Heimadæmi02 Greining og Hönnun stýrikerfa TÖV201G

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2.1 Demonstrate the Validity of the following identities by means of truth tables

a) DeMorgan's theorem for three variables: (x +y +z) = x'y'z' and (xyz)' = x' + y' + z'

x	y	z	x + y + z	(x + y + z)'	x'	y'	z'	x'y'z'
0	0	0	0	1	1	1	1	1
0	0	1	1	0	1	1	0	0
0	1	0	1	0	1	0	1	0
0	1	1	1	0	1	0	0	0
1	0	0	1	0	0	1	1	0
1	0	1	1	0	0	1	0	0
1	0	0	1	0	0	1	1	0
1	0	1	1	0	0	1	0	0

x	y	z	(xyz)	(xyz)'	x'	y'	z'	x'+ y' + z'
0	0	0	0	1	1	1	1	1
0	0	1	0	1	1	1	0	1
0	1	0	0	1	1	0	1	1
0	1	1	0	1	1	0	0	1
1	0	0	0	1	0	1	1	1
1	0	1	0	1	0	1	0	1
1	1	0	0	1	0	0	1	1
1	1	1	1	0	0	0	0	0

b) The distributive law : x + yz = (x + y)(x + z)

x	y	z	x + yz	(x + y)	(x + z)	(x + y)(x + z)
0	0	0	0	0	0	0
0	0	1	0	0	1	0
0	1	0	0	1	0	0
0	1	1	1	1	1	1

x	y	z	x + yz	(x + y)	(x + z)	(x + y)(x + z)
1	0	0	1	1	1	1
1	0	1	1	1	1	1
1	1	0	1	1	1	1
1	1	1	1	1	1	1

c) The distributive law : x(y + z) = xy + xz

x	y	z	x(y + z)	xy	xz	xy + xz
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	0	0	0	0
1	0	0	0	0	0	0
1	0	1	1	0	1	1
1	1	0	1	1	0	1
1	1	1	1	1	1	1

d) The associative law: x + (y + z) = (x + y) + z

x	y	z	x	y + z	x + (y + z)	(x + y)	(x + y) + z
0	0	0	0	0	0	0	0
0	0	1	0	1	1	0	1
0	1	0	0	1	1	1	1
0	1	1	0	1	1	1	1
1	0	0	1	0	1	1	1
1	0	1	1	1	1	1	1
1	1	0	1	1	1	1	1
1	1	1	1	1	1	1	1

d) The associative law: x(yz) = (xy)z

x	y	z	yz	x(yz)	xy	(xy)z
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	1	0	0	0
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	0	0	1	0
1	1	1	1	1	1	1

2.4 Reduce the following Boolean expression to the indicated number of literals :

(a) A'C' + ABC + AC' -> to three literals

A'C' + ABC + AC'

= C' + ABC

= (C+C')(C'+AB)

= AB + C'

(b) (x'y' + z)' + z + xy + wz -> to three literals

(x'y'+z)'+z+xy+wz

=(x'y')'z'+z+xy+wz =[(x+y)z'+z]+xy+wz

== (z + z')(z + x + y) + xy + wz

= z + wz + x + xy + y

= z(1 + w) + x(1 + y) + y

= x + y + z

(c) A'B(D' + C'D) + B(A + A'CD) -> to one literal

A'B(D'+C'D)+B(A+A'CD)

=B(A'D'+A'C'D+A+A'CD)

= B(A'D' + A + A'D(C + C')

= B(A + A'(D' + D))

= B(A + A')

= B

(d) (A' + C)(A' + C')(A + B + C'D) -> to four literals

(A'+C)(A'+C')(A+B+C'D)

=(A'+CC')(A+B+C'D)

=A'(A+B+C'D)

= AA' + A'B + A'C'D

= A'(B + C'D)

(e) ABC'D + A'BD + ABCD -> to two literals

ABCD+A'BD+ABC'D

=ABD+A'BD

=BD

2.12 We can preform logical operations on strings of bits by considering each pair of corresponding bits separately (called bitwise operation) Given two eight-bit strings string A = 10110001, B = 10101100 Evaluate the eight-eight but result

a) A AND B = 1010_0000

b) A OR B = 1011_1101

c) A XOR B = 0001_1101

d) Not A = = 0100_1110

e) Not B = 0101_0011

2.17 Obtain the truth table of the following functions, and express each function in sum of min terms and product of maxterms form

a) (b + cd)(c +bd)

2.27 Write the Boolean equations and draw the logic diagram of the circuit whose outputs are defined by the following truth table:

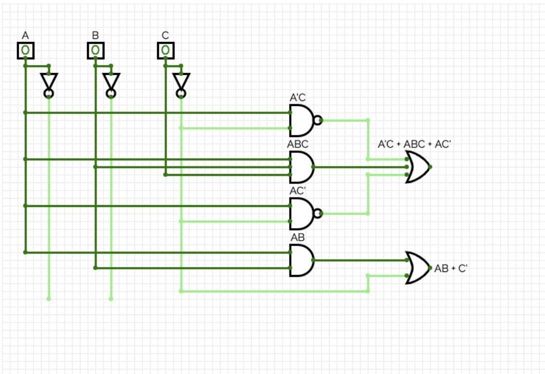
a	b	c	f1	f2
0	0	0	1	0
0	0	1	0	0
0	1	0	0	1
0	1	1	1	1
1	0	0	0	1
1	0	1	0	1
1	1	0	1	1
1	1	1	1	0

f1 = a'b'c + a'bc + abc' + abc

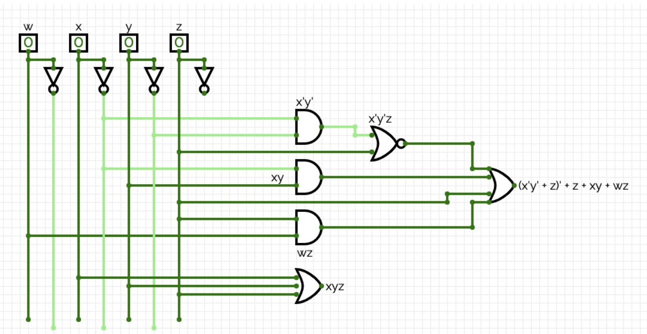
f2= a'bc' + a'bc + ab'c' + ab'c + abc'

2.27 Draw logic diagrams of the circuits that implement the original and simplified expressions in Problem 2.4

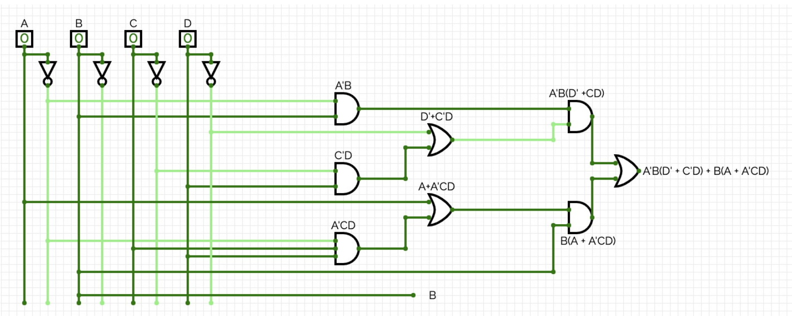
A)



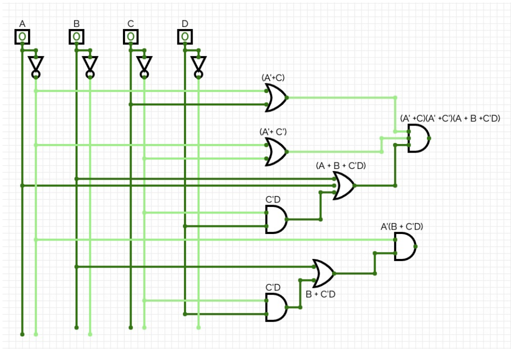
b)



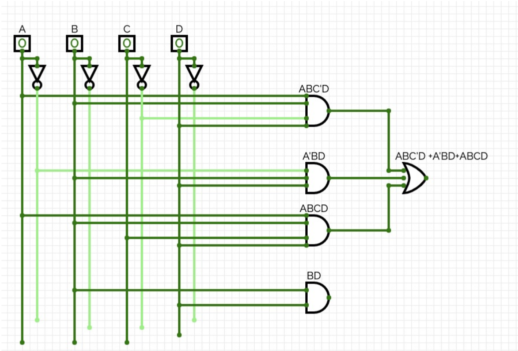
c)



d)


A
B
C
D
0
0
0
0
(A'+C)
(A'+ C')
(A' +C)(A' +C')(A + B +C'D)
(A + B + C'D)
C'D
A'(B + C'D)
C'D
B + C'D

e)


A
B
C
D
0
0
0
0
ABC'D
A'BD
ABC'D +A'BD+ABCD
ABCD
BD

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In [ ]:
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