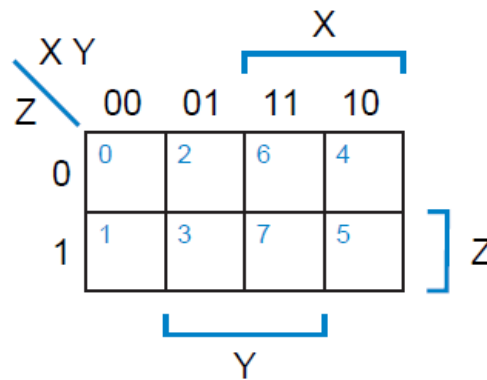
2 variables

(a)



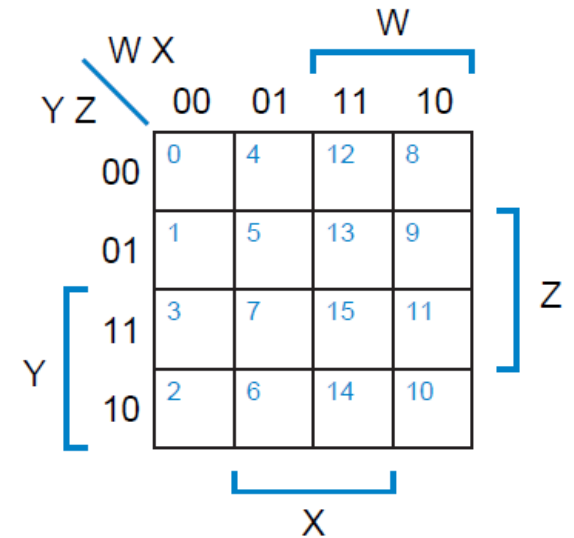
3 variables

(b)



4 variables

(c)

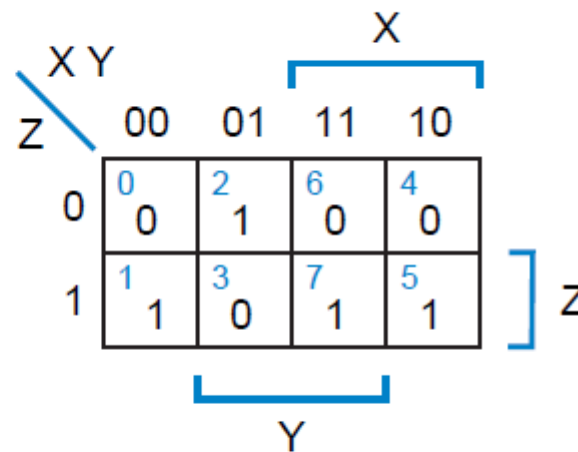


Mapas de Karnaugh

$$F = \sum_{X,Y,Z} (1,2,5,7)$$

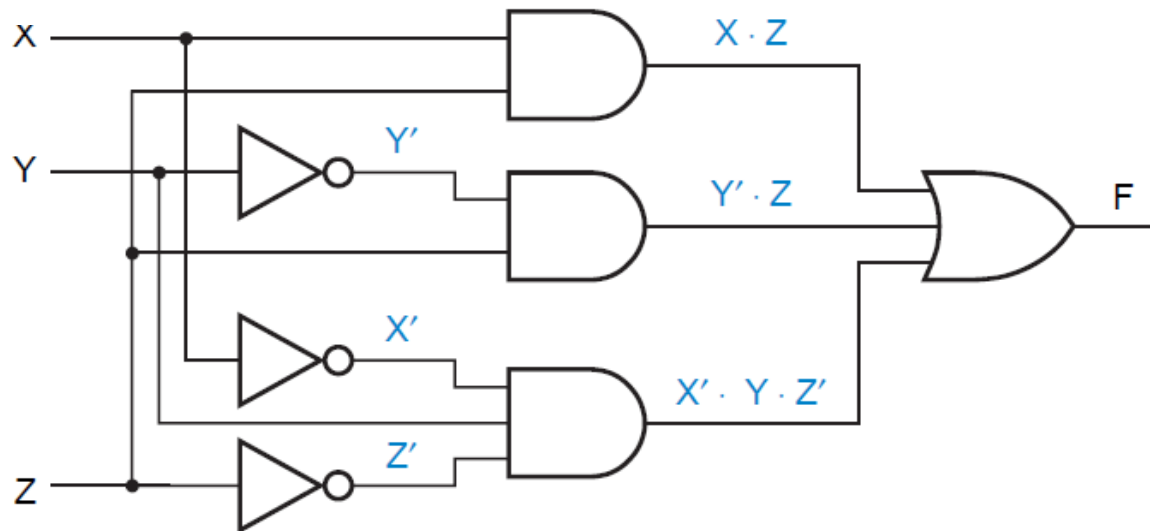
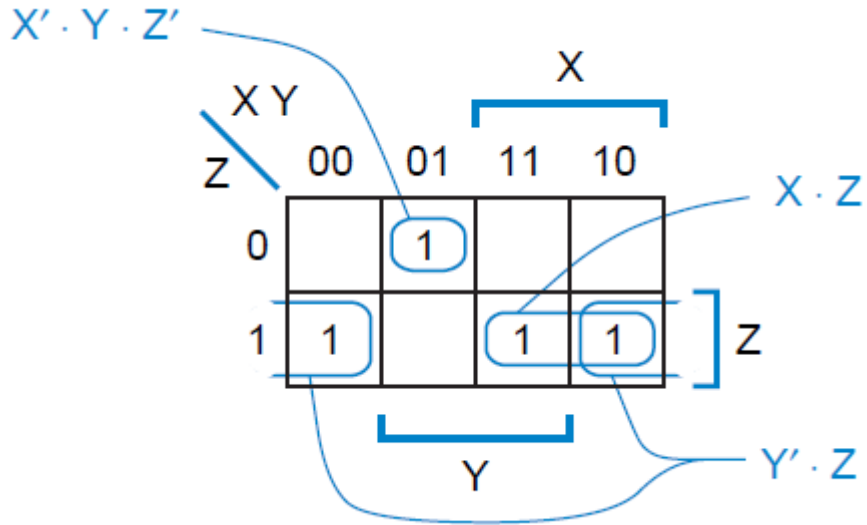
X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

(a)



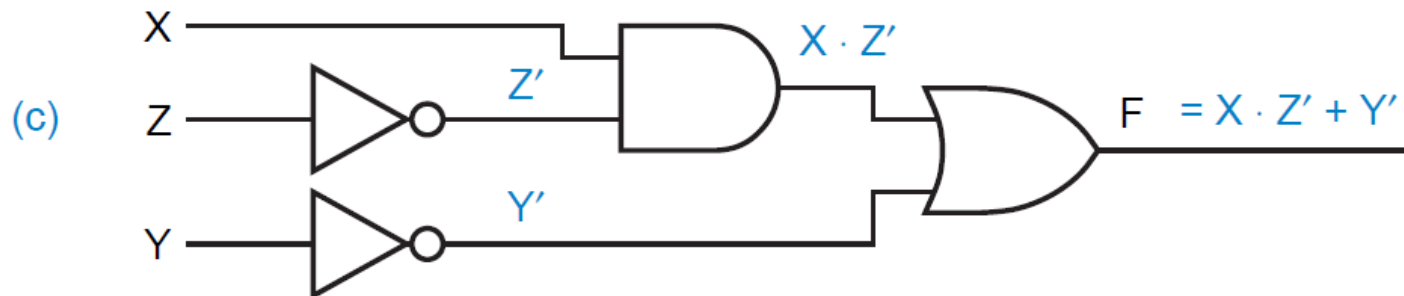
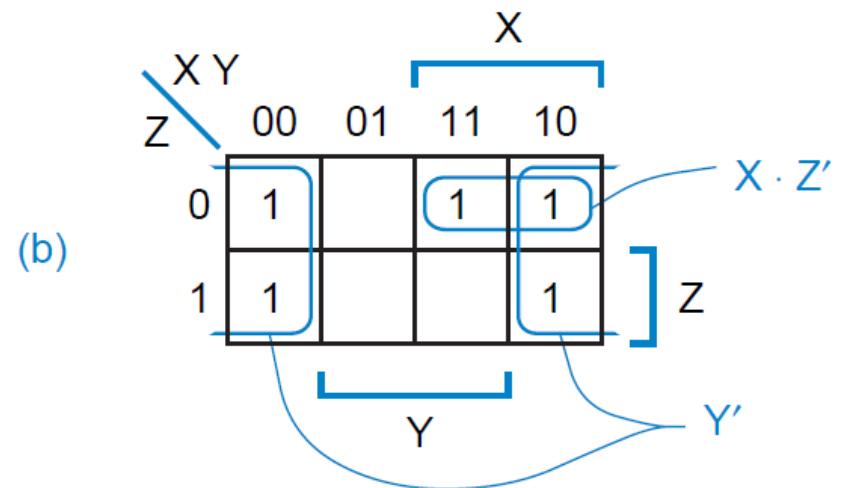
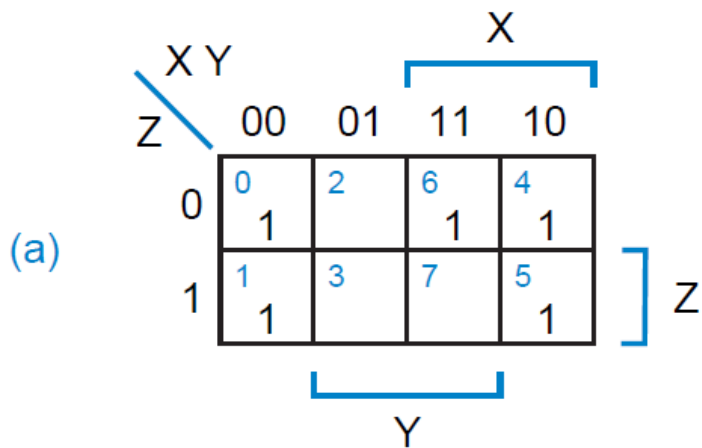
(b)

Implicantes Primos (IP)



Implicantes Primos (IP)

$$F = \sum_{X,Y,Z} (0,1,4,5,6)$$



Solución en S.O.P.

(a)

		N ₃			
		00	01	11	10
N ₁	N ₃ N ₂	00	01	11	10
	00	0	4	12	8
	01	1	5	13	9
	11	3	7	15	11
10	2	6	14	10	

N₂

N₀

$$F = \sum_{N_3, N_2, N_1, N_0} (1, 2, 3, 5, 7, 11, 13)$$

(b)

		N ₃			
		00	01	11	10
N ₁	N ₃ N ₂	00	01	11	10
	00				
	01	1	1	1	
	11	1	1		1
10	1				

N₂

N₀

N₂ · N₁' · N₀

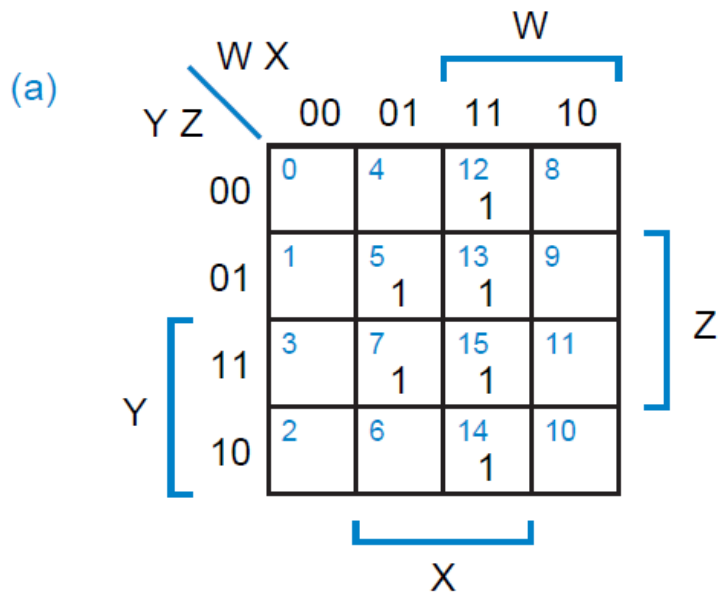
N₂' · N₁ · N₀

N₃' · N₀

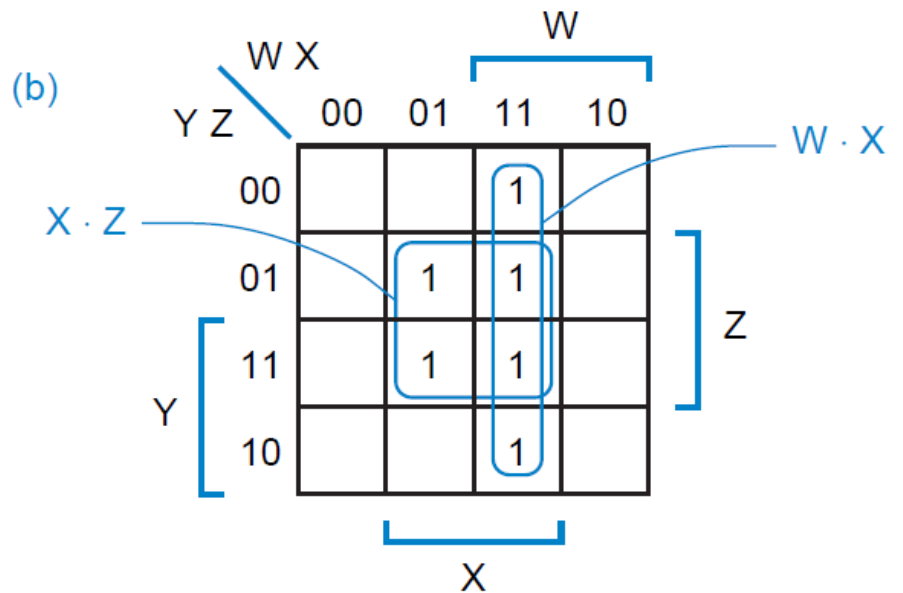
N₃' · N₂' · N₁

$$F = N_3' \cdot N_0 + N_3' \cdot N_2' \cdot N_1 + N_2' \cdot N_1 \cdot N_0 + N_2 \cdot N_1' \cdot N_0$$

Solución en S.O.P.

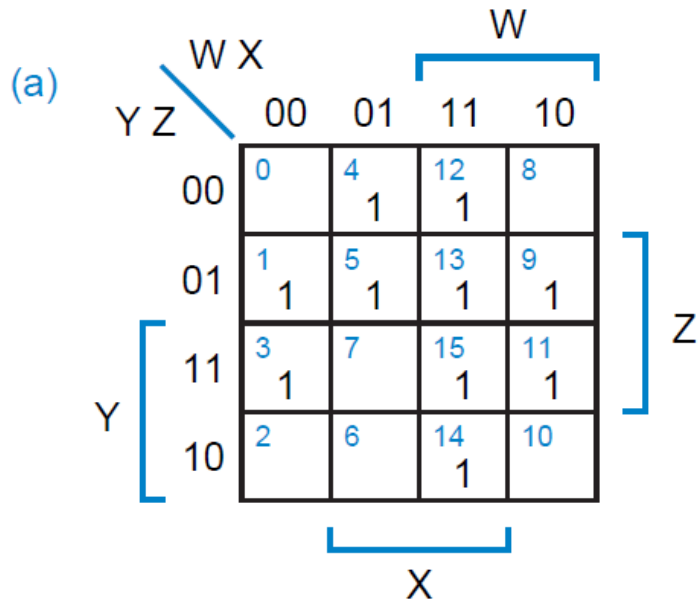


$$F = \sum_{W,X,Y,Z}(5,7,12,13,14,15)$$

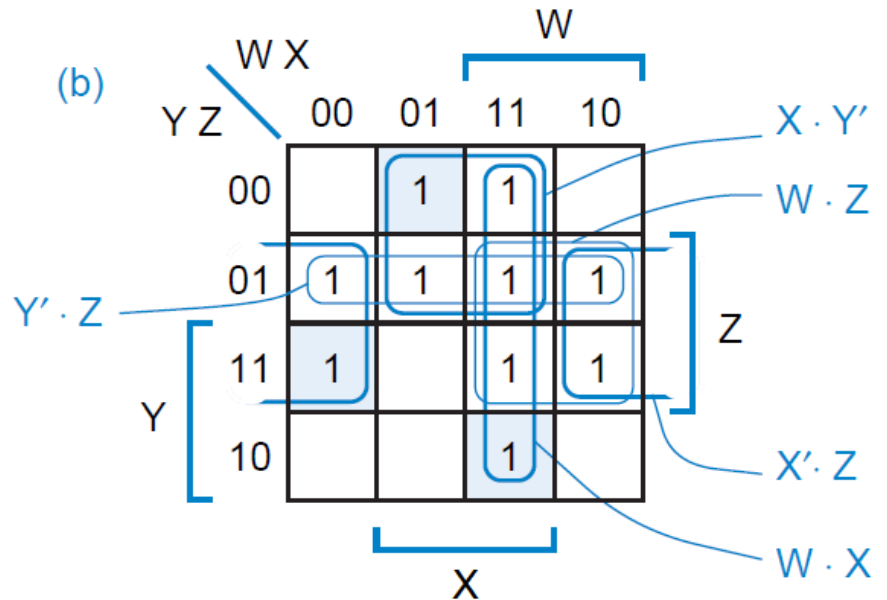


$$F = X \cdot Z + W \cdot X$$

Implicantes Primos Esenciales (IPE)

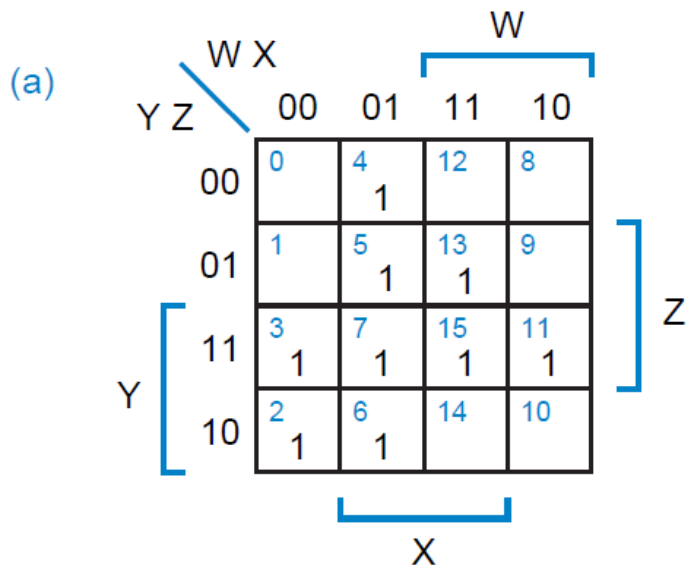


$$F = \sum_{W,X,Y,Z}(1,3,4,5,9,11,12,13,14,15)$$

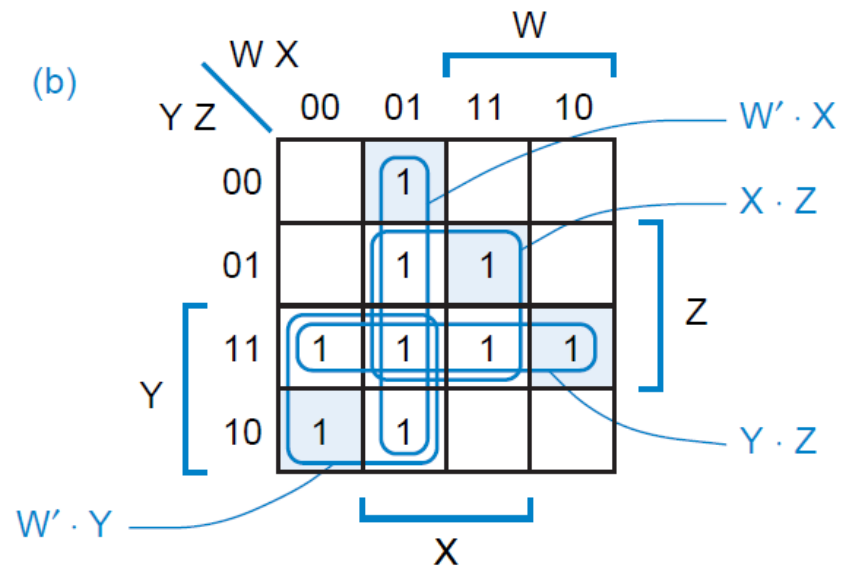


$$F = X \cdot Y' + X' \cdot Z + W \cdot X$$

Implicantes Primos Esenciales (IPE)

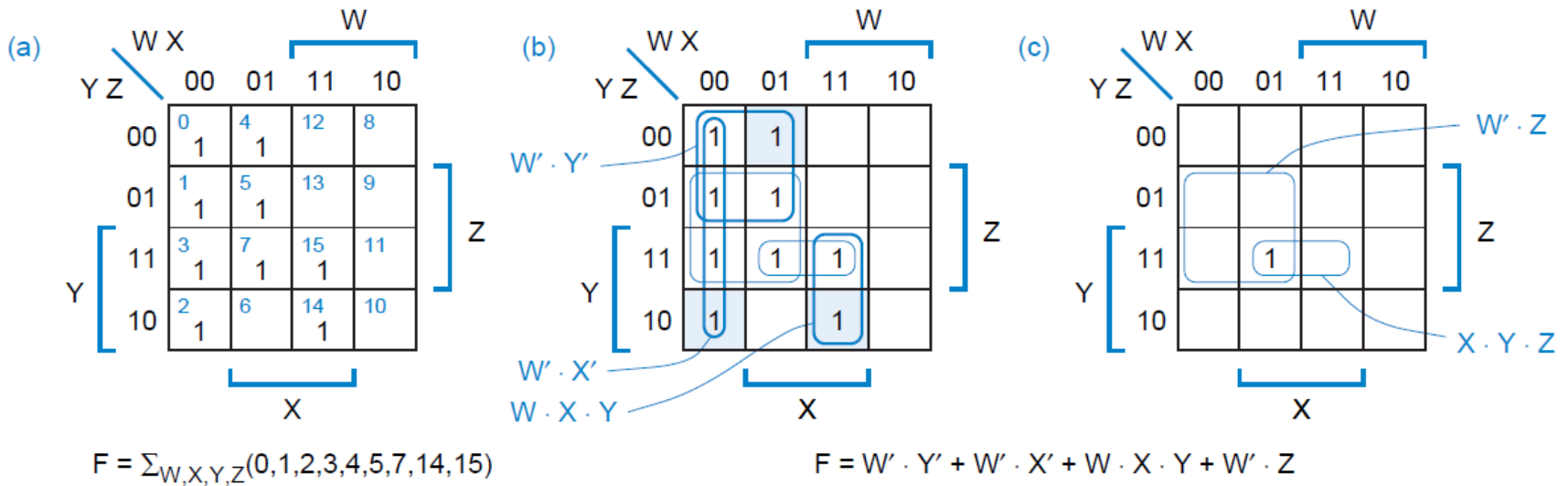


$$F = \sum_{W,X,Y,Z}(2,3,4,5,6,7,11,13,15)$$

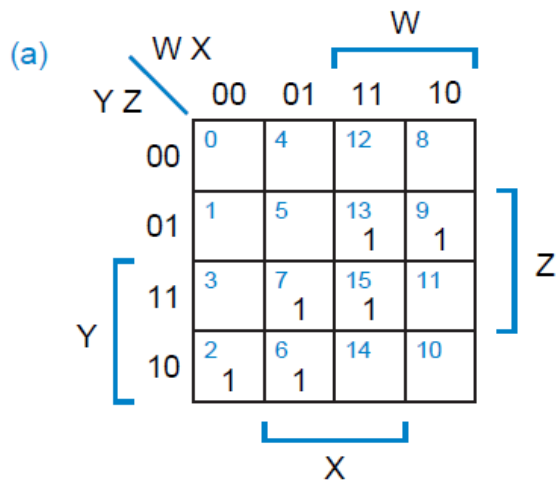


$$F = W' \cdot Y + W' \cdot X + X \cdot Z + Y \cdot Z$$

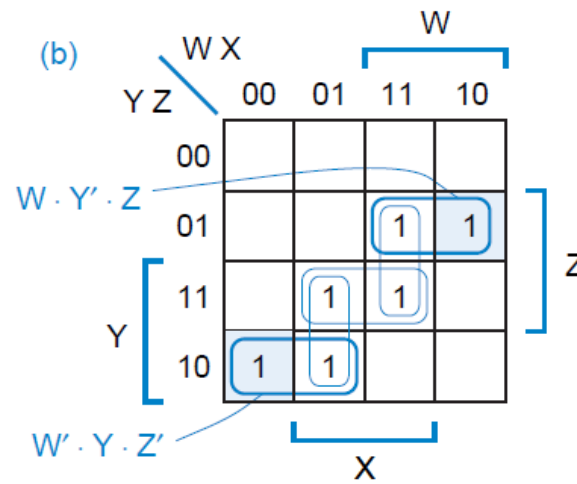
IPE Secundarios (IPES)



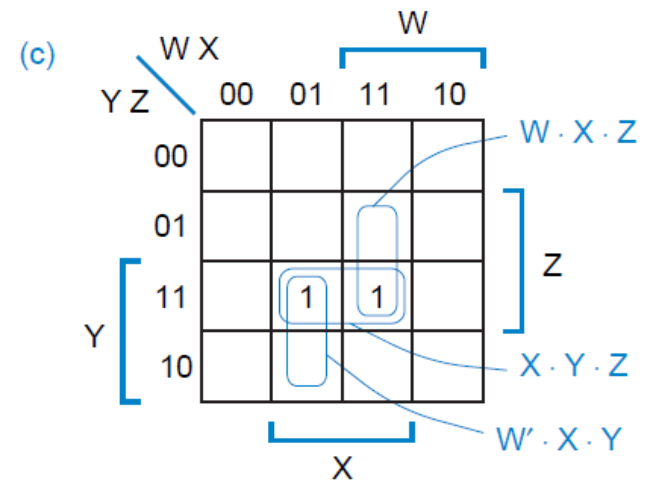
IPE Secundarios (IPES)



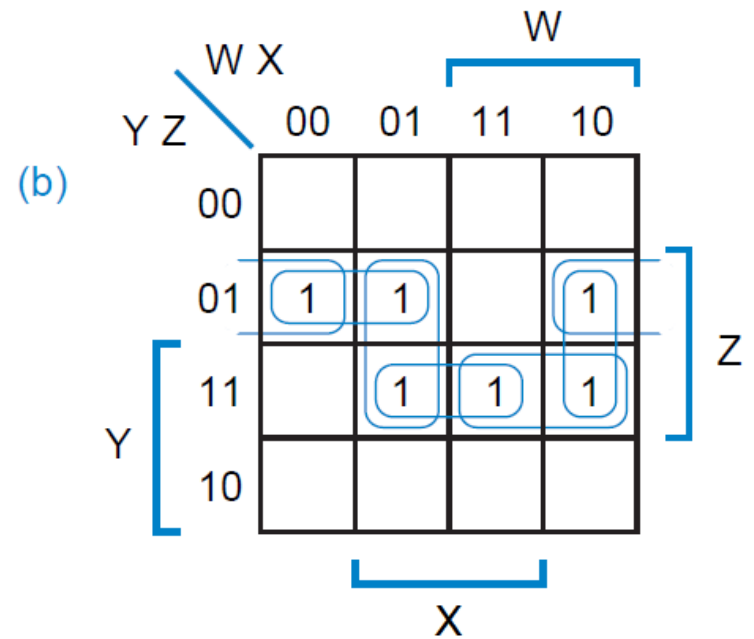
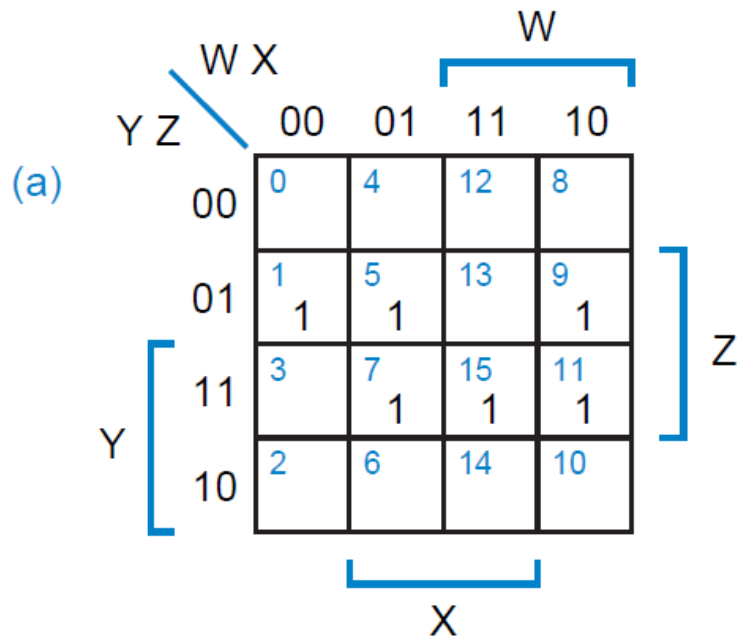
$$F = \sum_{W,X,Y,Z}(2,6,7,9,13,15)$$



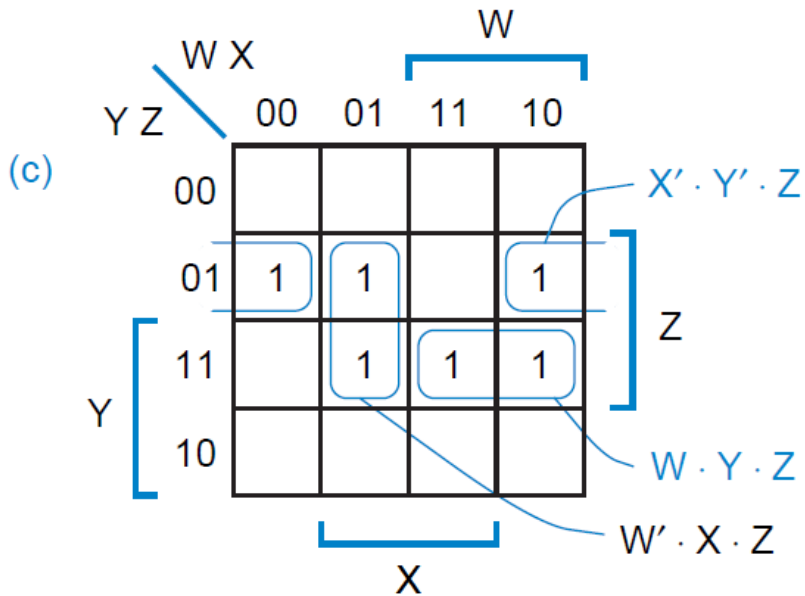
$$F = W \cdot Y' \cdot Z + W' \cdot Y \cdot Z' + X \cdot Y \cdot Z$$



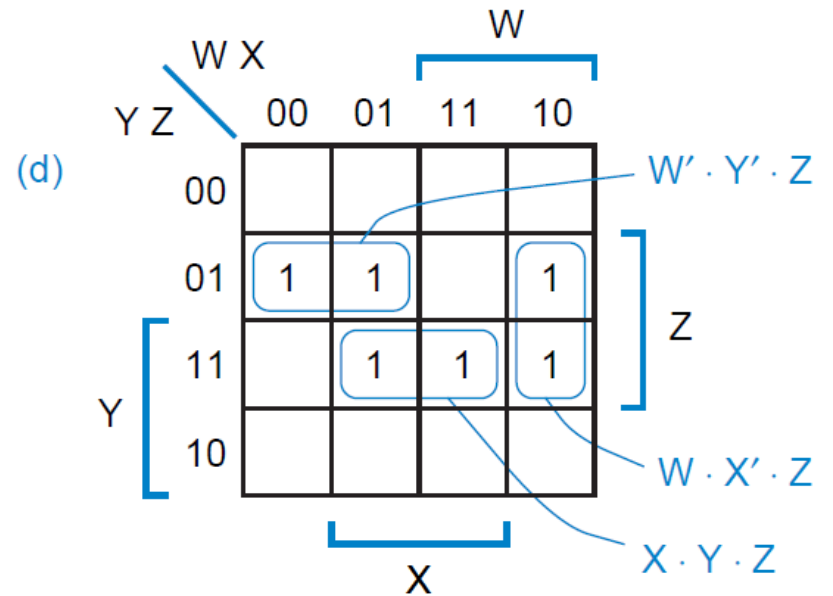
IPE Secundarios (IPES)



Mapas de Karnaugh



$$F = W' \cdot X \cdot Z + W \cdot Y \cdot Z + X' \cdot Y' \cdot Z$$



$$F = X \cdot Y \cdot Z + W \cdot X' \cdot Z + W' \cdot Y' \cdot Z$$