OPERATOR PRECEDENCE

1) Parantheses
2) NOT
3) AND
4) OR

Sum of Product:-

$F1 = y' + xy + x'yz'$

Product of Sum:-

$F2 = x(y'+z)(x'+y+z')$

* each maxterm is a complement of it's corresponding minterm & vice versa

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

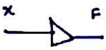
Minterms

Maxterms

$F = xy + x'z$

			Minterms		Maxterms	
x	y	z	Term	Designation	Term	Designation
0	0	0	$x'y'z'$	m_0	$x+y+z$	M_0
0	0	1	$x'y'z$	m_1	$x+y+z'$	M_1
0	1	0	$x'yz'$	m_2	$x+y'+z$	M_2
0	1	1	$x'yz$	m_3	$x+y'+z'$	M_3
1	0	0	$xy'z'$	m_4	$x'+y+z$	M_4
1	0	1	$xy'z$	m_5	$x'+y+z'$	M_5
1	1	0	xyz'	m_6	$x'+y'+z$	M_6
1	1	1	xyz	m_7	$x'+y'+z'$	M_7

↳ note that $m_{x\text{th}}$ value, x is the value in decimal of that binary no!

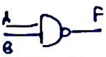
Buffer  $F = x$

Exclusive-NOR  $F = (x \oplus y)'$

AND  $F = x \cdot y$

OR  $F = A+B$

Inverter  $F = x'$

NAND  $= F = (xy)'$

NOR  $F = (A+B)'$

XOR  $F = x \oplus y$.

• **Converting function into sum of minterms.**

EXAMPLE :- $A + B'C$

→ first expression A is missing other two terms.

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

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

→ similarly,

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

$AB'C + A'B'C$

$$F = \underset{\substack{111 \\ m_7}}{ABC} + \underset{\substack{110 \\ m_6}}{ABC'} + \underset{\substack{101 \\ m_5}}{AB'C} + \underset{\substack{100 \\ m_4}}{AB'C'} + \underset{\substack{001 \\ m_1}}{A'B'C}$$

$\Sigma(1,4,5,6,7)$

• **converting function into product of maxterms.**

EXAMPLE :- $xy + x'z$

→ converting into OR terms, using $A+BC = (A+B)(A+C)$ DISTRIBUTIVE LAW.

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

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

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

$(x'+y) \rightarrow x'+y+zz' \Rightarrow (x'+y+z)(x'+y+z')$

$(x+z) \rightarrow x+z+yy' \Rightarrow (x+z+y)(x+z+y')$

$(y+z) \rightarrow y+z+xx' \Rightarrow (y+z+x)(y+z+x')$

$$F = \underset{M_0}{(x+y+z)}\underset{M_2}{(x+y'+z)}\underset{M_4}{(x'+y+z)}\underset{M_5}{(x'+y+z')}$$

$\Pi(0,2,4,5)$

VERY IMPORTANT

Postulate 2 (a) $x + 0 = x$ (b) $x \cdot 1 = x$

Postulate 5 (a) $x + x' = 1$ (b) $x \cdot x' = 0$

Theorem 1 (a) $x + x = x$ (b) $x \cdot x = x$

Theorem 2 (a) $x + 1 = 1$ (b) $x \cdot 0 = 0$

Theorem 3, involution $(x')' = x$

Commutative (a) $x + y = y + x$ (b) $xy = yx$

Distributive (a) $x(y+z) = xy + xz$ (b) $x + yz = (x+y)(x+z)$

De Morgan (a) $(x+y)' = x'y'$ (b) $(xy)' = x' + y'$

Absorption (a) $x + xy = x$ (b) $x(x+y) = x$

Associative (a) $x + (y+z) = (x+y)+z$ (b) $x(yz) = (xy)z$

MORE ON ABSORPTION

$A + A = A$

$A \cdot A = A$

$A + AB = A$

$A(A+B) = A$

$\left.\begin{array}{l} A + \overline{A}B = A + B \\ A \cdot (\overline{A} + B) = AB \end{array}\right]$ Redundancy laws.