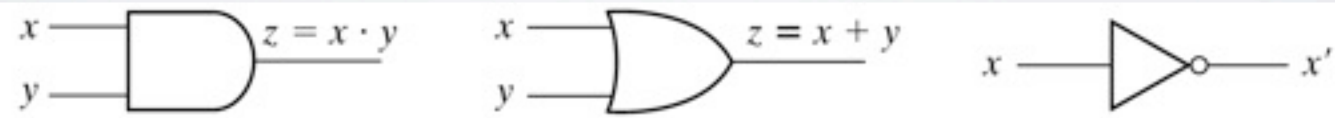
MINIMIZACIÓN DE CIRCUITOS

INEL 4076 - Spring 2013

OPERACIONES BÁSICAS

- AND - Salida es "1" si todas las entradas son "1"
- OR - salida es "1" si alguna entrada es "1"
- Not (complemento) - salida es "1" si la entrada es "0", "0" si la entrada es "1"



(a) Two-input AND gate (b) Two-input OR gate (c) NOT gate or inverter

Fig. 1-4 Symbols for digital logic circuits

TABLAS DE VERDAD

- la tala de verdad presenta la salida para todas las combinaciones posibles de las entradas
- si hay "n" entradas, el total de combinaciones únicas es 2^N

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

AND

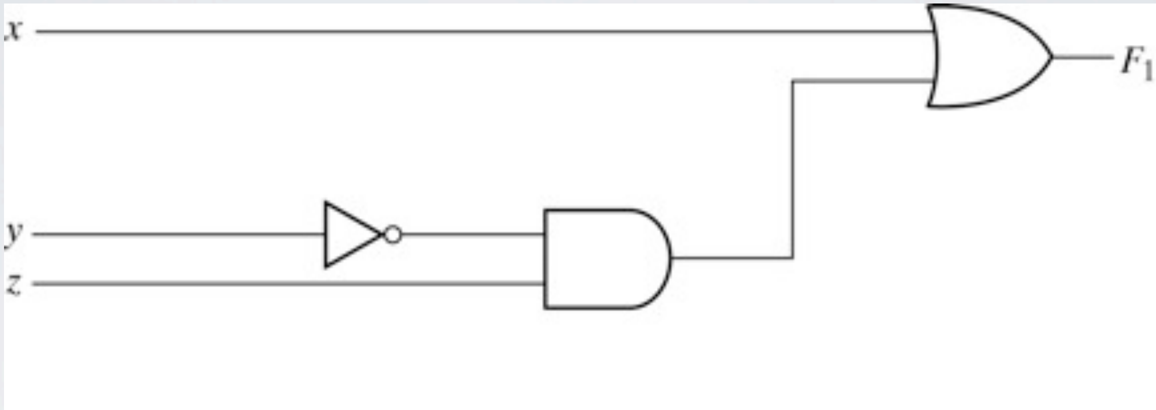
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

OR

A	Y
0	1
1	0

NOT

EXPRESIÓN BOOLEANA



Escriba la tabla de verdad y
la expresión booleana que representa
la salida "F_1" en términos de las entradas
"x", "y" y "z"

Table 2-1
Postulates and Theorems of Boolean Algebra

Postulate 2	(a)	$x + 0 = x$	(b)	$x \cdot 1 = x$
Postulate 5	(a)	$x + x' = 1$	(b)	$x \cdot x' = 0$
Theorem 1	(a)	$x + x = x$	(b)	$x \cdot x = x$
Theorem 2	(a)	$x + 1 = 1$	(b)	$x \cdot 0 = 0$
Theorem 3, involution		$(x')' = x$		
Postulate 3, commutative	(a)	$x + y = y + x$	(b)	$xy = yx$
Theorem 4, associative	(a)	$x + (y + z) = (x + y) + z$	(b)	$x(yz) = (xy)z$
Postulate 4, distributive	(a)	$x(y + z) = xy + xz$	(b)	$x + yz = (x + y)(x + z)$
Theorem 5, DeMorgan	(a)	$(x + y)' = x'y'$	(b)	$(xy)' = x' + y'$
Theorem 6, absorption	(a)	$x + xy = x$	(b)	$x(x + y) = x$

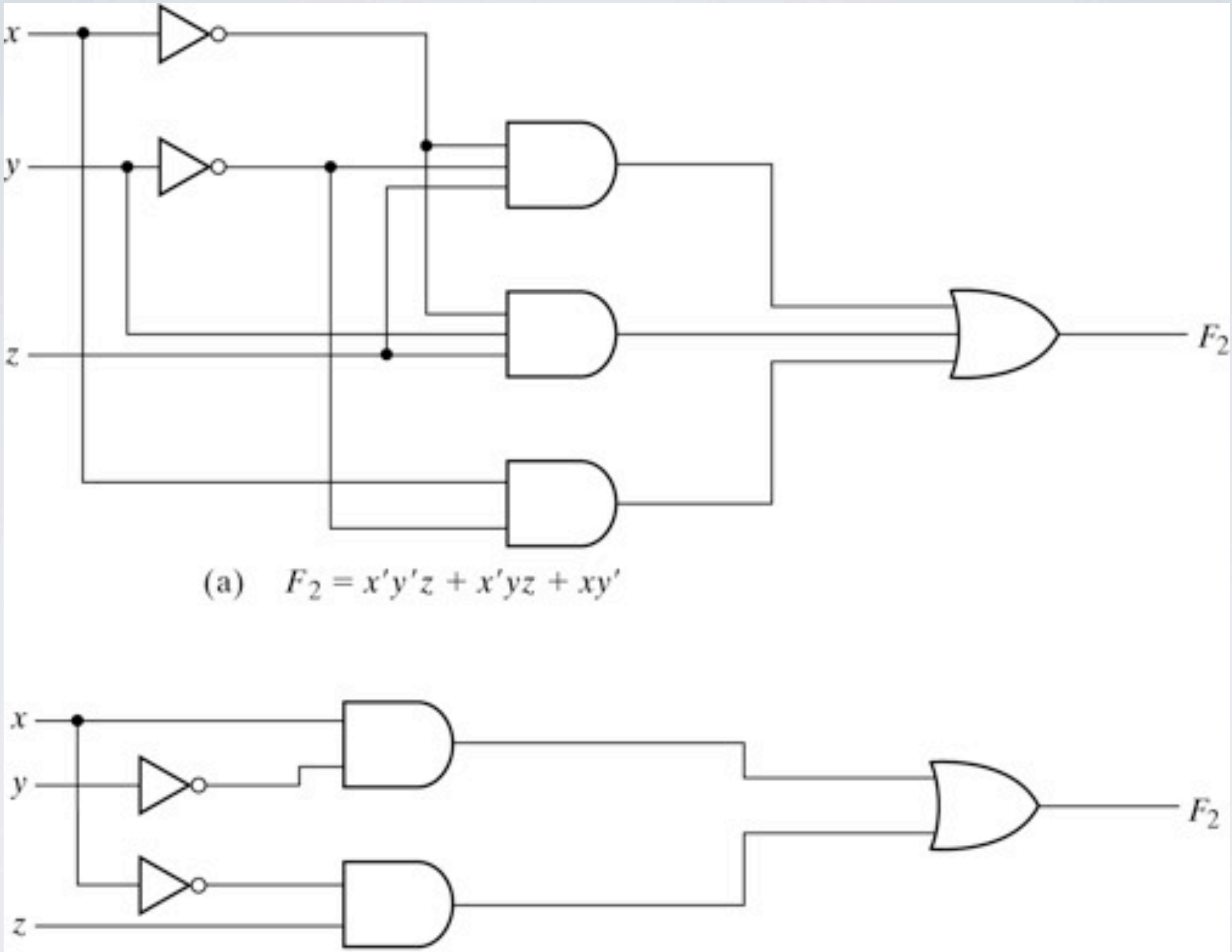
postulado 4b forma 2 $X + X'Y = X + Y$

Teorema del Consenso $XY+X'Z+YZ = XY+X'Z$

SIMPLIFICACIÓN

- Simplifique la siguiente expresión booleana

$$F_2=x'y'z+x'yz+xy'$$

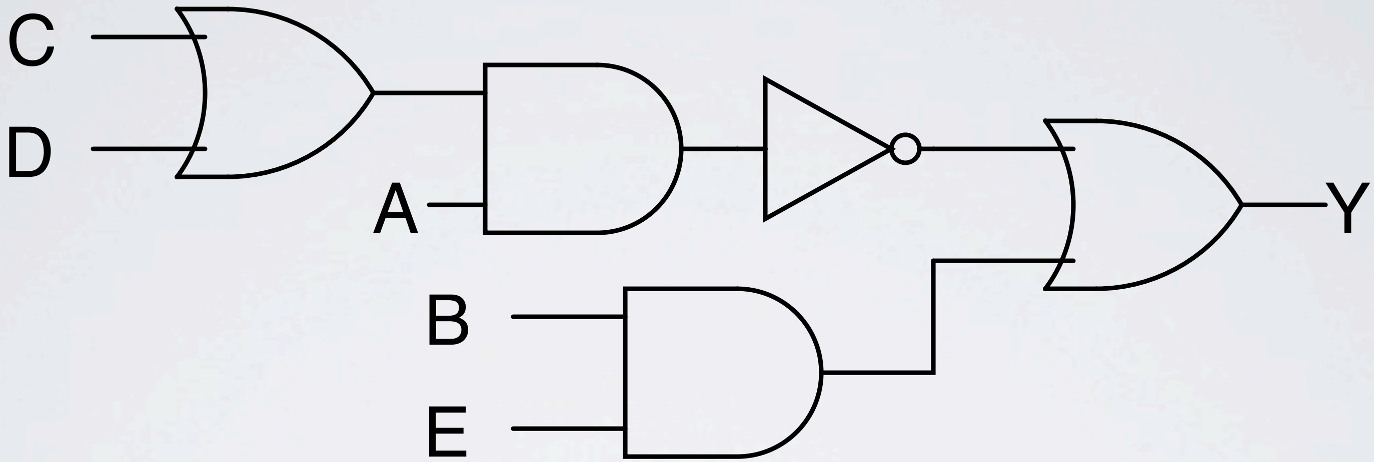


(a) $F_2 = x'y'z + x'yz + xy'$

(b) $F_2 = xy' + x'z$

Fig. 2-2 Implementation of Boolean function F_2 with gates

EJEMPLO



- Escriba la expresión booleana y la tabla de verdad para la "Y" del diagrama de arriba

- dibuje el diagrama para un circuito que produzca la siguiente salida

ACF+Dc'f'

Minterms *for Three Binary Variables*

x	y	z	Minterms: Term	Minterms: Designation
0	0	0	$x'y'z'$	m_0
0	0	1	$x'y'z$	m_1
0	1	0	$x'yz'$	m_2
0	1	1	$x'yz$	m_3
1	0	0	$xy'z'$	m_4
1	0	1	$xy'z$	m_5
1	1	0	xyz'	m_6
1	1	1	xyz	m_7

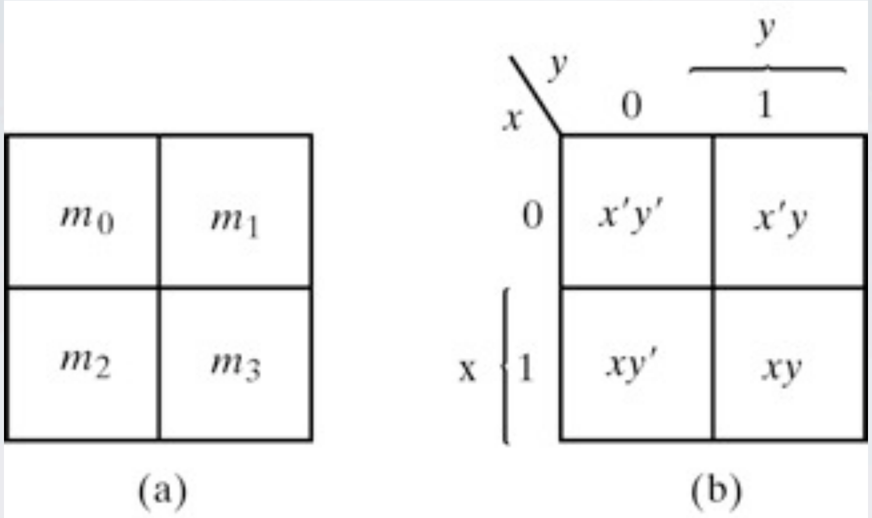


Fig. 3-1 Two-variable Map

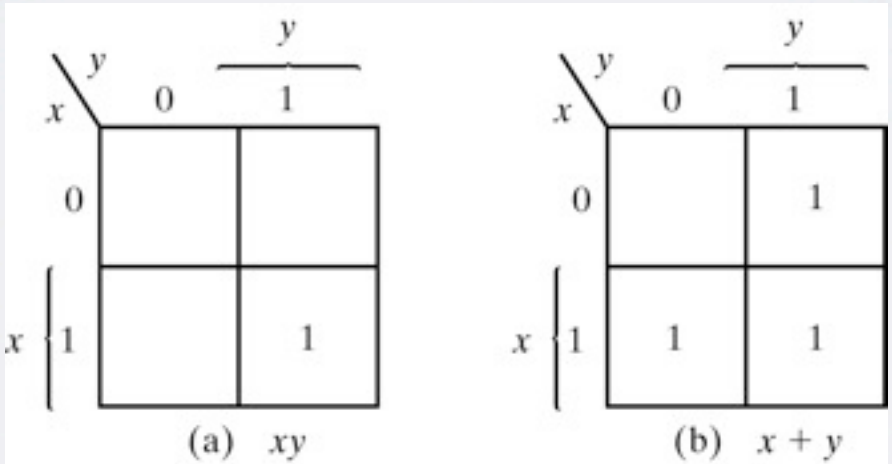


Fig. 3-2 Representation of Functions in the Map

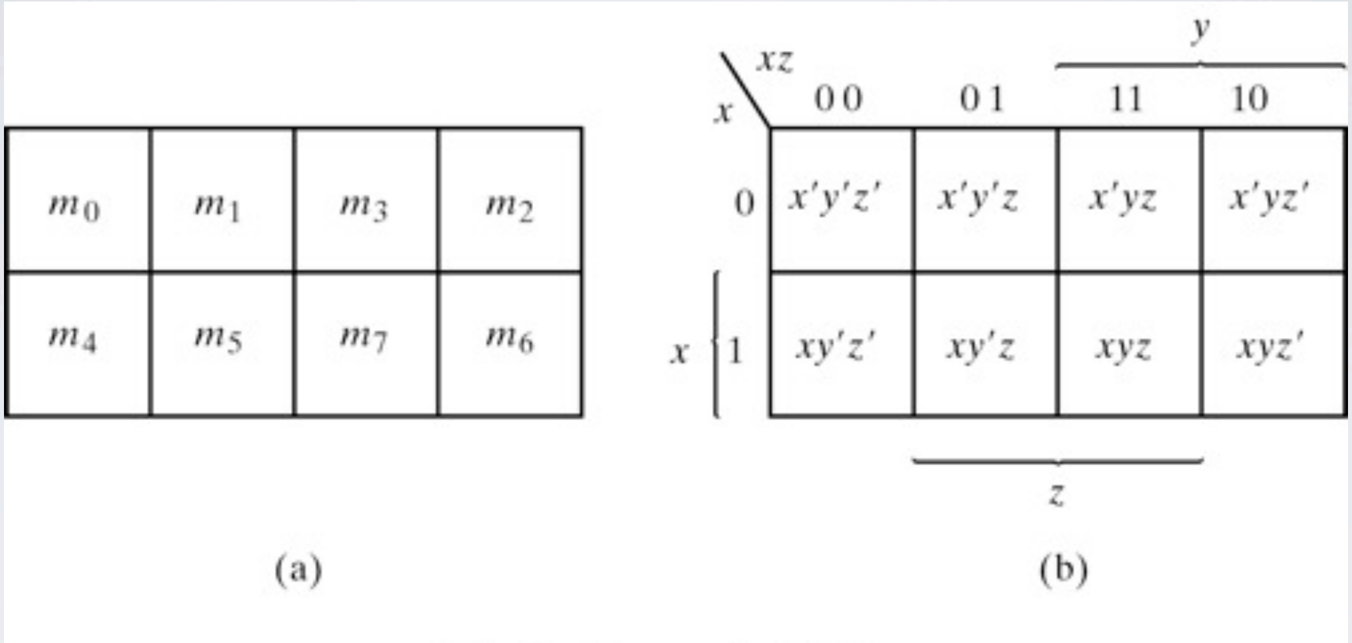


Fig. 3-3 Three-variable Map

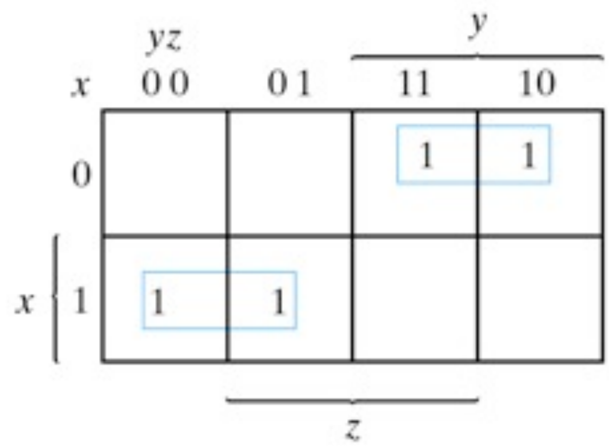


Fig. 3-4 Map for Example 3-1; $F(x, y, z) = \Sigma(2, 3, 4, 5) = x'y + xy'$

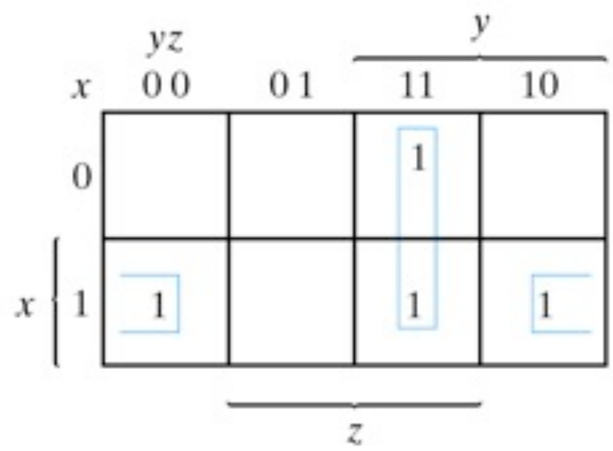


Fig. 3-5 Map for Example 3-2; $F(x, y, z) = \Sigma(3, 4, 6, 7) = yz + xz'$

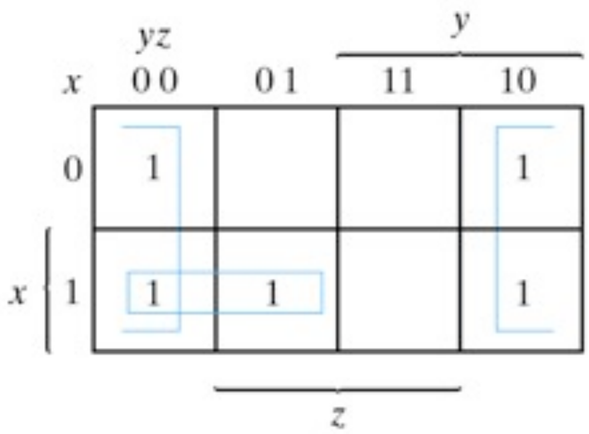


Fig. 3-6 Map for Example 3-3; $F(x, y, z) = \Sigma(0, 2, 4, 5, 6) = z' + xy'$

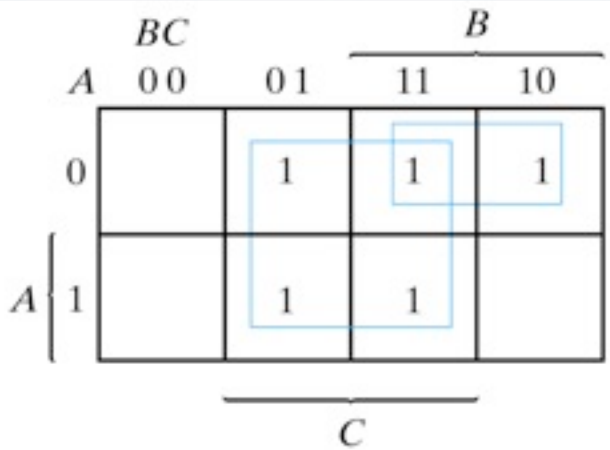


Fig. 3-7 Map for Example 3-4; $A'C + A'B + AB'C + BC = C + A'B$

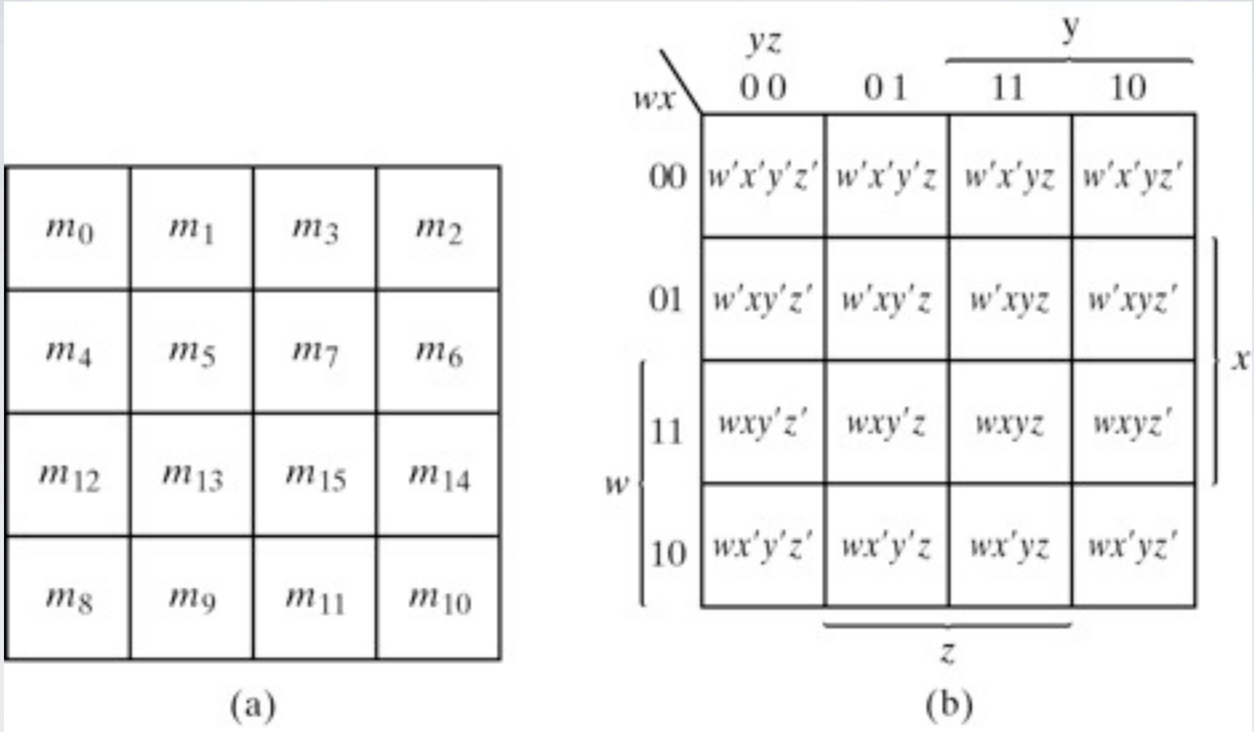


Fig. 3-8 Four-variable Map

Example: $f(w,x,y,z) = \sum(0,1,2,4,5,6,8,9,12,13,14)$

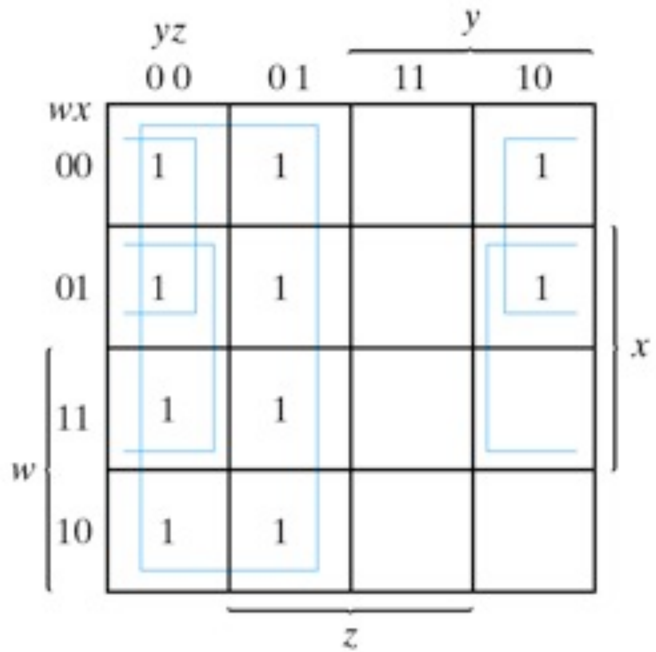


Fig. 3-9 Map for Example 3-5; $F(w, x, y, z)$
$= \Sigma (0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14) = y' + w'z' + xz'$

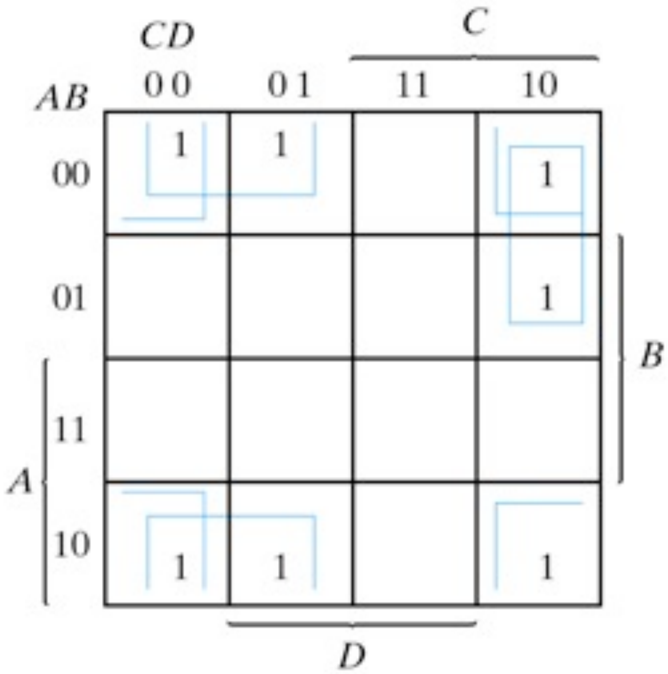


Fig.3-10 Map for Example 3-6; $A'B'C + B'CD' + A'BCD' + AB'C' = B'D' + B'C' + A'CD'$

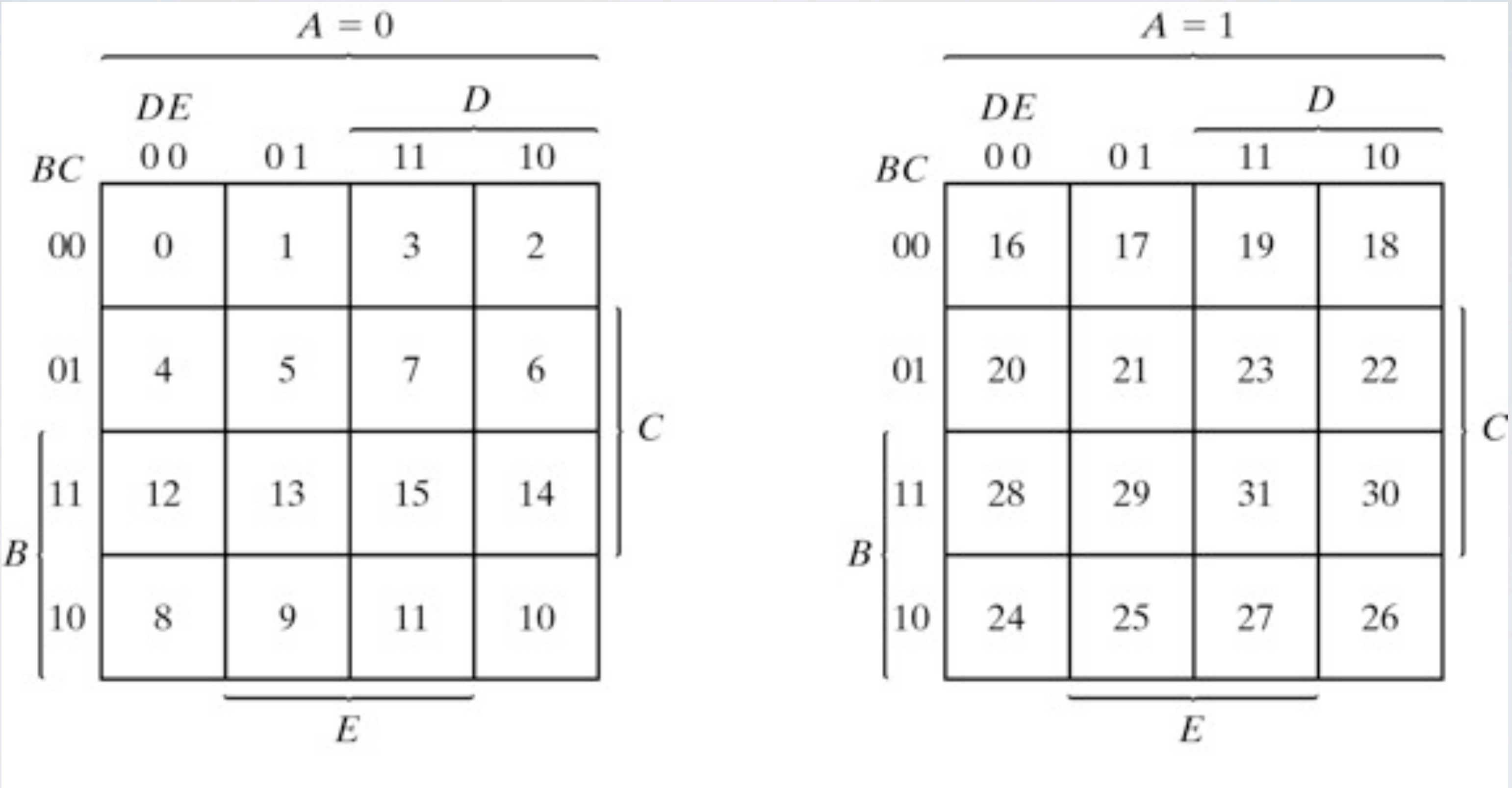


Fig. 3-12 Five-variable Map

Example: F(A,B,C,D,E) = A'B'E' + BD'E + ACE

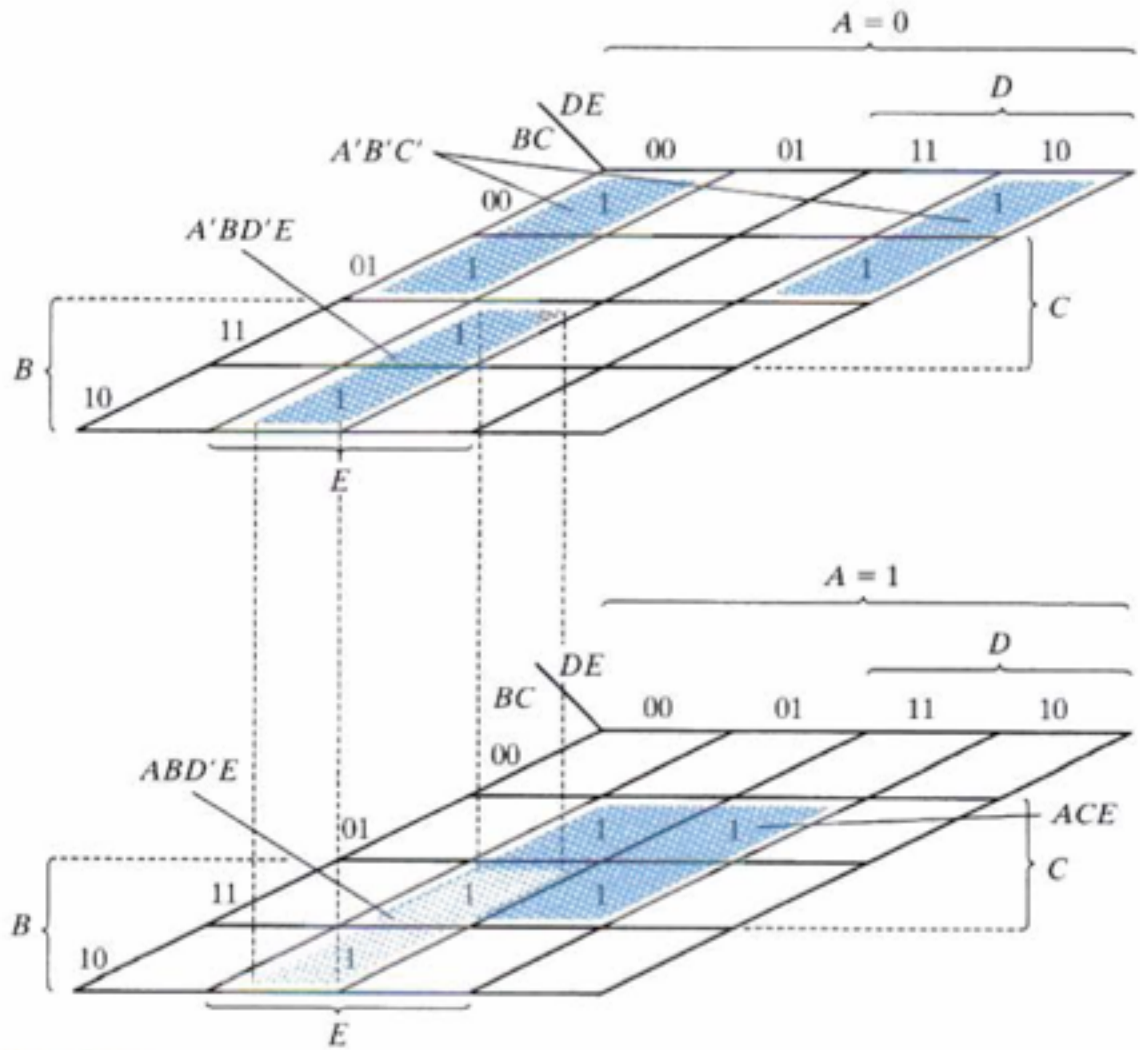


FIGURE 3.13
Map for Example 3.7, $F = A'B'E' + BD'E + ACE$

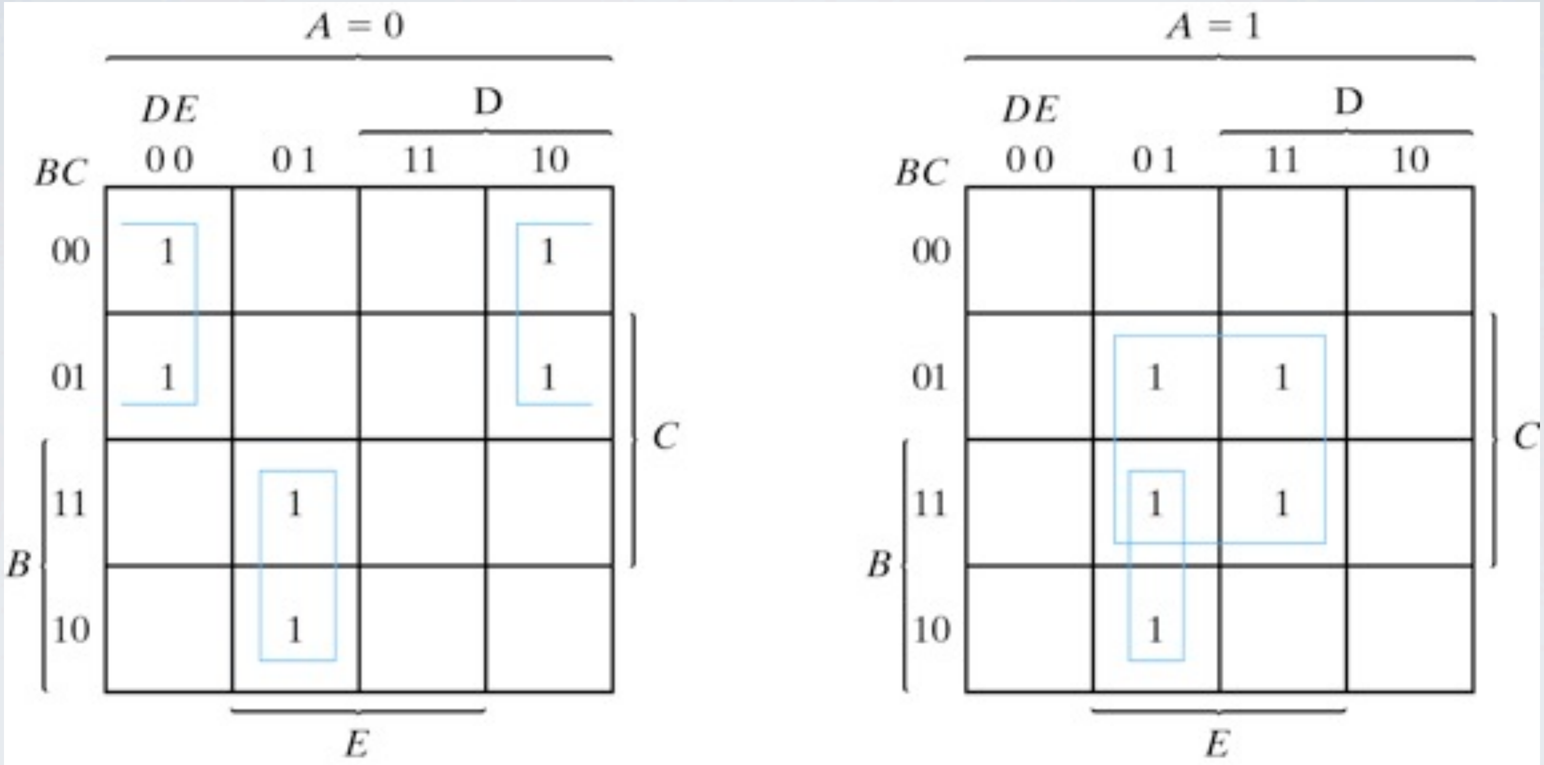


Fig. 3-13 Map for Example 3-7; $F = A'B'E' + BD'E + ACE$