28/1/19

	A	B	C	Min Term	Max Term
0	0	0	0	$A'B'C'$	$A+B+C$
1	0	0	1	$A'B'C$	$A+B+C'$
2	0	1	0	$A'BC'$	$A+B'+C$
3	0	1	1	$A'BC$	$A+B'+C'$
4	1	0	0	$AB'C'$	$A'+B+C$
5	1	0	1	$AB'C$	$A'+B+C'$
6	1	1	0	ABC'	$A'+B'+C$
7	1	1	1	ABC	$A'+B'+C'$

Minterms $\rightarrow m_i$ (m_0 to m_7)

Maxterms $\rightarrow M_i$ (M_0 to M_7)

Canonical SOP

n- No. of variables

$$F_n = \sum_{i=0}^{2^n-1} a_i m_i$$

$$a_i = \begin{cases} 0 & \text{if } m_i \text{ is absent} \\ 1 & \text{if } m_i \text{ is present} \end{cases}$$

Ex:

- $F = A'BC' + ABC + A'B'C = m_2 + m_7 + m_1$

  $F(A,B,C) = \sum m(1,2,7)$

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

  $= M_5 \cdot M_2 \cdot M_0$

  $= \prod M(0,2,5)$

$m_0' = (A'B'C')' = A'' + B'' + C''$ $\boxed{m_i' = M_i}$

$= A + B + C = M_0$

Canonical POS

$$F_n = \prod_{i=0}^{2^n-1} (a_i + M_i) \quad , \quad a_i = \begin{cases} 0 & \text{, if } M_i \text{ is } \cancel{\text{absent}} \text{ present} \\ 1 & \text{, if } M_i \text{ is absent} \end{cases}$$

$$F' = \left(\sum_{i=0}^{2^n-1} a_i m_i \right)'$$

$$= \prod_{i=0}^{2^n-1} (a_i m_i)' = \prod_{i=0}^{2^n-1} (a_i' + M_i)$$

→

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

$F(A,B,C) = \Sigma m(0, 2, 5, 7)$

$F'(A,B,C) = \Sigma m(1, 3, 4, 6)$

$F + F' = \Sigma m(0 \text{ to } 7) = 1$

$F(A,B,C) = M_1 \cdot M_3 \cdot M_4 \cdot M_6$

$F = \pi(M(1,3,4,6))$

$F' = \pi M(0, 2, 5, 7)$

$F \cdot F' = \pi M(0 \text{ to } 7) = 0$

Ex: $F(A,B,C) = \Sigma m(1,3,5,6)$

$F = \prod M(0,2,4,7)$

$F' = \Sigma m(0,2,4,7)$

$F' = \prod M(1,3,5,6)$

→ Given an arbitrary expression, how to express it as SOP/POS

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

$= AC + B'C$

$= A\cdot 1\cdot C + 1\cdot B'\cdot C$

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

$= ABC + \underline{AB'C} + \underline{AB'C} + A'B'C$

$= ABC + AB'C + A'B'C$ — SOP

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

$= (A+B'+0)\cdot C$

$= (A+B'+CC')\cdot C$

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

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

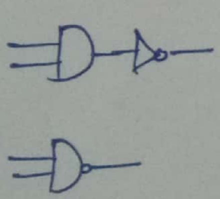
$C = 0+0+C$

$= (AA'+BB'+C)$

$\vdots$

NAND

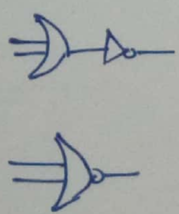
AND-NOT



A	B	$(A\cdot B)'$
0	0	1
0	1	1
1	0	1
1	1	0

NOR

OR-NOT



A	B	$(A+B)'$
0	0	1
0	1	0
1	0	0
1	1	0