

3. Gate Level Minimization

Karnaugh Map w. Minterms

	Y	0	1
X	0	m_0	m_1
	1	m_2	m_3

$$x'y' + x'y?$$

	Y	0	1
X	0	1	1
	1		

$$= x'$$

$$x'y' + x'y + xy?$$

	Y	0	1
X	0	1	1
	1		1

$$= x' + y$$

	YZ	00	01	11	10
X	0	m_0	m_1	m_3	m_2
	1	m_4	m_5	m_7	m_6

$$x'y'z' + xy'z' + x'yz' + xyz'?$$

	YZ	00	01	11	10
X	0	1			1
	1	1			1

$$= z'$$

How about $XY + Y'Z + XZ$?

↓

Un simplify it!

$$XY(Z + Z') + Y'Z(X + X') + XZ(Y + Y') \\ = XYZ + XYZ' + XY'Z + X'Y'Z + \cancel{XYZ} + \cancel{XY'Z}$$

↓ then, K-map!

YZ		00	01	11	10
X	0		1		
	1		1	1	1

$= Y'Z + XY$

YZ		00	01	11	10
WX	00	m_0	m_1	m_3	m_2
	01	m_4	m_5	m_7	m_6
	11	m_{12}	m_{13}	m_{15}	m_{14}
	10	m_8	m_9	m_{11}	m_{10}

$A=0$

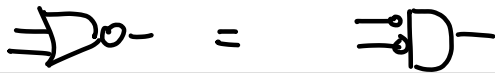
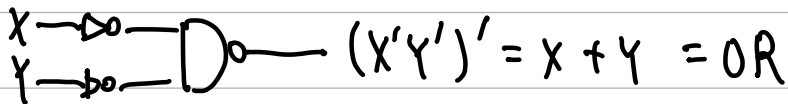
DE		00	01	11	10
BC	00	0	1	3	2
	01	4	5	7	6
	11	12	13	15	14
	10	8	9	11	10

$A=1$

		00	01	11	10
	00	16	17	19	18
	01	20	21	23	22
	11	28	29	31	30
	10	24	25	27	26

문자 때 $2^{0,1,2,\dots}$ 만큼씩만 가능!

NAND, NOR : Universal Gate



Non-degenerate Forms.

AND $\left[\begin{array}{l} \text{OR} \\ \text{NOR} \end{array} \right.$

NAND $\left[\begin{array}{l} \text{NAND} \\ \text{AND} \end{array} \right.$

OR $\left[\begin{array}{l} \text{AND} \\ \text{NAND} \end{array} \right.$

NOR $\left[\begin{array}{l} \text{NOR} \\ \text{OR} \end{array} \right.$

Exclusive - OR

$$X \oplus Y = X'Y + XY'$$

$$(X \oplus Y)' = XY + X'Y'$$

$$X \oplus 0 = X, \quad X \oplus 1 = X'$$

$$X \oplus X = 0, \quad X \oplus X' = 1$$

$$X \oplus Y' = X' \oplus Y = (X \oplus Y)'$$

1이 연속 개인지 판단 가능!