

Electronics
MSc. Physics Semester 2
Paper - MPHY CC-7
Unit 4
Topic - SOP & POS Form

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SEM-II

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Electronics - CG-6

SOP and POS

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↳ min term & Max term

SOP - SUM OF PRODUCT

$$Y = AB + BC + AC$$

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

SOP \rightarrow 0/P \rightarrow high output $\rightarrow 1$

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

$$A=1 \Rightarrow A$$

Dec. Eq	Variables	Min terms	O/P	SOP
	A B C	m_i	Y	3 variables
	0 0 0	$\bar{A}\bar{B}\bar{C} = m_0$	0	2^n
	0 0 1	$\bar{A}\bar{B}C = m_1$	0	n is the no of input
	0 1 0	$\bar{A}B\bar{C} = m_2$	1	
	0 1 1	$\bar{A}BC = m_3$	0	$2^3 = 8$
	1 0 0	$A\bar{B}\bar{C} = m_4$	1	
	1 0 1	$A\bar{B}C = m_5$	1	
	1 1 0	$AB\bar{C} = m_6$	1	
	1 1 1	$ABC = m_7$	1	

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

Min terms.

Sum of product

This equation is Standard form or Canonical Form.

$$Y = m_2 + m_4 + m_5 + m_6 + m_7 = \sum m(2,4,5,6,7)$$

(2)

$$Y = \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$$

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

$$= \bar{A}B\bar{C} + \bar{A}B \cdot 1 + AB \cdot 1$$

$$= \bar{A}B\bar{C} + A(\bar{B} + B) \quad \because \bar{B} + B = 1$$

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

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

$$= \bar{A}X + A$$

$$X = B\bar{C}$$

$$= X + A$$

$$= \boxed{B\bar{C} + A} \rightarrow \text{minimal SOP form}$$

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

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

$$= AB + A\bar{C}A + BCB + B\bar{C}\bar{C}A$$

$$= AB + A\bar{C} + BC + 0$$

$$\boxed{A \cdot A = A}$$

$$= \underline{AB + A\bar{C} + BC}$$

$$\boxed{C\bar{C} = 0}$$

↓ SOP Form ↓

these are called minterm.

This is minimal SOP form. This is not standard or canonical form.

Product of Sum (POS)

3 variables

$$2^n = 2^3 = 8 \text{ variables}$$

POS form
↓
low (0)

Dec	Variables			Max terms M_i	O/P Y
	A	B	C		
0	0	0	0	$A+B+C = M_0$	0
1	0	0	1	$A+B+\bar{C} = M_1$	0
2	0	1	0	$A+\bar{B}+C = M_2$	1
3	0	1	1	$A+\bar{B}+\bar{C} = M_3$	0
4	1	0	0	$\bar{A}+B+C = M_4$	1
5	1	0	1	$\bar{A}+B+\bar{C} = M_5$	1
6	1	1	0	$\bar{A}+\bar{B}+C = M_6$	1
7	1	1	1	$\bar{A}+\bar{B}+\bar{C} = M_7$	1

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

Max terms

This is standard / canonical POS form.

$$Y(A,B,C) = M_0 M_1 M_3$$

$$= \prod M(0, 1, 3)$$

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

$$A+BC = (A+B)(A+C)$$

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

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

$$= A + \underbrace{B\bar{B}}_0 + BC = \boxed{A+BC}$$

Minimal POS Form

(4)

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

$$= (A+B)(A+C)(B+C)(B+A)$$

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

$$A \cdot A = A$$

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

~~This is Minimal POS form.~~

Max Form.

Canonical

Y

Canoe

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

Max Form

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

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

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

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

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