

DLD - ASSIGNMENT - 2

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BS-CS - B

CHAPTER 2

• 2.4

a) $A'C' + ABC + AC'$ (3 literals)

$$= C'(A' + A) + ABC$$

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

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

$$= C' + AB$$

c) $A'B(D' + C'D) + B(A + A'CD)$ (1 literal)

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

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

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

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

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

$$= B(A' + A)$$

$$= B$$

e) $ABC'D + A'BD + ABCD$ (2 literals)

$$= ABD(C' + C) + A'BD$$

$$= ABD + A'BD$$

$$= BD(A + A')$$

$$= BD$$

b) $(x'y' + z)' + z + xy + wz$ (3 literals)

$$= (x'y')' \cdot z' + z + xy + wz$$

$$= ((x+y) \cdot z' + z) + xy + wz$$

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

$$= x+y+z + xy + wz$$

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

$$= x + y + z$$

d) $(A' + C)(A' + C')(A + B + C'D)$ (4 literals)

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

$$= A'A + A'B + A'C'D + AA'C' + A'C'D + A'AC' + A'BC' + A'CC'D$$

$$= A'C'D + A'B + A'BC' + A'BC$$

$$= A'C'D + A'B(1 + C') + A'BC$$

$$= A'C'D + A'B + A'BC$$

$$= A'C'D + A'B(1 + C)$$

$$= A'C'D + A'B$$

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

• 2.9

a) $xy' + x'y$

$$F = xy' + x'y$$

$$F' = (xy' + x'y)'$$

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

$$= (x' + y)(x + y')$$

$$= x'x + x'y' + xy + y'y'$$

$$= xy + x'y'$$

b) $(a+c)(a+b')(a'+b+c')$

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

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

$$= (a'+b+c')' + (a+c)' + (a+b')'$$

$$= ab'c + a'c' + a'b$$

c) $z + z'(v'w + xy)$

$$F = z + z'(v'w + xy)$$

$$F' = [z + z'(v'w + xy)]'$$

~~$$= z' + [z + z'(v'w + xy)]'$$~~

~~$$= (v'w + xy)' \cdot z'$$~~

~~$$= (v'w)'(xy)' \cdot z'$$~~

~~$$= (v+w')(x'+y')z'$$~~

~~$$= (vx' + vy' + w'x' + w'y')z'$$~~

$$= z' \cdot (z + (v'w + xy)')$$

$$= z' \cdot (z' + (v'w)' + (xy)')$$

$$= z' \cdot (z' + (v+w')(x'+y'))$$

$$= z'z + z'(v+w')(x'+y')$$

$$= z'(v+w')(x'+y')$$

$$= z'(vx' + vy' + w'x' + w'y')$$

$$= z'vx' + z'vy' + z'w'x' + z'w'y'$$

• 2.19

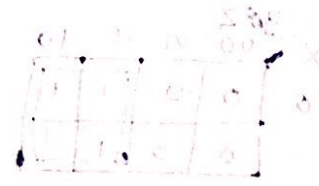
$$\begin{aligned}
 F(A, B, C, D) &= B'D + A'D + BD \\
 &= B'D(C + C') + A'D(B + B') + BD(A + A') \\
 &= B'CD + B'C'D + A'BD + A'B'D + ABD + A'BD \\
 &= B'CD(A + A') + B'C'D(A + A') + A'BD(C + C') + A'B'D(C + C') + ABD(C + C') + A'BD(C + C') \\
 &= AB'CD + A'B'CD + AB'C'D + A'B'C'D + A'BCD + A'BC'D \\
 &\quad + A'BCD + A'BC'D + ABCD + ABC'D + A'BCD + A'BC'D \\
 \text{Sum of minterms} &= \sum (11, 3, 9, 1, 7, 5, 13)
 \end{aligned}$$

$$\begin{aligned}
 &= \sum (1, 3, 5, 7, 9, 11, 13, 15) \\
 \text{Product of maxterms} &= \pi(0, 2, 4, 6, 8, 10, 12, 14)
 \end{aligned}$$

• 2.20

$$\begin{aligned}
 \text{a) } F(A, B, C, D) &= \sum (2, 4, 7, 10, 12, 14) \\
 F'(A, B, C, D) &= \sum (0, 1, 3, 5, 6, 8, 9, 11, 13, 15)
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } F(x, y, z) &= \pi(3, 5, 7) \\
 F'(x, y, z) &= \pi(0, 1, 2, 4, 6) \\
 &= \sum (3, 5, 7)
 \end{aligned}$$



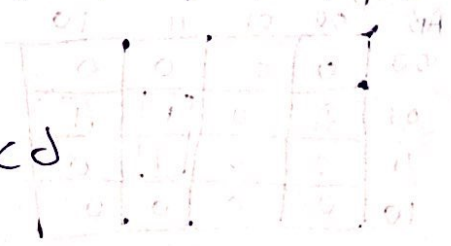
• 2.21

$$\begin{aligned}
 \text{a) } F(x, y, z) &= \sum (1, 3, 5) \\
 &= \pi(0, 2, 4, 6, 7)
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } F(A, B, C, D) &= \pi(3, 5, 8, 11) \\
 &= \sum (0, 1, 2, 4, 6, 7, 9, 10, 12, 13, 14, 15)
 \end{aligned}$$

• 2.30

$$\begin{aligned}
 &(b+d)(a'+b'+c) \\
 &= a'b + bb' + bc + a'd + b'd + cd \\
 &= a'b + bc + a'd + b'd + cd
 \end{aligned}$$



• 2.31

$$a'b + a'c' + abc$$

$$= abc + a'(b + c')$$

$$F = (abc + a')(abc + b + c')$$

$$= (a' + ab)(a' + c')(b + c' + ab)(b + c' + c')$$

$$= (a' + ab)(b + c' + ab)(a' + c')(b + c')$$

$$= (a' + a)(a' + b)(b + c' + a)(b + c' + b)(a' + c')(b + c')$$

$$= (a' + b)(b + c' + a)(b + c')(a' + c')(b + c')$$

$$= (a' + b)(b + c' + a)(b + c')(a' + c')$$

$$= (a' + b)(b + c')(1 + a)(a' + c')$$

$$= (a' + b)(b + c')(a' + c')$$

CHAPTER 3

• 3.41

a) $F(x, y, z) = \sum(2, 3, 6, 7)$

	yz			
x	00	01	11	10
0	0	0	1	1
1	0	0	1	1

$$F = y$$

b) $F(A, B, C, D) = \sum(4, 6, 7, 15)$

	CD			
AB	00	01	11	10
00	0	0	0	0
01	1	0	1	1
11	0	0	1	0
10	0	0	0	0

$$F = BCD + A'BD'$$

c) $F(A, B, C, D) = \sum (3, 7, 11, 13, 14, 15)$

AB \ CD	00	01	11	10
00	0	0	1	0
01	0	0	1	0
11	0	1	1	1
10	0	0	1	0

$F = ABC + CD + ABD$

d) $F(w, x, y, z) = \sum (2, 3, 12, 13, 14, 15)$

wxyz	00	01	11	10
00	0	0	1	1
01	0	0	0	0
11	1	1	1	1
10	0	0	0	0

$F = w'x'y + wx$

e) $F(w, x, y, z) = \sum (1, 12, 13, 14, 15)$

wxyz	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	1	1	1
10	0	0	1	0

$F = wyz + wx$

f) $F(w, x, y, z) = \sum (8, 10, 12, 13, 14)$

wxyz	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	1	0	1
10	1	0	0	1

$F = wx' + wxy'$

• 3.9

a) $F(w, x, y, z) = \sum(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$

wx \ yz	00	01	11	10
00	1	0	0	1
01	1	1	1	1
11	0	1	1	0
10	1	0	0	1

Essential = $xz, x'z'$

b) $F(A, B, C, D) = \sum(0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	1	0
11	0	0	1	1
10	1	0	1	1

Essential = $AC, B'D', A'BD$

c) $F(A, B, C, D) = \sum(2, 3, 4, 5, 6, 7, 9, 11, 12, 13)$

AB \ CD	00	01	11	10
00	0	0	1	1
01	1	1	1	1
11	1	1	0	0
10	0	1	1	0

$A'C, B'CD, A'B, B'C, AC'D, AB'D$

Essential = $A'B, B'C, AB'D$

d) $F(w, x, y, z) = \sum(1, 3, 6, 7, 8, 9, 12, 13, 14, 15)$

wx \ yz	00	01	11	10
00	0	1	0	1
01	0	0	1	1
11	1	1	1	1
10	1	1	0	0

Essential = $xy, wy, w'x'y', w'x'yz'$

e) $F(A, B, C, D) = \sum(0, 1, 2, 5, 7, 8, 9, 10, 13, 15)$

AB \ CD	00	01	11	10
00	1	1	0	1
01	0	1	1	0
11	0	1	1	0
10	1	1	1	1

Essential = $BD, B'D'$

F) $F(w, x, y, z) = \sum(0, 1, 2, 5, 7, 8, 10, 15)$

	00	01	11	10
00	1	1	0	1
01	0	1	1	0
11	0	0	1	0
10	1	0	0	1

Essential = $x'z'$, xyz

• 3.11

$F(w, x, y, z) = \sum(0, 1, 2, 5, 8, 10, 13)$

	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	0	0
10	0	0	0	0

$$\begin{aligned} F &= yz + xz' + wx'z \\ &= (xz' + yz + wx'z)' \\ &= (x' + z)(y' + z')(w' + x + z') \end{aligned}$$

• 3.15

a) $F(x, y, z) = \sum(0, 1, 4, 5, 6)$

$\partial(x, y, z) = \sum(2, 3, 6)$

x \ yz	00	01	11	10
0	1	1	X	X
1	1	1	X	1

$F = 1$

$F = \sum(0, 1, 2, 3, 4, 5, 6, 7)$

AB \ CD	00	01	11	10
00	1	0	0	1
01	X	0	0	1
11	0	0	0	1
10	1	0	0	X

b) $F(A, B, C, D) = \sum(0, 6, 8, 13, 14)$

$\partial(A, B, C, D) = \sum(2, 4, 10)$

$$\begin{aligned} F &= B'D' + CD' + ABC'D \\ &= \sum(0, 2, 6, 8, 10, 13, 14) \end{aligned}$$

c) $F(A, B, C, D) = \sum(5, 6, 7, 12, 14, 15)$
 $d(A, B, C, D) = \sum(3, 9, 11, 15)$

AB \ CD	00	01	11	10
00	0	0	X	0
01	0	1	1	1
11	1	0	X	1
10	0	X	X	0

$$F = BC + A'BD + ABD'$$

$$F = \sum(5, 6, 7, 12, 14, 15)$$

d) $F(A, B, C, D) = \sum(0, 2, 4, 7, 10, 12)$
 $d(A, B, C, D) = \sum(0, 6, 8)$

AB \ CD	00	01	11	10
00	X	0	0	1
01	1	0	1	1
11	1	0	0	0
10	X	0	0	1

$$F = BD' + A'BC + C'D'$$

$$F(A, B, C, D) = \sum(0, 2, 4, 6, 7, 8, 10, 12)$$

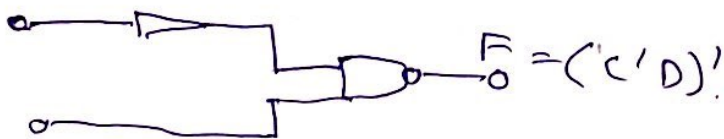
• 3.16

a) $F(A, B, C, D) = AC'D' + A'C + ABC + AB'C + A'C'D'$

AB \ CD	00	01	11	10
00	1	0	1	1
01	1	0	1	1
11	1	0	1	1
10	1	0	1	1

Simplified expression $C + D'$

$$\begin{aligned} F &= (F')' \\ &= ((C + D')')' \\ &= (C'D)' \end{aligned}$$



Nand Gate circuit

b) $F(A, B, C, D) = A'B'C'D + CD + AC'D$

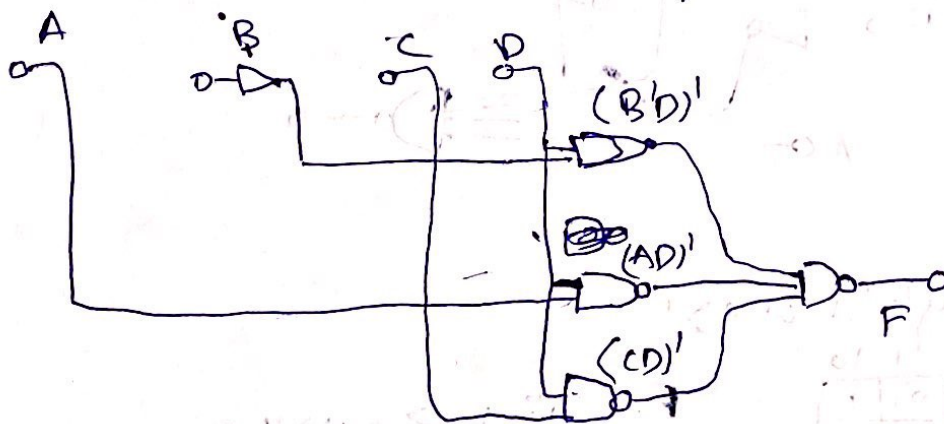
AB \ CD	00	01	11	10
00	0	1	1	0
01	0	0	1	0
11	0	1	1	0
10	0	1	1	0

$$F(A, B, C, D) = CD + AD + B'D$$

$$F = (F')'$$

$$= ((CD + AD + B'D)')'$$

$$= ((CD)' \cdot (AD)' \cdot (B'D)')$$



c) $F(A, C, D) = (A' + C' + D')(A' + C')(C' + D')$

AC \ D	0	1
0	1	1
1	1	0

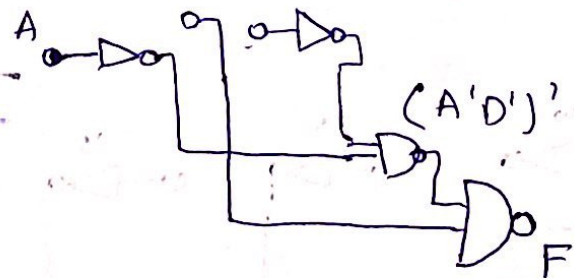
$$C' + A'D'$$

$$F = (F')'$$

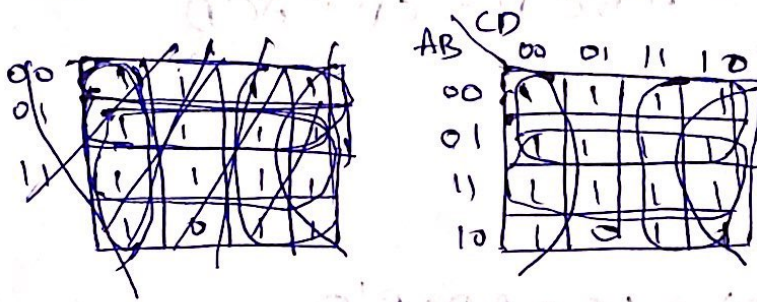
$$= [(C' + A'D')']'$$

$$= [(C')' \cdot (A'D')']'$$

$$= [C \cdot (A'D')']'$$



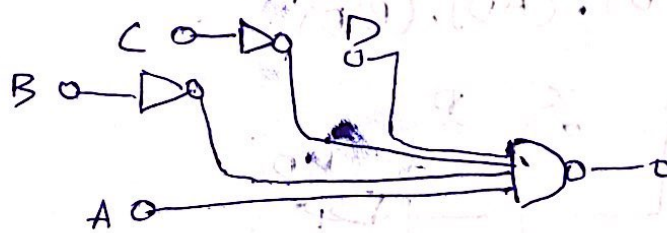
d) $F = (A, B, C, D) = A' + B + D' + B'C$



$$= [(A' + D' + B + C)']$$

$$= (A \cdot B' \cdot D \cdot C')'$$

Nand Gate Circuit:-



• 3.19

a) $F = wx' + y'x' + w'y'z'$

	00	01	11	10
00	1	0	0	1
01	1	0	0	1
11	1	0	0	0
10	1	1	1	1

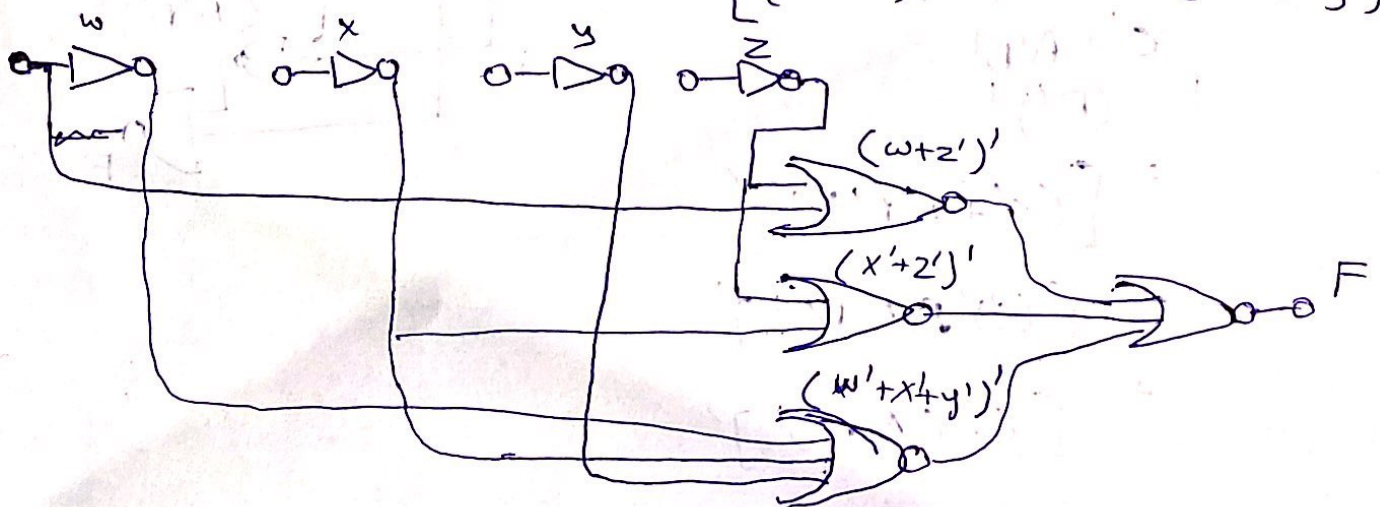
$$F' = w'z + xz + wxy$$

$$F = (w + z')(x' + z)(w' + x' + y')$$

$$F = (F')'$$

$$= [(w + z')(x' + z)(w' + x' + y')]'$$

$$= [(w + z')' + (x' + z')' + (w' + x' + y')']'$$



b) $F = (w, x, y, z) = \sum (0, 3, 12, 15)$

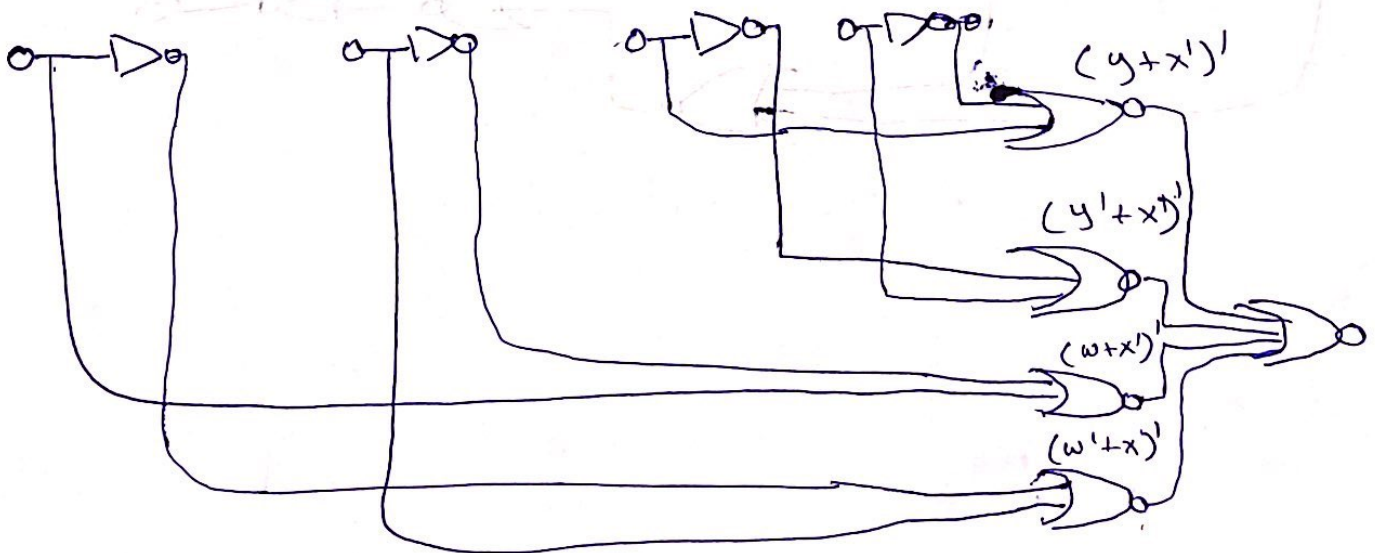
wx \ yz				
	00	01	11	10
00	1	0	1	0
01	0	0	0	0
11	1	0	1	0
10	0	0	0	0

$$F' = y'z + yz' + w'x + wx'$$

$$F = (y+z') \cdot (y'+z) \cdot (w'+x) \cdot (w+x')$$

$$F = (F')'$$

$$= ((y+z')' + (y'+z)' + (w+x')' + (w'+x)')'$$



$$c) F = (x, y, z) = [(x+y)(x+z)]'$$

$$F = (x+y)' + (x+z)'$$

$$F = (F')'$$

$$= \left[\left[(x+y)' + (x+z)' \right]' \right]'$$

