

Logic Wizard

Converting Min/Max Terms and Boolean Expression

A Digital Logic Design Project

Under the Guidance of **Dr Varun Kumar**



IIITV-ICD

Team Members

Nitin Kumar	202211059
Rahul Gupta	202211069
Ramcharan Singh	202211072
Rituraj Kumar	202211075
Sanskar Koserwal	202211077

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Project Statement

Question Statement - 1

User will insert the min/max term and simulator will give the optimum solution in the following form

- (i) SOP
- (ii) POS

Question Statement - 2

User will write the boolean expression (A, B, C, D → usual notation).

Simulator will give the min/max term indices.

Min/Max Terms

MinTerm

- A minterm (short for "minimal term") is a product term that represents a specific combination of input variables in their true or complemented form.
- In an SOP expression, the minterm index is used to denote a specific product term.

MaxTerm

- A maxterm (short for "maximal term") is a sum term that represents a specific combination of input variables in their true or complemented form, with the entire term complemented.
- In a POS expression, the maxterm index is used to denote a specific sum term.

Min Term to SOP

Terminologies:

- Minterms: Binary expressions representing all input combinations in a truth table.
- SOP Form: Summing relevant minterms that yield a "1" output.

Steps:

- Identify relevant minterms (those producing "1" output).
- Sum these minterms to create an SOP expression.
- Optionally, simplify the expression using Boolean algebra.

Min Term to SOP

A	B	C	F
0	0	0	0
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	0

SOP Implementation from a Truth Table

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

Maxterm to POS

Terminologies:

- MaxTerms: Binary expressions representing all input combinations in a truth table.
- POS Form: Product of non-relevant MaxTerms that yield a "0" output.

Steps:

- Identify non-relevant MaxTerms (those producing "0" output).
- Multiply these MaxTerms to create a POS expression.
- Optionally, simplify the expression using Boolean algebra.

Maxterm to POS

A	B	C	F	POS implementation from a Truth Table
0	0	0	0	
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	0	

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

Boolean Expression to Min/Max

Terminologies:

- Boolean Expression: A logical expression using variables, operators, and parentheses.

Steps:

- MinTerms: Identify the terms in the expression that, when true, make the expression equal to "1."
- MaxTerms: Identify the terms in the expression that, when true, make the expression equal to "0."

Boolean Expression to Min/Max

Variables			Min terms	Max terms
A	B	C	m_i	M_i
0	0	0	$A' B' C' = m\ 0$	$A + B + C = M\ 0$
0	0	1	$A' B' C = m\ 1$	$A + B + C' = M\ 1$
0	1	0	$A' B C' = m\ 2$	$A + B' + C = M\ 2$
0	1	1	$A' B C = m\ 3$	$A + B' + C' = M\ 3$
1	0	0	$A B' C' = m\ 4$	$A' + B + C = M\ 4$
1	0	1	$A B' C = m\ 5$	$A' + B + C' = M\ 5$
1	1	0	$A B C' = m\ 6$	$A' + B' + C = M\ 6$
1	1	1	$A B C = m\ 7$	$A' + B' + C' = M\ 7$



User Interface for Problem 10

Number Conversion Applet

***** **NUMBER Converter** *****

Enter Digit: 10

Convert From:

Converted to Decimal: 10

Converted to Binary: 1010

Converted to Octal: 12

Converted to Hexa: a

0	1	2	3	<input type="button" value="Reset"/>
4	5	6	7	
8	9	A	B	
C	D	E	F	



Conclusion

Our project provides a valuable digital logic simulator for effortlessly converting min/max terms and Boolean expressions into SOP and POS forms. This versatile tool holds practical significance across various domains, addressing the need for optimized digital solutions. Its potential for the future reflects our commitment to advancing digital logic and technology, bridging theory and application for enhanced efficiency and innovation in electronics and engineering.

References

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Thank You