PRODUCT-OF-SUMS FORM

LOGIC MINIMIZATION

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TOPIC OUTLINE

Product-of-Sums (POS) Form

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When two or more **sum terms** are multiplied, the resulting expression is a **product-of-sums (POS)**.

example

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

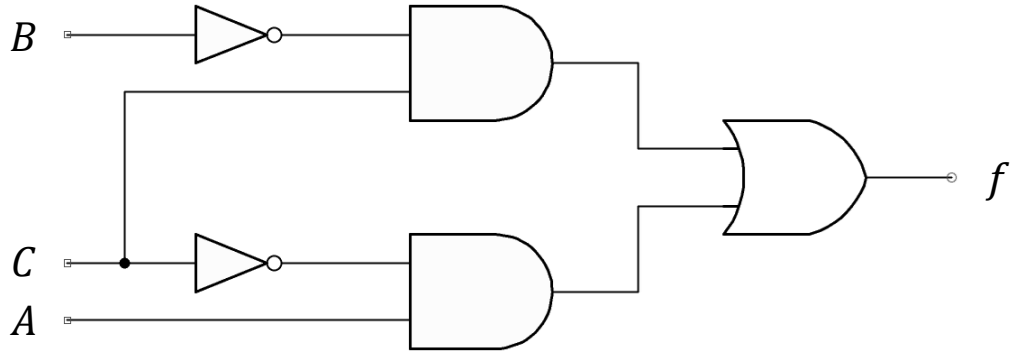
$f = (\bar{A} + \bar{B} + \bar{C})(C + \bar{D} + E)(\bar{B} + C + D)$

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

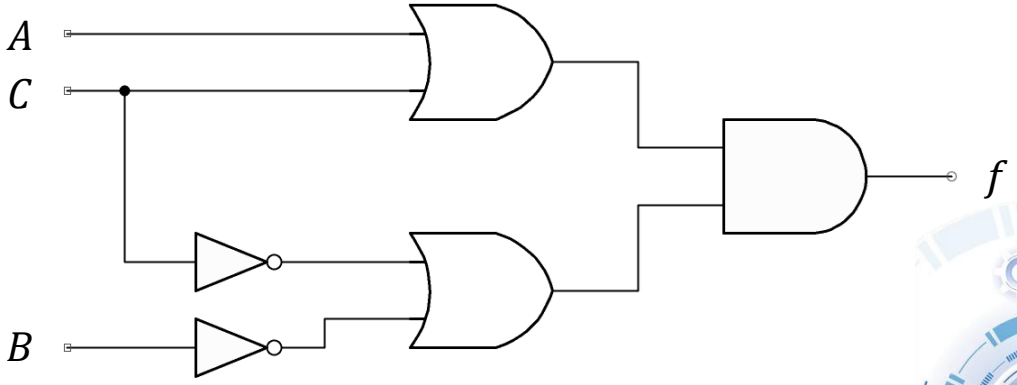
note

POS expression can have the term $\bar{A} + \bar{B} + \bar{C}$ but not $\overline{A + B + C}$.

Minimal SOP realization



Minimal POS realization



EXERCISE

Convert the given Boolean expressions to POS form.

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

Solution

STANDARD POS FORM

A **standard POS form** ensures that each product term is a **maxterm**.

Maxterm is a **sum term** that evaluates to **0** for exactly one unique combination of input values.

Maxterms for the three-variable table

Decimal	A	B	C	Maxterm
0	0	0	0	$M_0 = A + B + C$
1	0	0	1	$M_1 = A + B + \bar{C}$
2	0	1	0	$M_1 = A + \bar{B} + C$
3	0	1	1	$M_1 = A + \bar{B} + \bar{C}$
4	1	0	0	$M_1 = \bar{A} + B + C$
5	1	0	1	$M_1 = \bar{A} + B + \bar{C}$
6	1	1	0	$M_1 = \bar{A} + \bar{B} + C$
7	1	1	1	$M_1 = \bar{A} + \bar{B} + \bar{C}$

EXERCISE

Convert the given Boolean expressions to standard POS form.

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

and then represent the result using a truth table format.

Solution

note

A nonstandard POS expression is converted into standard form using Boolean algebra rule:

$$A \cdot \bar{A} = 0$$

EXERCISE

Convert the given Boolean expressions to standard POS form.

$$f = ABC + AB(C + D)$$

and then represent the result using a truth table format.

Solution

EXERCISE

Convert the given Boolean expressions to standard POS form.

$$f = AB + B(C + D)$$

and then represent the result using a truth table format.

Solution

LABORATORY