ECE124: Discussion

Discussion #5

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2.15Simplify the following Boolean functions T1and T2to minimum number of literals:

A	B	C	T	T
0	0	0	1	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	0	1
1	0	1	0	1
1	1	0	0	1
1	1	1	0	1

m0 m1 m2

t1(abc) = m0+m1+m2

A'B'C'+A'B'C+A'BC'

A'B'(C'+C)+A'BC'

A'B'+A'BC'

A'(B'+BC')

A'B'+A'C'

- For the Boolean function: F (a, b, c, d) = (c’ + d)(b + c’)

(a)Express the function in sum of mintermsand product of maxterms forms.

(b)Obtain the truth table of F.

F = C'+BD

A B C ' D
0 0 0 0
0 0 0 1
0 1 0 0
0 1 0 1
1 0 0 0
1 0 0 1
1 1 0 0
1 1 0 1

abcd
0101
0111
1101
1111

abc'd
0010
0110
1010
1110

abc'd
0010
0011
1010
1011

f = pi(2 3 6 10 11 14)

f = sum(0 1 4 5 7 8 9 12 13 15)

- For the Boolean function: F (a, b, c, d) = (c’ + d)(b + c’)

(c) Use Boolean algebra to simplify the function to a minimum number of literals.

F = (c+d)(b+c')

(c'+d)b+(c'+d)c'

bc'+bd+c'+c'd

c'(b+1+d)+bd = c'bd

2.19Express the following function as a sum of mintermsand as a product of maxterms:

F (A, B, C, D) = B’D + A’D + BD

ab'cd

0001

0010

1000

1010

f= sum(1 3 5 7 11

13 15)

pi(0 2 4 6 8 10 12

14

2.29Determine whether the following Boolean equation is true or false.

x’y’ + x’z+ x’z’ = x’z’ + y’z’ + x’z

f1 = x'y'+x'z+x'z'

sum(0 1 2 3)

x'yz'	xy'z'	x'yz
000	000	001
010	100	011

2.30Write the following Boolean expressions in sum of products form and in sum of mintermsform.

$$F(a, b, c, d) = (b + d)(a' + b' + c)$$

f = (b+d)(a'+b'+c)

(b+d)a'+(b+d)b'+(b+d)c

a'b+a'd+b'd+bc+cd

f = pi(0 2 8 10 12 13

abcd

000

0010

1000

1010

a'b'cd

1100

1101

* Simplify function F (x, y) = x’y’ + x’y+ xy’ using Boolean algebra

f(xy) = x'y'+x'y+xy'

x(y'+y)'+xy'

x'+xy'

(x'+x)(x'y')

x'+y'

x'+(xy')

y'+y = 1

y'y = 0

* Simplify function X (A, B, C) = AB + ABC + AB’C’ + AC’ using Boolean algebra

X(ABC) = AB(1+c) + Ac'(b'+1)

AB+AC'

A(B+C')

A+0)(B+c')

* Simplify function F= A’BC + AB’C + ABC’ + ABC using Boolean algebra

F(ABC) = 9A'B+AB')C+AB(C'+C)

(A'B+AB')C+AB

(A'B)+A {A'B+A(B'+B)}(C+AB)

((A'+A)(B+A))(C+AB)

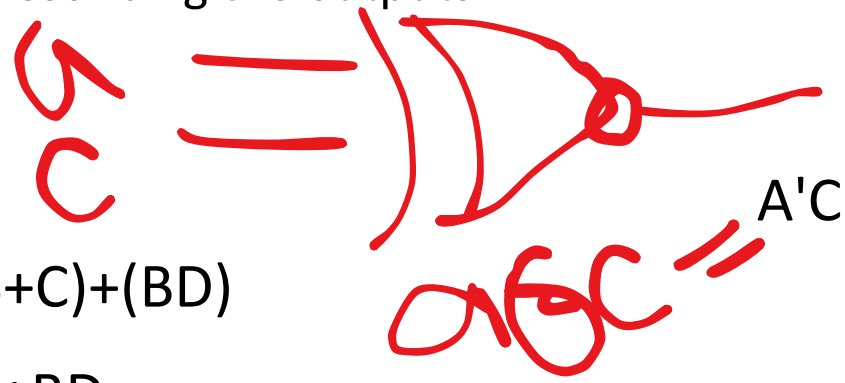
(B+A)(C+AB)

BC+AC+AB

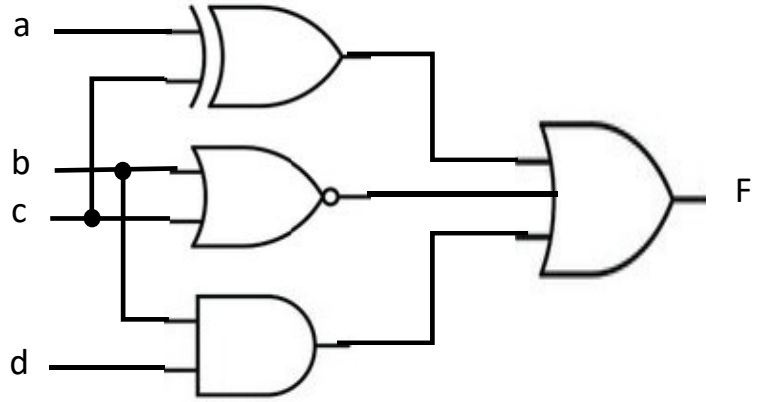
*From the logic diagram,

(a) Express the function F in Boolean expression.

(b) Construct the truth table describing the outputs



A'C'+AC



F = A NAND C + (B+C)+(BD)

A'C+AC'+B'C'+BD

F = SUM(0 1 2 3 5 6 7 8 9 12 13 15

a	b	c	d	
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1