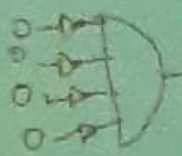
btain the truth table of the following functions, and express each function in sum-of-minterms and product-of-maxterms form:

a. $F(A,B,C,D) = (B + CD)(C + BD)$

m_i $A \cdot B \cdot C \cdot D$

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



$A'B'C'D' = 0000$

A	B	C	D	CD	(B+CD)	BD	(C+BD)	F	
0	0	0	0	0	0	0	0	0	m0
0	0	0	1	0	0	0	0	0	m1
0	0	1	0	0	0	0	1	0	m2
0	0	1	1	1	1	0	1	1	m3
0	1	0	0	0	1	0	0	0	m4
0	1	0	1	0	1	1	1	1	m5
0	1	1	0	0	1	0	1	1	m6
0	1	1	1	1	1	1	1	1	m7
1	0	0	0	0	0	0	0	0	m8
1	0	0	1	0	0	0	0	0	m9
1	0	1	0	0	0	0	1	0	m10
1	0	1	1	1	1	0	1	1	m11
1	1	0	0	0	1	0	0	0	m12
1	1	0	1	0	1	1	1	1	m13
1	1	1	0	0	1	0	1	1	m14
1	1	1	1	1	1	[illegible]	1	1	m15

$F = m3 + m5 + m6 + m7 + m11 + m13 + m14 + m15$

$= \Sigma(3, 5, 6, 7, 11, 13, 14, 15)$

m3 m5
0011 0101
$= A'B'CD + A'BC'D + \ldots$

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5) Given that $F(A, B, C) = B'C + AC' + ABC$ then

a. Express F in terms of Sum of its minterms as $\boxed{F(A, B, C) = \sum(\dots)}$

b. Express F in terms of product of its maxterms as $\boxed{F(A, B, C) = \pi(\dots)}$

c. Express F' in terms of Sum of its minterms as $F'(A, B, C) = \sum(\dots)$

d. Express F' in terms of product of its maxterms as $F'(A, B, C) = \pi(\dots)$

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

$$= AB'C + A'B'C + ABC' + AB'C' + ABC$$

$$\begin{array}{ccccc} 101 & 001 & 110 & 100 & 111 \\ 5 & 1 & 6 & 4 & 7 \end{array}$$

$$F = \Sigma(\boxed{1, 4, 5, 6, 7}) \qquad F' = \Sigma(0, 2, 3)$$

$$= \Pi(\boxed{0, 2, 3}) \qquad F' = \Pi(\underbrace{1, 4, 5, 6, 7}_{F' = 0})$$

$$F = 0$$

3) obtain The Truth Table, express minterms and maxterms :-

a) $(B + CD)(C + BD)$

B	C	D	F	
0	0	0	0	0
0	0	1	0	1
0	1	0	0	2
0	1	1	1	3
1	0	0	0	4
1	0	1	1	5
1	1	0	1	6
1	1	1	1	7

minterms $\rightarrow F(B,C,D) = \Sigma(3,5,6,7)$

maxterms $\rightarrow F(B,C,D) = \Pi(0,1,2,4)$

7) Express the **complement** of the following functions in sum of minterms and product of maxterm

a. $F(A, B, C, D) = \sum(0, 2, 6, 11, 13, 14)$ $\rightarrow \boxed{F' = 1}$ $F = 0$

$$F' = \sum(1, 3, 4, 5, 7, 8, 9, 10, 12, 15)$$

$$F' = \Pi\underbrace{(0, 2, 6, 11, 13, 14)}_{F' = 0 \Rightarrow F = 1}$$

c. $F(X, Y, Z) = \pi(0, 3, 6, 7)$

$$F' = \sum\underbrace{(0, 3, 6, 7)}_{F' = 1 \Rightarrow F = 0}$$

$$F' = \Pi\underbrace{(1, 2, 4, 5)}_{F' = 0 \Rightarrow F = 1}$$

y the following
expressions to a
number of literals:

)'(A'+B')'

)'' (A B)

sociativity

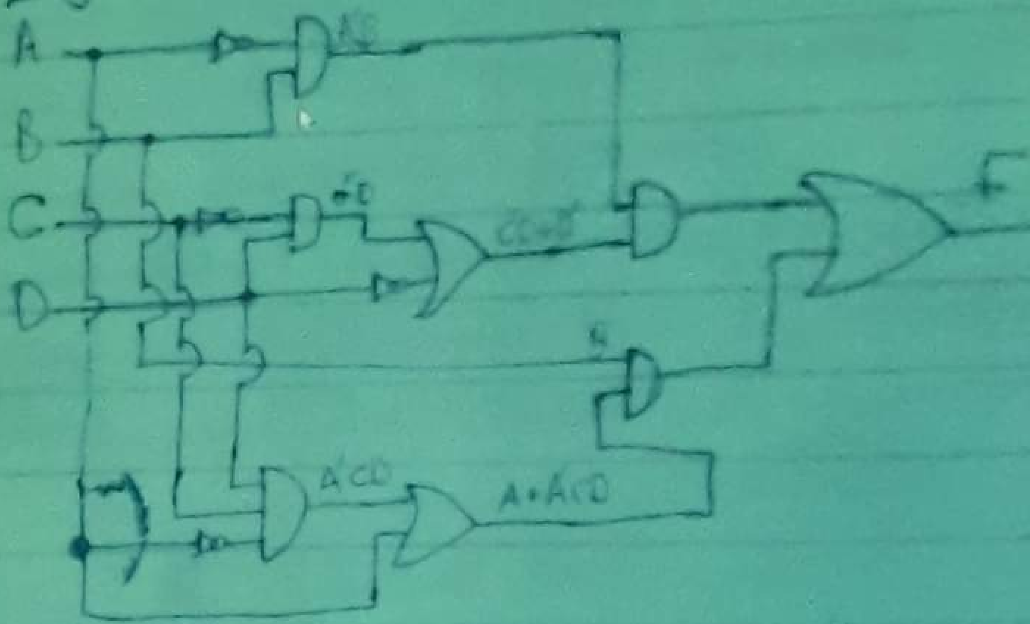
ABC' + ABC + A'BC'

-c') + AB(c'+c)

) + AB(1)

+ AB

original



simplified

Express the following functions in sum-of-prod

a. $F(X, Y, Z) = \sum(1, 3, 7)$

$$\overset{001}{} \quad \overset{011}{} \quad \overset{111}{}$$
$$= x'y'z + x'yz + xyz$$
$$= \prod(\underbrace{0, 2, 4, 5, 6}_{\text{rows in which } F=0})$$
$$\overset{000}{} \quad \overset{010}{} \quad \overset{100}{}$$
$$= (x+y+z) \cdot (x+y'+z) \cdot (x'+y+z)$$
$$\overset{101}{} \quad \overset{110}{}$$
$$\cdot (x'+y+z') \cdot (x'+y'+z)$$

b. F(A, B, (

= (A

=

=

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F as sum of minterms ← $m_0 = \underbrace{A'B'C'D'}_{\text{product}}$

\- - - of product ←

$$F = \Sigma(\text{all rows in which } f = 1)$$

Obtain the truth table of the following functions, and express each function in sum-of-minterms and product-of-maxterms form:

a. $F(A,B,C,D) = (B + CD)(C + BD)$

$m_1 \rightarrow A' \cdot B' \cdot C' \cdot D'$

A	B	C	D	CD	(B+CD)	BD	(C+BD)	F
0	0	0	0	0	0	0	0	0 m0
0	0	0	1	0	0	0	0	0 m1
0	0	1	0	0	0	0	1	0 m2
0	0	1	1	1	1	0	1	1 m3
0	1	0	0	0	1	[illegible]	0	0 m4
0	1	0	1	0	1	1	1	1 m5
0	1	1	0	0	1	0	1	1 m6
0	1	1	1	1	1	1	1	1 m7
1	0	0	0	0	0	0	0	0 m8
1	0	0	1	0	0	0	0	0 m9
1	0	1	0	0	0	0	1	0 m10
1	0	1	1	1	1	0	1	1 m11
1	1	0	0	0	1	0	0	0 m12
1	1	0	1	0	1	1	1	1 m13
1	1	1	0	0	1	0	1	1 m14
1	1	1	1	1	1	1	1	1 m15

1

$A'B'C'D' \equiv 0000$

$F = m3 + m5 + m6 + m7 + m11 + m13 + m14 + m15$

$= \Sigma(3, 5, 6, 7, 11, 13, 14, 15)$

m3   m5

0011   0101

$= A'B'CD + A'BC'D + \ldots$

$$= B\left[\, A'(D' + C' \cdot D) + (A + A'CD) \,\right]$$

$$= B\left[\, A'(D' + C') \cdot \cancel{(D' + D)} + \cancel{(A + A')}(A + CD) \,\right]$$

$$= B\left[\, \underbrace{A'(D' + C')} + A + CD \,\right]$$

$$= B\left[\, \underbrace{(A + DC)'}_{X'} + \underbrace{(A + DC)}_{X} \,\right]$$

$$= B[1] = B$$

8) Convert each of the following functions to its canonical form:

a. $F(x, y, z) = \sum(1, 3, 5) = \overset{001}{x'y'z} + \overset{011}{x'yz} + \overset{101}{xy'z}$

b. $F(A, B, C, D) = \pi(3, 5, 8, 11)$

$= \overset{0011}{(A+B+C'+D')} \cdot \overset{0101}{(A+B'+C+D')} \cdot \overset{1000}{(A'+B+C+D)}$

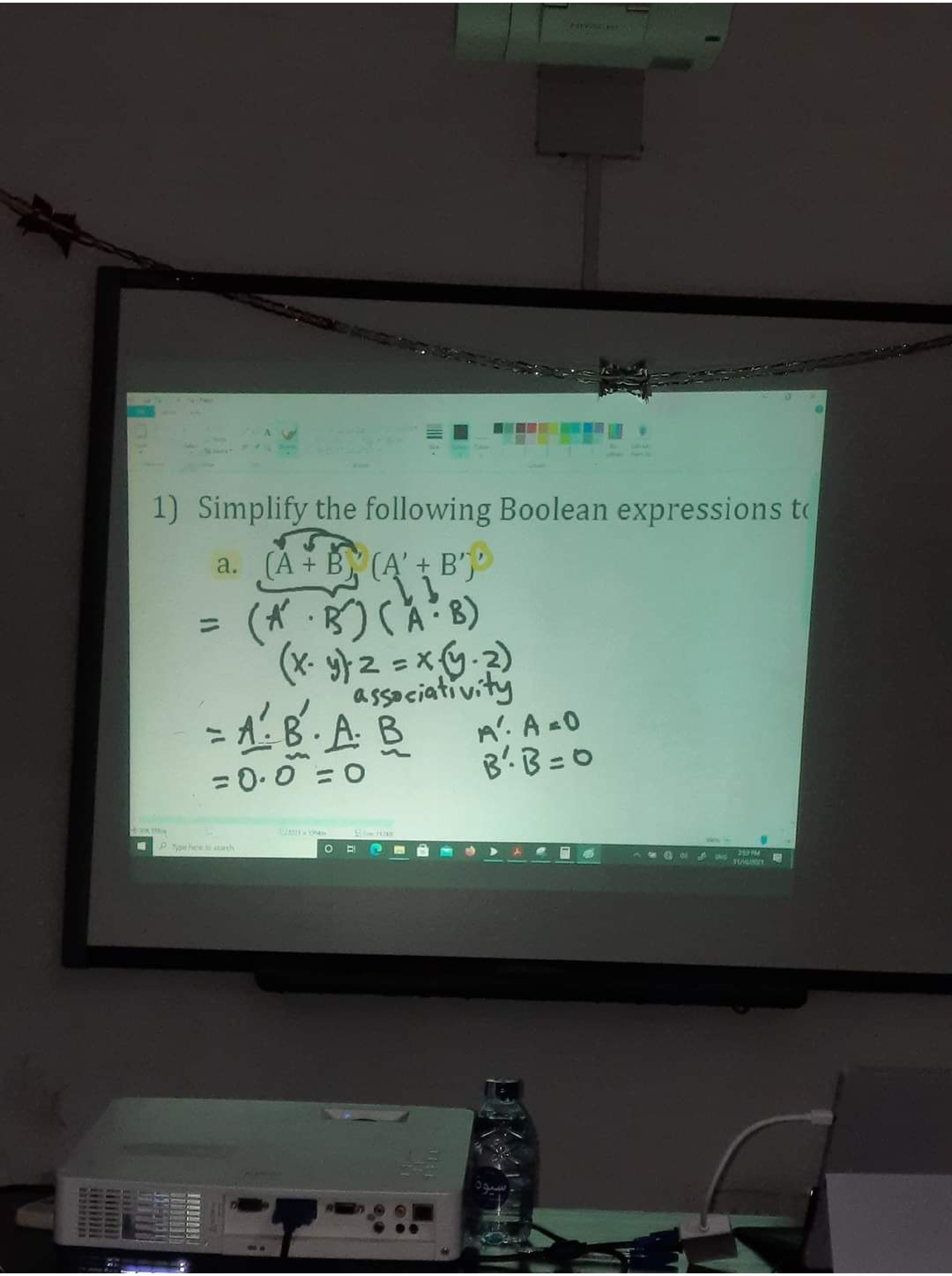
$\cdot \overset{1101}{(A'+B'+C+D')}$

) Simplify the following Boolean ex

b. $A'BC + ABC' + ABC + A'BC'$

$= A'B\underbrace{(C+C')}_{1} + AB\underbrace{(C'+C)}_{1}$

$= A'B + AB = \underbrace{(A'+A)}_{1}B = B$


1) Simplify the following Boolean expressions
a. (A + B)' (A' + B')'
= (A' · B') (A · B)
(x · y) z = x (y · z)
associativity
= A' · B' · A · B
A' · A = 0
B' · B = 0
= 0 · 0 = 0

F as sum of $\boxed{\text{minterms}}$ — — — of $\boxed{\text{product}}$

$m_0 = \underbrace{A'B'C'D'}_{\text{product}}$

$F = \Sigma\left(\text{all rows inwhich } f = 1\right)$

F as product of Maxterms — — — — — — sums

$M_0 = \underbrace{A+B+C+D}_{\text{sum}}$

$F = \Pi\left(\text{all rows inwhich } f = 0\right)$

um-of-product and product-of-sum forms

b. $F(A, B, C) = \pi \underbrace{\boxed{0, 1, 2, 3, 4, 6}}_{F=0}$

$$\overset{000}{=(A+B+C)} \cdot \overset{001}{(A+B+C')} \cdot \overset{010}{(A+B'+C)} \cdot \overset{011}{(A+B'+C')} \cdot \overset{100}{(A'+B+C)} \cdot \overset{110}{(A'+B'+C)}$$

produc of sum/maxterms

$$= \Sigma(\underbrace{5,\ 7}_{\text{rows inwhich } F=1})$$

$$= \overset{101}{AB'C} + \overset{111}{ABC}$$

unctions, and express each function in sum-of-

m:

$m1 \rightarrow A' \cdot B' \cdot C' \cdot D$

$m0 \rightarrow A' \; B' \; C' \; D'$

maxterm

$M0 = (m_0)'$

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

$= A+B+C+D$

$\quad 0 \quad 0 \quad 0 \quad 0$

(C+BD)	F	
0	0	m0
0	0	m1
1	0	m2
1	1	m3
0	0	m4
1	1	m5
1	1	m6
1	1	m7
0	0	m8
0	0	m9
1	0	m10
1	1	m11
0	0	m12
1	1	m13
1	1	m14
1	1	m15

$F = M_0 \cdot M_1 \cdot M2 \cdot M4 \cdot M8 \cdot M9 \cdot M10 \cdot M12$

$= \prod(0, 1, 2, 4, 8, 9, 10, 12)$

$\quad 0000 \qquad 0001$

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