



PRODUCT OF SUM AND MAX-TERM REPRESENTATION

**ANALOG & DIGITAL ELECTRONICS
ESC-301**

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COMPUTER SCIENCE AND ENGINEERING

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PRODUCT OF SUM

- ⊙ When two or more sum terms are multiplied together

- ⊙ **EXAMPLE:**

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

Diagram illustrating the Product of Sum (POS) expression:

- The expression is $f(A,B,C) = (A' + B) \cdot (B + C')$.
- The terms $(A' + B)$ and $(B + C')$ are identified as **Sum terms** (indicated by upward arrows from the label).
- The entire expression is identified as the **Product** (indicated by a downward arrow from the label).

CANONICAL OR STANDARD POS FORM

⦿ In POS form all the terms do not involve all the literals

⦿ For example:

The expression $A.(B+C)$

-the first term does not contain B and C whereas the second term does not contain A

⦿ If each term of POS contain all the literals then it is known as **STANDARD POS FORM**

Lets take an example and convert it to Standard POS form

STEP-WISE CONVERSION TO STANDARD POS FORM

- Find the missing literals in each sum term.

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

Literal B is missing

Literal A is missing

Literal C is missing

- OR $f(A,B,C) = (A + B) + (C \cdot C') + (B + C) + (A \cdot A') + (A + C) + (B \cdot B')$ element.



- Expand the repeated the

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

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

MAX-TERMS

- Maxterms are OR terms with every variable in true or complemented form.
- Given that each binary variable may appear normal (e.g., x) or complemented (e.g. x'), there are 2^n maxterms for n variables.
- Example: Two variables (X and Y) produce $2 \times 2 = 4$ combinations:

$X+Y$ (both normal)

$X+Y'$ (x normal, y complemented)

$X'+Y$ (x complemented, y normal)

$X'+Y'$ (both complemented)

TRUTH TABLE REPRESENTATION OF MAX TERMS

A	B	C	Maxterms
0	0	0	$A+B+C = M_0$
0	0	1	$A+B+C' = M_1$
0	1	0	$A+B'+C = M_2$
0	1	1	$A+B'+C' = M_3$
1	0	0	$A'+B+C = M_4$
1	0	1	$A'+B+C' = M_5$
1	1	0	$A'+B'+C = M_6$
1	1	1	$A'+B'+C' = M_7$

MAX-TERMS EXAMPLES

1. $f(A,B,C) = (A+B+C).(A+B'+C).(A+B'+C')+(A'+B'+C')$
 $= M_0 + M_2 + M_3 + M_7$
 $= \prod M(0,2,3,7)$
2. $f(A,B,C) = (A+B+C').(A+B'+C').(A+B'+C').(A'+B'+C')$
 $= M_1 + M_3 + M_5 + M_7$
 $= \prod M(1,3,5,7)$
3. $f(A,B,C) = (A+B+C).(A+B'+C).(A+B'+C').(A'+B'+C)$
 $= M_0 + M_2 + M_3 + M_6$
 $= \prod M(0,2,3,6)$

The background of the slide is a light gray network pattern. It consists of numerous small circles, some of which are solid gray and others are hollow with a gray outline. These circles are interconnected by thin, light gray lines, creating a complex, web-like structure that fills the entire background.

**THANK
YOU**