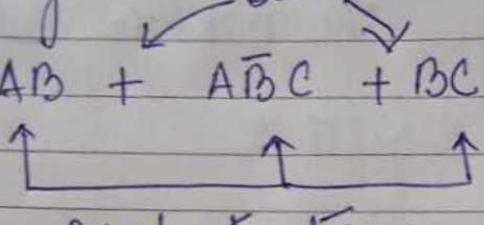


## Boolean Function Representation :-

### (1) SOP (Sum of products) form:-

\* Group of product terms summed together

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

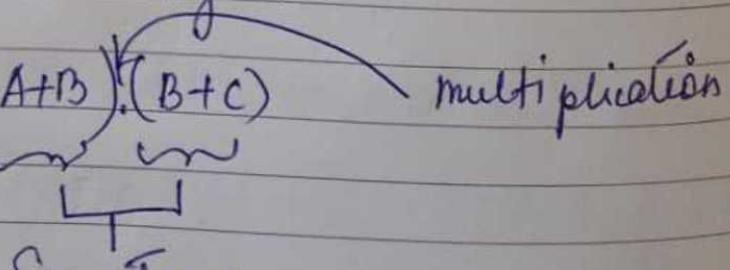


↳ Also called Disjunctive normal form. (DNF)

### (2) Product of Sums (POS) form:-

\* group of sum terms multiplied ANDed together

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



↳ Conjunctive normal form (CNF)

## Canonical form:-

### standard SOP (ssop)

Each product term  
contains all the variables  
of the function

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

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

SOP ✓  
SSOP X

### 2. Standard POS (spos)

↳ Each sum term contains  
all the variables of  
the function

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

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

↳ spos ✓

## MINTERMS & MAXTERMS:-

### Minterm

### Maxterm

\* Each individual term in SOP is called a Minterm

\* Each individual term in POS is called Maxterm

2-variable function,  $f(A, B)$

Variable	Minterm	Maxterm
A B		
0 0	$\bar{A} \bar{B}$ ( $m_0$ )	$A + B$ ( $M_0$ )
0 1	$\bar{A} B$ ( $m_1$ )	$A + \bar{B}$ ( $M_1$ )
1 0	$A \bar{B}$ ( $m_2$ )	$\bar{A} + B$ ( $M_2$ )
1 1	$A B$ ( $m_3$ )	$\bar{A} + \bar{B}$ ( $M_3$ )

Minterm  $\rightarrow$  0  $\rightarrow$  take complement  
 1  $\rightarrow$  actual variable

Maxterm  $\rightarrow$  0  $\rightarrow$  actual variable  
 1  $\rightarrow$  take complement

$$f(A/B) = AB + A\bar{B}$$

$$\text{Ex:- } f(A, B) = AB + \bar{A}B$$

SSOP form.

$$= \Sigma m(1, 3)$$

$$\begin{array}{r} 11 \\ AB + \bar{A} B \\ \hline \end{array}$$

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

SPOS form

$$= \overline{\Pi} M(0, 2)$$

SOP to SSOP :-

Steps

1. Identify the missing variables in product terms.
2. Multiply (variable + its complement)
3. Neglect the repeated terms.

Ex:-  $f(A, B, C) = AB + ABC + BC$

$= AB(C + \bar{C}) + ABC + BC(A + \bar{A})$

$= \cancel{ABC} + \cancel{ABC} + \cancel{ABC} + \cancel{ABC} + ABL$

$= ABC + A\bar{B}\bar{C} + \bar{A}BC$

$\begin{matrix} 1 & 1 & 1 \\ m_7 & \uparrow m_6 & m_3 \end{matrix}$

SSOP

$= \Sigma m(3, 6, 7)$

## POS to SPOS :-

5 steps

1. Identify the missing variable

2. Add with that variable  
& its complement separately

3. Neglect repeated terms.

Ex:-  $f(A, B, C) = A(\overbrace{A+C}) \rightarrow B \text{ is missing.}$

↓

Single sum term, B, C are missing

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

$$(A + B + C)(A + C + \bar{B})(A + C + \bar{B})$$

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

$$= \text{PI M } ( )$$

$\therefore M(0, 1, 2, 3)$