

Boolean Algebra

Imp term is literal Boolean Expression :- represent Boolean fun.
variables ~~are~~ and its complement is called literals.

$$f(A, B) = A, \bar{A}, B, \bar{B}$$

No need to use all literals
No. of literals = $2n$ (Maximum)

3 variables = 6

$$f(A, B, C) = A, \bar{A}, B, \bar{B}, C, \bar{C}$$

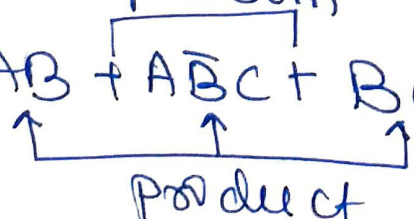
Boolean Equation

i) SOP, POS, Canonical form
(Standard SOP & POS)

SOP (Sum of Product)

group of product, summed together

Ex:- $AB + A\bar{B}C + BC$



Also called Disjunctive normal form (DNF)

POS

(Product of Sum)

POS is a group of sum terms multiplied together.

Ex:- $(A+B)(B+C)$

↑
Product

~ ~ ~
Sum

$$A(B+C)(C+D) \rightarrow \text{POS}$$

It is also called as Conjunctive Form (CNF)

Canonical Form

2 forms in Canonical

SSOP (Standard
[SOP])

→ Each product term contains all the variables of the function

Ex:- $F(A, B, C) = \bar{A}BC + A\bar{B}\bar{C}$

$$AB + B\bar{C}\bar{A} \times$$

Standard POS [SPOS]

Each sum term contains all the variables of the function.

$$F(A, B, C) = (A+B+\bar{C})(\bar{A}+B+C)$$

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

Not (POS)
But SPOS

MINTERMS & MAXTERM

Minterm

Each Individual term
in SSOP is called
Minterm

Maxterm

Each Individual
term in SPOS is
called as Maxterm

For Two Variable function

Variable A B	Minterm SSOP	Maxterm SPOS
0 0	$\bar{A}\bar{B} \ m_0$	$A+B \rightarrow M_0$
0 1	$\bar{A}B \ m_1$	$A+\bar{B} \rightarrow M_1$
1 0	$A\bar{B} \ m_2$	$\bar{A}+B \rightarrow M_2$
1 1	$AB \ m_3$	$\bar{A}+\bar{B} \rightarrow M_3$

$$F(A, B) = \overset{1}{A}\overset{1}{B} + \overset{0}{A}\overset{1}{B} \rightarrow \text{SSOP}$$

$$= \sum m(3, 1) \rightarrow \text{minterms (SSOP)}$$

$$= m_3 + m_1$$

$$f(A,B) = (\overset{0}{A} + \overset{0}{B}) (\overset{1}{A} + \overset{0}{B})$$

$$= \Sigma M(0,2)$$

Q

a	b	c	f
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

Find Minterms

$$\bar{a}\bar{b}c + \bar{a}b\bar{c} + a\bar{b}\bar{c}$$

$m_1 \quad m_2 \quad m_4$

Any F.T to function and vice versa

$$a\bar{b}c + a\bar{b}\bar{c} + \bar{a}b\bar{c}$$

101 100 + 001 5 4 1

$$f(a,b,c) = \Sigma(5,4,1)$$

Q Obtain the canonical SOP of the fun

1) $Y(A, B) = A + B$

2) $Y(A, B, C) = A + BC$

3) $Y = AB + AC$

Q Obtain the canonical POS of the fun
 $Y(A, B, C) = (A + \bar{B})(B + C)(A + \bar{C})$

Q Express the function

$$Y = A + \bar{B}C$$

a) Canonical SOP b) Canonical POS form

Q 1) $Y(A, B) = \underset{\downarrow}{A} + \underset{\downarrow}{B}$ (Minterm or SOP = 1)
 $\Rightarrow A \cdot 1 + B \cdot 1$ (Maxterm POS = 0)
 $\Rightarrow A \cdot (B + \bar{B}) + B \cdot (A + \bar{A})$ ($x \cdot \bar{x} = 0$)
 $\Rightarrow AB + A\bar{B} + AB + \bar{A}B$
 $\Rightarrow AB + \bar{A}B + A\bar{B}$