(Lay-4)

Min Term

Max Term

Karnaugh Map

Decimal to Binary

Binary to Decimal

(Boolean Function)

=> Min terms (SOP):-
Sum of Product

=> Minterm Sop are the product of input variable such that value of product is "1"

$$\underset{1}{(A \cdot B \cdot D)} + \underset{1}{(C \cdot E \cdot F)}$$

⇒ (Max term) PoS

- Max terms are the sum of the input variables such that total value of sum = 0

$(A+B+C) \cdot (D+E+F)$
0 0

X	Y	Minterm	Max term
0	0	$m_0 = x'y'$	$M_0 = x+y$
0	1	$m_1 = x'y$	$M_1 = x+y'$
1	0	$m_2 = xy'$	$M_2 = x'+y$
1	1	$m_3 = xy$	$M_3 = x'+y'$

X	Y
0	0

$x = 0$
$x' = 1$

Minterm = x', y'
1, 1

$1 \cdot 1 = 1$

S.NO	A	B	C	F
0	0	0	0	1 ✓
1	0	0	1	0 ✗
2	0	1	0	1 ✓
3	0	1	1	1 ✓
4	1	0	0	0 ✗
5	1	0	1	1 ✓
6	1	1	0	0 ✗
7	1	1	1	1 ✓

(Sum of min terms) ✓

⇒ And we know min-terms means whole product always (one)

$F(A,B,C) = m_0 + m_2 + m_3 + m_5 + m_7$

OR we can write this

$$F(A,B,C) = \Sigma(0,2,3,5,7)$$

⇒ $A'B'C' + A'BC' + A'BC + AB'C + ABC$

Explanation

⇒ yahan pe peeche jo kiya hai uska ye Logic hai SoP means sum aur product ka. equal ho one-(1) ke agar product equal nhi aayi 1 ke toh hum khud ched ched karke one ke equal karenge

For- exp

x y

⇒ 0 1

= 0 x 1 = 0

lekin agar hum x ka not lein aur phir y ke satt multiply karen toh phir ye product one ke equal ayegi jo hum chahiye

⇒ x' y

1 1

⇒ 1 x 1 = 1 ✓

Sum of Max term

=> Using Same previous truth table

$F(A,B,C) = M_1 . M_4 . M_6$

(OR it can be denoted by)

$\pi (1, 4, 6)$

$F(A,B,C) = (A+B+C') . (A'+B+C) . (A'+B'+C)$

(Karnaugh Map)

⇒ A special version of truth table

=> karnaugh Map (k-Map) is a graphical display of fundamental terms in truth table

=> Don't require to use of Boolean Algebra theorem and equations.

=> work with 2, 3, 4 (even more) input variables (gets more and more difficult with more variables.

=> k-maps provide an alternate way of simplifying logic circuits

=> One can transfer logic values from a truth table into a k-Map.

> The arrangement of 0's and 1's within a map helps in visualizing leading directly to simplified boolean expression

IF - confuse - Go to SD
SD-card → Voice of Fast → Lab-4 → k-map
and listen a brief voice

(For n variable k-Map
2^n cells are requried)

⇒ Two variable k-Map

A \ B	0	1
0	00	01
1	10	11

OR

A \ B	B'	B
A'	A'B'	A'B
A	AB'	AB

OR

A \ B	0	1
0	m_0	m_1
1	m_2	m_3

OR

A \ B	0	1
	0	1
	2	3

Three variable k-Map $2^3 = 8$

A \ BC	00	01	11	10
0	0	1	3	2
1	4	5	7	6

Four variable k-Map $2^4 = 16$

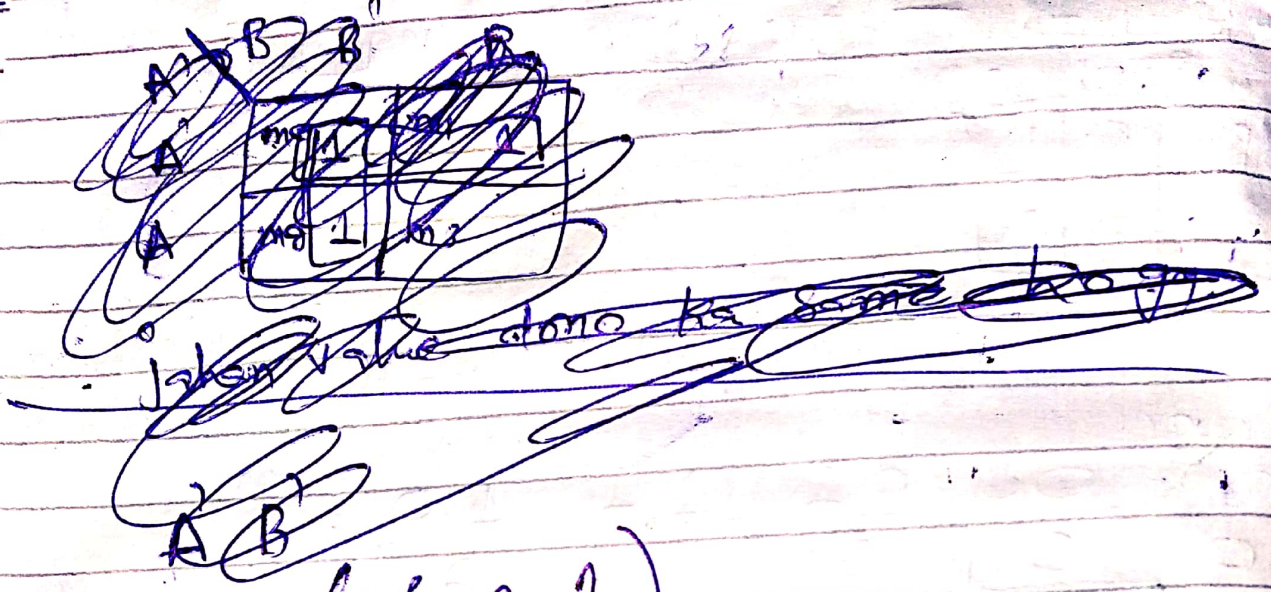
AB \ CD	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

A	B	F
0	0	1
0	1	1
1	0	1
1	1	0

$F(A,B) = \Sigma(0,1,2)$

$A'B' + A'B + AB'$

eqn (1)



taken value done ka same karo ji.

(step 1)

A \ B	B'	B
A'	m_0	m_1
A	m_2	m_3

(step-2)

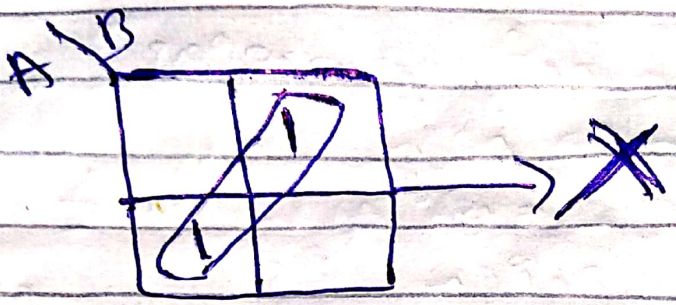
Put the "1", value of min term

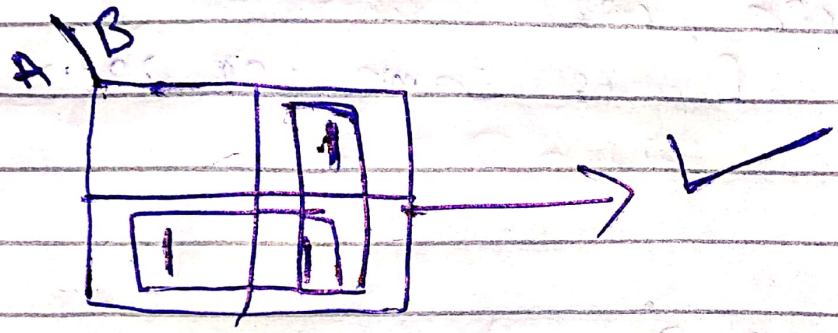
A \ B	B'	B
A'	m_0 1	m_1 1
A	m_2 2	m_3

(Step 3)

Make Groups

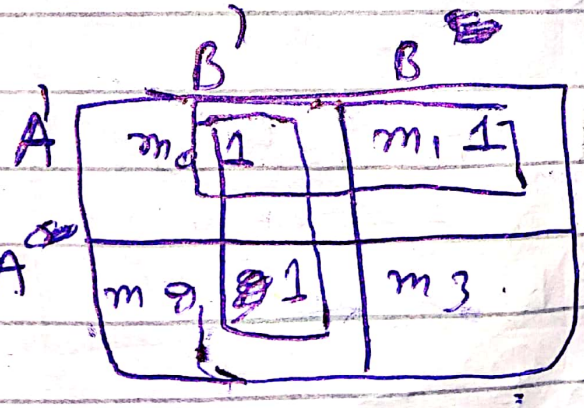
=> (Group Rules)





@ => Group must contain 1, 2, 4, 8 or in general 2^n cells.

(Step 4) — Making Groups



(Step 5)

write those whose value can't be changed

Exp ⇒ Take a row. Pi that row A is not changing its same but B is changing which is B', so which is same we will write that and in colum B' is same for both

A' B'

Now this A' B' is equal to eq(i) & means it will give the same output that eq(i) will give F-exp

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A = 0, B = 0

A' B' ⇒ 1.1 ⇒ 1

eq(i) A'B' + A'B + AB'

1.1 + 1.0 + 0.1

1 + 0 + 0 = 1

(Decimal to Binary)

(2) $(87)_{10}$ = ( )

2	87
2	43 — 1
2	21 — 1
2	10 — 1
2	5 — 0
	2 — 1
	1

$(1\ 0\ 1\ 0\ 1\ 1)_2$ — Binary Number

2	77
2	38 — 1
2	19 — 0
2	9 — 1
2	4 — 1
2	2 — 0
	1 — 0

1 0 0 1 1 0 1

(3) (45.185)

45

2	45
2	22 — 1
2	11 — 0
2	5 — 1
2	2 — 1
	1 — 0

101101

0.185

0.185

⇒ 0.185 × 2 = 0.85 — 0
0.85 × 2 = 0.5 — 0
0.5 × 2 = 1.0 — 1

0.185

⇒ .001

⇒ 0.185 × 2 ⇒

0.85 — 0

⇒ 0.85 × 2

5 — 0

So 45.185

101101.001 ₂

(Binary to Decimal)

① $(101101)_2 = (\quad)$

$2^5 \quad 2^4 \quad 2^3 \quad 2^2 \quad 2^1 \quad 2^0$

$1 + 0 + 1 + 1 + 0 + 1$

$1\times2^0 + 0\times2^1 + 1\times2^2 + 1\times2^3 + 0\times2^4 + 1\times2^5$

$1 + 0 + 4 + 8 + 0 + 32$

$\Rightarrow 45$

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② 10011.011

4) 10 (·25
8
20
80

8) 10 (
8
20
16
40

$\Rightarrow 1\ 0\ 0\ 1\ 1\ .\ 0\ 1\ 1$

$2^4\ 2^3\ 2^2\ 2^1\ 2^0 \quad 2^{-1}\ 2^{-2}\ 2^{-3}$

$\Rightarrow 1\ 0\ 0\ 1\ 1\ .\ 0\ 1\ 1$

$1\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 + 0\times2^{-1} + 1\times2^{-2} + 1\times2^{-3}$

$16 + 0 + 0 + 2 + 1 + 0 + \frac{1}{4} + \frac{1}{8}$

$19 + 0.25 + 0.125$

19.375