

### Minterm Variables

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

### Maxterm Variables

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

Consider the maxterm logical function

$F(A, B, C) = \prod M(2, 4, 6)$ . The truth table corresponding to the above function can be written as shown in above table. Therefore the standard POS form of the given function is

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

### SOP FORMS.

Converting expressions to standard SOP form

SOP form can be converted to standard SOP using following steps.

Step 1: Find the missing literals in each product term if any.

Step 2: AND each product term having missing literals with in terms form by ORing the literals and its complement.

Step 3: Expand the terms by applying distributive law and reorder the literals and its complement in the product terms.

Step 4: Reduce the expression by omitting repeated product terms if any.

### PROBLEM:

1.) Convert the given expression in standard SOP form.

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

Solu:

Step 1:  $f(A, B, C) = AC + \bar{A}B + B\bar{C}$

Diagram illustrating missing literals:

- Under  $AC$ ,  $\bar{A}$  is missing
- Under  $\bar{A}B$ ,  $C$  is missing
- Under  $B\bar{C}$ ,  $B$  is missing

Step 2: AND product term with sum of missing literals & its complement.

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

Step 3: Expand and reorder

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

Step 4: Omit repeated product terms

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

2) Obtain the Canonical Sum of Product form of the function.

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

Solu:

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

$$\therefore Y(A, B, C) = A(B + \bar{B})(C + \bar{C}) + BC(A + \bar{A}) + \bar{A}BC$$

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

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

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

### POS FORMS

1) Convert the following function into Canonical Product of Max terms.

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

Solu:

Step 1: Find the missing literals in each sum term.

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

Step 2:

$$F(A, B, C) = (A + B' + C \cdot C')(A \cdot A' + B + C)(A + B \cdot B' + C')$$

Step 3: Since  $A+BC = (A+B)(A+C)$ , we can write

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

Step 4:

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

Q) Convert the given expression in standard POS form.

$$f = A \cdot (A+B+C)$$

Solu:

Step 1:  $f(A,B,C) = A \cdot (A+B+C)$

Step 2:  $f(A,B,C) = (A+B\bar{B}+C\bar{C}) \cdot (A+B+C)$

Step 3: Expand.

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

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

Step 4:

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