Tien Nguyen
CS 47
11/15/18

1a. F(x,y,z) = x'z + xy = x'y'z + yz + xy

Boolean Expression	Identity
x'y'z + yz + xy	
x'y'z + (1)yz + xy	
x'y'z + (x + x')yz + xy	1 = x + x'
x'y'z + xyz + x'yz + xy	Distributive
x'(y'z + yz) + xy(z + 1)	Distributive 2x
x'(z(y + y')) + xy(1)	Distributive and z + 1 = 1
x'(z(1)) + xy	Simplify and y + y' = 1
x'z + xy	Simplify

1b. F(a,b,d) = a'b'c'd' + a'b'cd + a'b'cd' + ab'c'd' + ab'cd' + ab'cd = b'(c+d')

Boolean Expression	Identity
a'b'c'd' + a'b'cd + a'b'cd' + ab'c'd' + ab'cd' + ab'cd	
a'b'c(d + d') + ab'c(d' + d) + a'b'c'd' + ab'c'd'	Distributive 2x
a'b'c(1) + ab'c(1) + a'b'c'd' + ab'c'd'	d + d' = 1
a'b'c + ab'c + a'b'c'd' + ab'c'd'	Simplify
b'c(a' + a) + b'c'd'(a' + a)	Distributive 2x
b'c(1) + b'c'd'(1)	a + a' = 1
b'c + b'c'd'	Simplify
b'(c + c'd')	Distributive
b'((c + c')(c + d'))	Distributive
b'(1(c+d'))	c + c' = 1

b’(c+d’)	Simplify

1c. LHS

x	y	z	x’	x’z	xy	x’z + xy
0	0	0	1	0	0	0
0	0	1	1	1	0	1
0	1	0	1	0	0	0
0	1	1	1	1	0	1
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	0	0	1	1
1	1	1	0	0	1	1

RHS

x	y	z	x’	y’	x’y’z	yz	xy	x’y’z + yz + xy
0	0	0	1	1	0	0	0	0
0	0	1	1	1	1	0	0	1
0	1	0	1	0	0	0	0	0
0	1	1	1	0	0	1	0	1
1	0	0	0	1	0	0	0	0
1	0	1	0	1	0	0	0	0
1	1	0	0	0	0	0	1	1
1	1	1	0	0	0	1	1	1

LHS = RHS

x’z + xy	x’y’z + yz + xy
0	0
1	1
0	0
1	1
0	0
0	0
1	1
1	1

1d.

LHS

a	b	c	d	a’	b’	c’	d’	a’b’ c’d’	a’b’ cd	a’b’ cd’	a b’ c’d’	ab’c d’	ab’c d	a’b’c’d’ + a’b’cd + a’b’cd’ + ab’c’d’ + ab’cd’ + ab’cd
0	0	0	0	1	1	1	1	1	0	0	0	0	0	1
0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
0	0	1	0	1	1	0	1	0	0	1	0	0	0	1
0	0	1	1	1	1	0	0	0	1	0	0	0	0	1
0	1	0	0	1	0	1	1	0	0	0	0	0	0	0
0	1	0	1	1	0	1	0	0	0	0	0	0	0	0
0	1	1	0	1	0	0	1	0	0	0	0	0	0	0

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

RHS

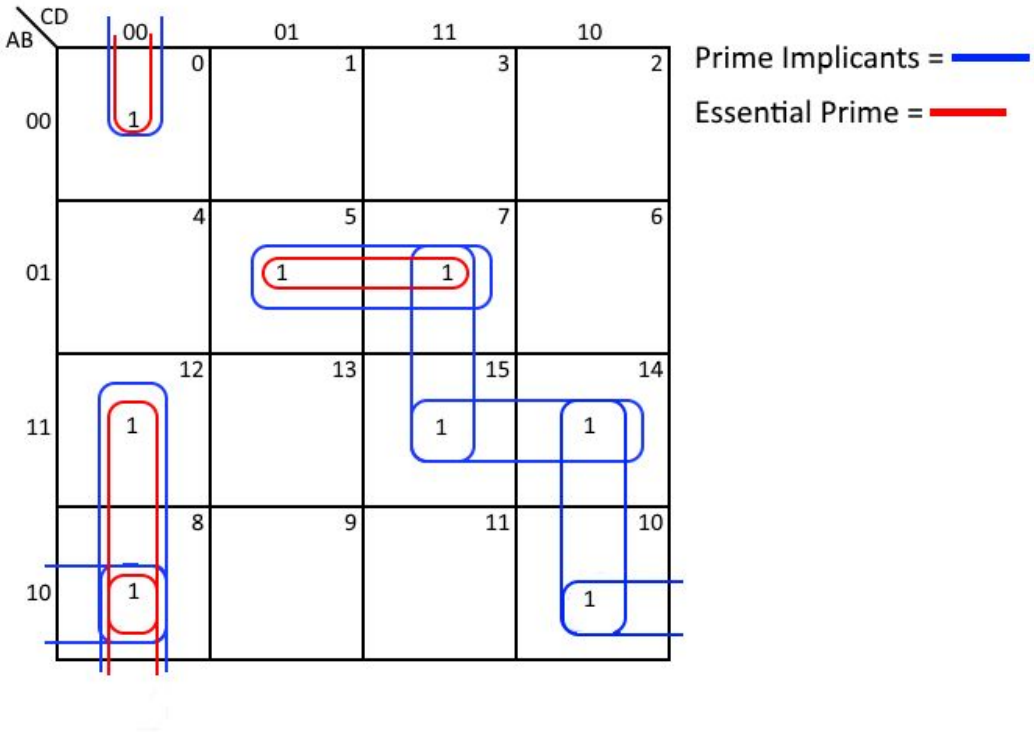
a	b	c	d	b’	d’	c+d’	b’(c+d’)
0	0	0	0	1	1	1	1
0	0	0	1	1	0	0	0
0	0	1	0	1	1	1	1
0	0	1	1	1	0	1	1
0	1	0	0	0	1	1	0
0	1	0	1	0	0	0	0
0	1	1	0	0	1	1	0
0	1	1	1	0	0	1	0
1	0	0	0	1	1	1	1
1	0	0	1	1	0	0	0
1	0	1	0	1	1	1	1
1	0	1	1	1	0	1	1
1	1	0	0	0	1	1	0
1	1	0	1	0	0	0	0

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

LHS = RHS

a’b’c’d’ + a’b’cd + a’b’cd’ + ab’c’d’ + ab’cd’ + ab’cd	b’(c+d’)
1	1
0	0
1	1
1	1
0	0
0	0
0	0
0	0
1	1
0	0
1	1
1	1
0	0
0	0
0	0
0	0

2a.

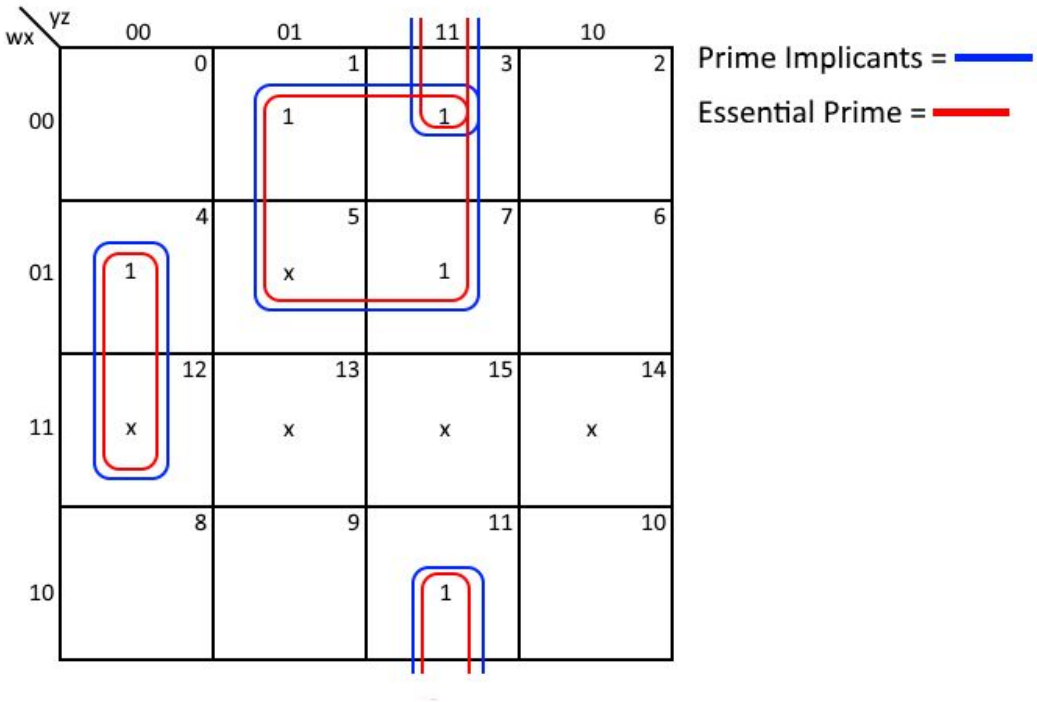


F(ABCD) = A'B'C'D' + AB'C'D' + AB'C'D' + ABC'D' + A'BC'D + A'BCD + ABCD +ABCD' + AB'CD' + ABCD'

= B'C'D'(A' + A) + AC'D'(B'+ B) + A'BD(C' + C) + ABC(D + D') + ACD'(B' + B)

= B'C'D' + AC'D' + A'BD + ABC + ACD'

2b.



F(wxyz) = w'xy'z' wxy'z' + w'x'y'z + w'x'yz + w'xy'z + w'xyz + w'x'yz + wx'yz

= xy'z'(w'+ w) + w'x'z(y'+ y) + w'xz(y'+ y) + x'yz(w'+ w)

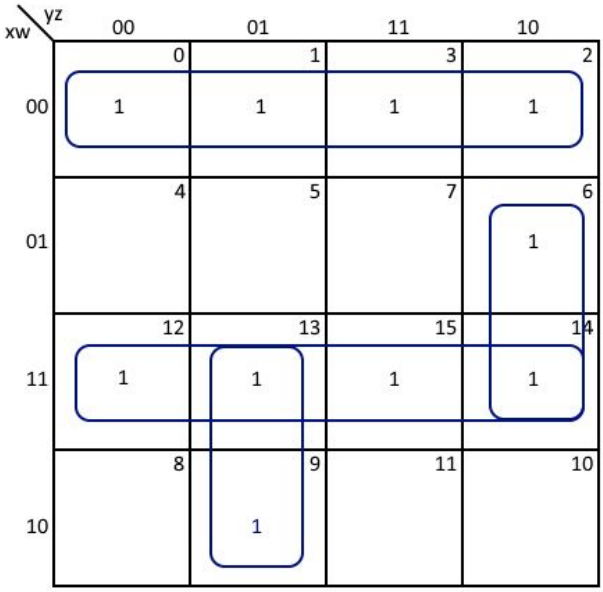
= xy'z' + w'z(x'+ x) + x'yz

= xy'z' + w'z + x'yz+

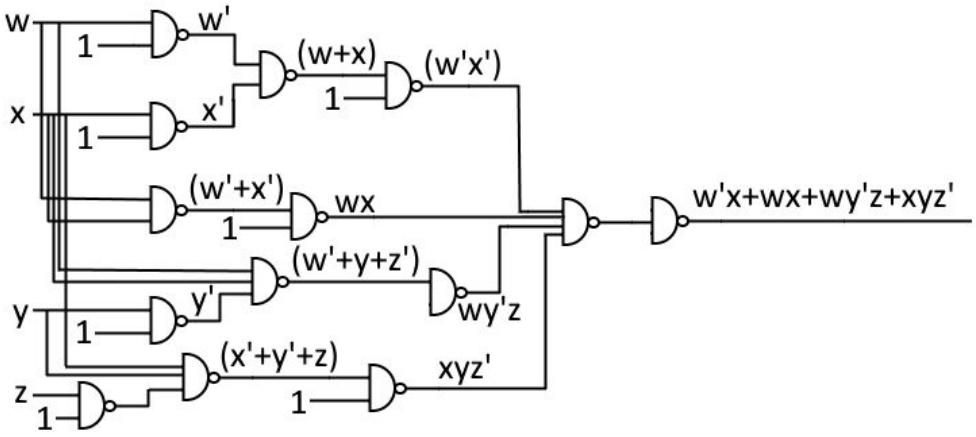
3.

Decimal number	w	x	y	z	F(w,x,y,z)
0	0	0	0	0	1
1	0	0	0	1	1
2	0	0	1	0	1
3	0	0	1	1	1
4	0	1	0	0	0
5	0	1	0	1	0
6	0	1	1	0	1
7	0	1	1	1	0
8	1	0	0	0	0
9	1	0	0	1	1
10	1	0	1	0	0
11	1	0	1	1	0
12	1	1	0	0	1
13	1	1	0	1	1
14	1	1	1	0	1
15	1	1	1	1	1

Σm(0,1,2,3,6,9,12,13,14,15)



F(w,x,y,z) = w’x’ + wx + wy’z + xyz’

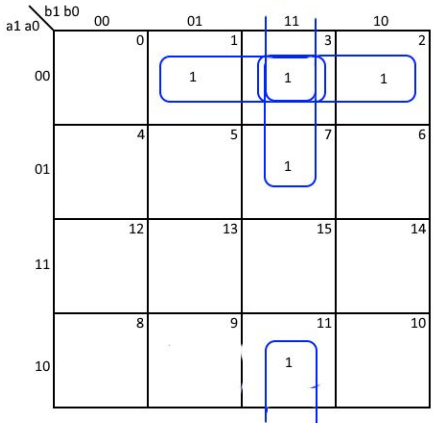


4.

a_1	a_0	b_1	b_0	L	E	G
0	0	0	0	0	1	0
0	0	0	1	1	0	0
0	0	1	0	1	0	0
0	0	1	1	1	0	0
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	0
0	1	1	1	1	0	0
1	0	0	0	0	0	1
1	0	0	1	0	1	0
1	0	1	0	0	1	0
1	0	1	1	1	0	0
1	1	0	0	0	0	1
1	1	0	1	0	0	1
1	1	1	0	0	0	1
1	1	1	1	0	1	0

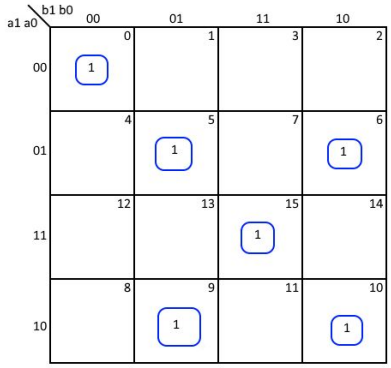
L: **Σ**m(1,2,3,7, 11)
E: **Σ**m(0,5,6,9,10,15)
G: **Σ**m(4,8,12,13,14)

L K-Map



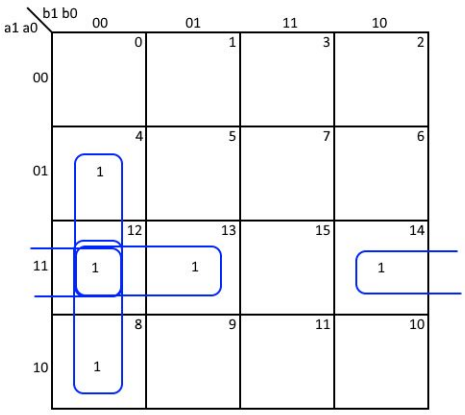
$L(a_1,a_0,b_1,b_0) = a_1'a_0'b_0 + a_1'a_0'b_1 + b_1b_0a_1' + b_1b_0a_0'$

E K-Map

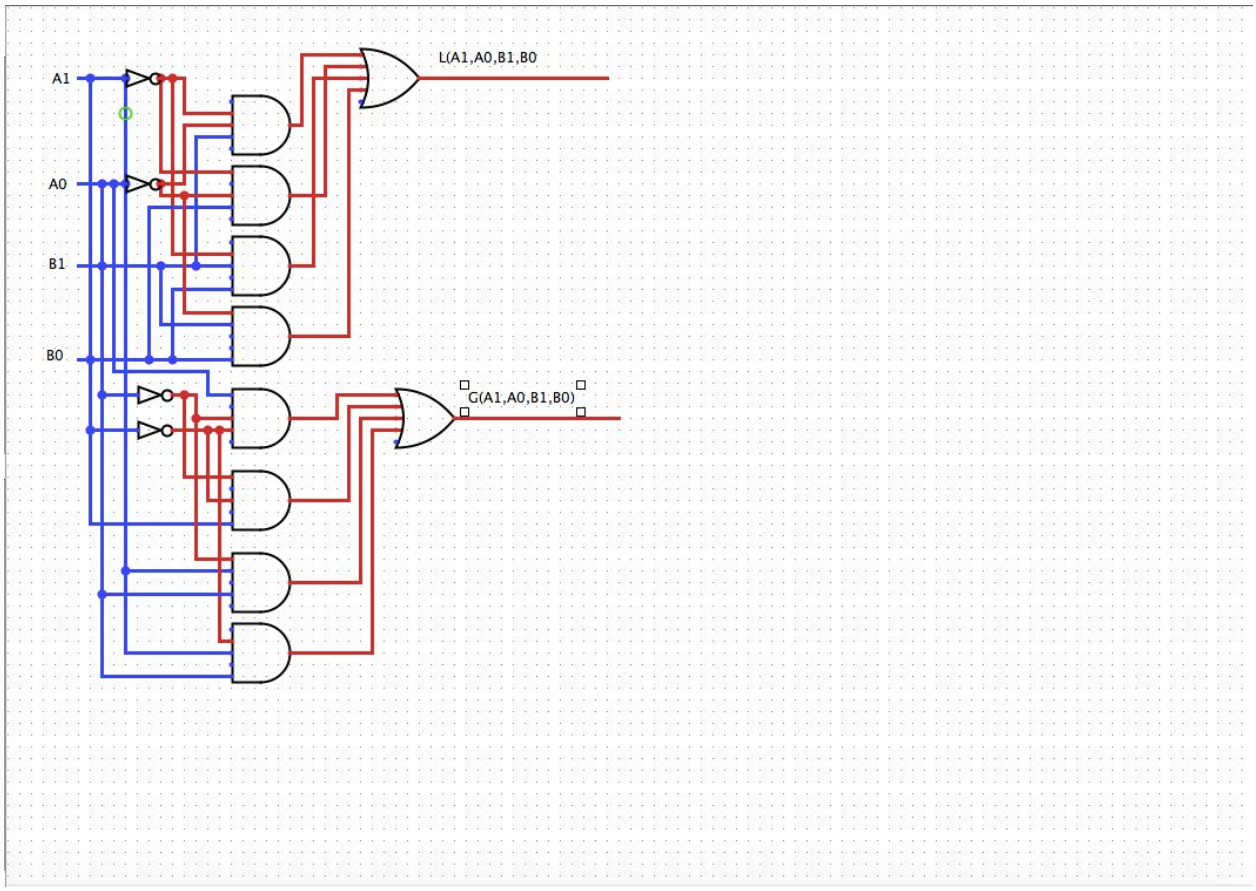


$E(a_1,a_0,b_1,b_0) = a_1'a_0'b_1'b_0' + a_1'a_0b_1'b_0 + a_1'a_0b_1b_0' + a_1a_0'b_1'b_0 + a_1a_0'b_1b_0' + a_1a_0b_1b_0$

G K-Map



$G(a_1,a_0,b_1,b_0) = a_0b_1'b_0' + a_1b_1'b_0' + a_1a_0b_1' + a_1a_0b_0'$


A1
A0
B1
B0
L(A1,A0,B1,B0
G(A1,A0,B1,B0)