IT COOKBOOK

디지털논리회로

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(Problem Solutions of Chapter 5)

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1. 진리표를 이용하여 두 함수가 같음을 증명

① $F=\overline{XYZ}$, $G=\overline{X}+\overline{Y}+\overline{Z}$

X	Y	Z	XYZ	식 F	$\overline{X}$	$\overline{Y}$	$\overline{Z}$	식 G
0	0	0	0	1	1	1	1	1
0	0	1	0	1	1	1	0	1
0	1	0	0	1	1	0	1	1
0	1	1	0	1	1	0	0	1
1	0	0	0	1	0	1	1	1
1	0	1	0	1	0	1	0	1
1	1	0	0	1	0	0	1	1
1	1	1	1	0	0	0	0	0

② $F=X\overline{Y}+Y\overline{Z}+\overline{X}Z$, $G=\overline{X}Y+\overline{Y}Z+X\overline{Z}$

X	Y	Z	$X\overline{Y}$	$Y\overline{Z}$	$\overline{X}Z$	식 F	$\overline{X}Y$	$\overline{Y}Z$	$X\overline{Z}$	식 G
0	0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	1	1	0	1	0	1
0	1	0	0	1	0	1	1	0	0	1
0	1	1	0	0	1	1	1	0	0	1
1	0	0	1	0	0	1	0	0	1	1
1	0	1	1	0	0	1	0	1	0	1
1	1	0	0	1	0	1	0	0	1	1
1	1	1	0	0	0	0	0	0	0	0

③ $f=\overline{a}\,\overline{c}+\overline{a}c+bc$, $g=(\overline{a}+c)(\overline{a}+b+\overline{c})$

a	b	c	$\overline{a}\,\overline{c}$	$\overline{a}c$	bc	식 f	$\overline{a}+c$	$\overline{a}+b+\overline{c}$	식 g
0	0	0	1	0	0	1	1	1	1
0	0	1	0	1	0	1	1	1	1
0	1	0	1	0	0	1	1	1	1
0	1	1	0	1	1	1	1	1	1
1	0	0	0	0	0	0	0	1	0
1	0	1	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	1	0
1	1	1	0	0	1	1	1	1	1

④ $f=\overline{a}\,\overline{c}+bc+a\overline{b}$, $g=\overline{b}\,\overline{c}+ac+\overline{a}b$

a	b	c	$\overline{a}\,\overline{c}$	bc	$a\overline{b}$	식 f	$\overline{b}\,\overline{c}$	ac	$\overline{a}b$	식 g
0	0	0	1	0	0	1	1	0	0	1
0	0	1	0	0	0	0	0	0	0	0
0	1	0	1	0	0	1	0	0	1	1
0	1	1	0	1	0	1	0	0	1	1
1	0	0	0	0	1	1	1	0	0	1
1	0	1	0	0	1	1	0	1	0	1
1	1	0	0	0	0	0	0	0	0	0
1	1	1	0	1	0	1	0	1	0	1

⑤ $f=ab+ac+\overline{a}bd$, $g=bd+a\overline{b}c+ab\overline{d}$

a	b	c	d	ab	ac	$\overline{a}bd$	식 f	bd	$a\overline{b}c$	$ab\overline{d}$	식 g
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0
0	1	0	1	0	0	1	1	1	0	0	1
0	1	1	0	0	0	0	0	0	0	0	0
0	1	1	1	0	0	1	1	1	0	0	1
1	0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0	0	0	0
1	0	1	0	0	1	1	1	0	1	0	1
1	0	1	1	0	1	1	1	0	1	0	1
1	1	0	0	1	0	1	1	0	0	1	1
1	1	0	1	1	0	1	1	1	0	0	1
1	1	1	0	1	1	1	1	0	0	1	1
1	1	1	1	1	1	1	1	1	0	0	1

2. 불 대수를 이용한 논리식 간소화

① $1 \cdot (A+B+C) = A+B+C$

② $A+B+C+1 = 1$

③ $ABC+1 = 1$

④ $(\overline{A} \cdot 1)+A = \overline{A}+A = 1$

⑤ $(\overline{A}AB+D)(CE\overline{E}+\overline{D}) = D\overline{D} = 0$

⑥ $(A+0)(C+D\overline{D}) = AC$

⑦ $(A+\overline{A})B+(C+\overline{C})B = B+B = B$

⑧ $\overline{\overline{A}}\,\overline{\overline{A}} = AA = A$

⑨ $AB\overline{A}+(B\overline{B}C+C)+C(D+1) = 0+C+C = C$

⑩ $(A+B)+(\overline{A}+\overline{B}) = (A+\overline{A})+(B+\overline{B}) = 1+1 = 1$

3. 불 대수를 이용한 논리식 간소화

① $(AB+CD)+(A+C) = (A+AB)+(C+CD) = A+C$

② $A(AB+C) = AAB+AC = AB+AC$

③ $\overline{A}B+AB+\overline{A}\overline{B} = (\overline{A}B+\overline{A}\overline{B})+(\overline{A}B+AB) = \overline{A}+B$

④ $A+A\overline{B}+\overline{A}B = AB+A\overline{B}+A\overline{B}+\overline{A}B = AB+A\overline{B}+AB+\overline{A}B = A+B$

⑤ $AB+A\overline{B}C = ABC+AB\overline{C}+A\overline{B}C = ABC+AB\overline{C}+ABC+A\overline{B}C = AB+AC$

⑥ $A\overline{B}+ABC = A\overline{B}C+A\overline{B}\overline{C}+A\overline{B}C+ABC = A\overline{B}+AC$

⑦ $A\overline{B}\overline{C}+A\overline{B}C+AB\overline{C}+ABC = A\overline{B}(\overline{C}+C)+AB(\overline{C}+C) = A\overline{B}+AB = A(\overline{B}+B) = A$

⑧ $AB+A(B+C)+B(B+C) = AB+AB+AC+BB+BC$
$= AB+AC+B+BC = AB+AC+B = B+AC$

⑨ $(A\overline{B}(C+BD)+\overline{A}\overline{B})C = (A\overline{B}C+A\overline{B}BD+\overline{A}\overline{B})C$
$= (A\overline{B}C+\overline{A}\overline{B})C = A\overline{B}CC+\overline{A}\overline{B}C$
$= A\overline{B}C+\overline{A}\overline{B}C = \overline{B}C(A+\overline{A}) = \overline{B}C$

⑩ $\overline{AB+AC}+\overline{A}\overline{B}C=(\overline{AB})(\overline{AC})+\overline{A}\overline{B}C=(\overline{A}+\overline{B})(\overline{A}+\overline{C})+\overline{A}\overline{B}C$
$=\overline{A}\overline{A}+\overline{A}\overline{C}+\overline{A}\overline{B}+\overline{B}\overline{C}+\overline{A}\overline{B}C$
$=\overline{A}+\overline{A}\overline{C}+\overline{A}\overline{B}+\overline{B}\overline{C}=\overline{A}+\overline{A}\overline{B}+\overline{B}\overline{C}$
$=\overline{A}+\overline{B}\overline{C}$

4. 불 대수를 이용한 증명

① $\overline{X}\overline{Y}+XY+\overline{X}Y=\overline{X}+Y$
$\overline{X}\overline{Y}+XY+\overline{X}Y=\overline{X}(\overline{Y}+Y)+XY=\overline{X}+XY=(\overline{X}+X)(\overline{X}+Y)=\overline{X}+Y$

② $\overline{X}Y+X\overline{Y}+XY+\overline{X}\overline{Y}=1$
$(\overline{X}+X)Y+(X+\overline{X})\overline{Y}=1\cdot Y+1\cdot\overline{Y}=Y+\overline{Y}=1$

③ $\overline{X}+XY+X\overline{Z}+X\overline{Y}\overline{Z}=\overline{X}+Y+\overline{Z}$
$\overline{X}+XY+X\overline{Z}+X\overline{Y}\overline{Z}=\overline{X}(Y+1)+XY+X\overline{Z}(1+\overline{Y})=\overline{X}Y+\overline{X}+XY+X\overline{Z}$
$=\overline{X}+(\overline{X}+X)Y+X\overline{Z}=\overline{X}+Y+X\overline{Z}=\overline{X}(\overline{Z}+1)+Y+X\overline{Z}=\overline{X}\overline{Z}+\overline{X}+Y+X\overline{Z}$
$=\overline{X}+Y+(\overline{X}+X)\overline{Z}=\overline{X}+Y+\overline{Z}$

④ $X\overline{Y}+\overline{Y}\overline{Z}+\overline{X}\overline{Z}=X\overline{Y}+\overline{X}\overline{Z}$
$X\overline{Y}+\overline{Y}\overline{Z}+\overline{X}\overline{Z}$
$=X\overline{Y}(Z+\overline{Z})+\overline{Y}\overline{Z}(X+\overline{X})+\overline{X}\overline{Z}(Y+\overline{Y})$
$=X\overline{Y}\overline{Z}+X\overline{Y}Z+X\overline{Y}\overline{Z}+\overline{X}\overline{Y}\overline{Z}+\overline{X}Y\overline{Z}+\overline{X}\overline{Y}\overline{Z}$
$=X\overline{Y}\overline{Z}+X\overline{Y}Z+\overline{X}\overline{Y}\overline{Z}+\overline{X}Y\overline{Z}$
$=X\overline{Y}(Z+\overline{Z})+\overline{X}\overline{Z}(Y+\overline{Y})$
$=X\overline{Y}+\overline{X}\overline{Z}$

5. 불 대수를 이용한 간략화

① $F=XYZ+\overline{X}Y+XY\overline{Z}$
$F=XYZ+\overline{X}Y+XY\overline{Z}=XY(Z+\overline{Z})+\overline{X}Y=XY+\overline{X}Y=(X+\overline{X})Y=Y$

② $F=\overline{X}YZ+XZ$
$F=\overline{X}YZ+XZ(Y+1)=\overline{X}YZ+XYZ+XZ=(\overline{X}+X)YZ+XZ=XZ+YZ$

③ $F=(\overline{X+Y})(\overline{X}+\overline{Y})$
$F=\overline{X}\overline{Y}(\overline{X}+\overline{Y})=\overline{X}\overline{Y}+\overline{X}\overline{Y}=\overline{X}\overline{Y}$

④ $F=XY+X(WZ+W\overline{Z})$
$F=XY+WX(Z+\overline{Z})=XY+WX$

⑤ $F=(X+\overline{Y}+X\overline{Y})(XY+\overline{X}Z+YZ)$
$F=XXY+X\overline{X}Z+XYZ+X\overline{Y}Y+\overline{X}\overline{Y}Z+\overline{Y}YZ+XX\overline{Y}Y+X\overline{X}\overline{Y}Z+X\overline{Y}YZ$
$=XY+XYZ+\overline{X}\overline{Y}Z=XY(1+Z)+\overline{X}\overline{Y}Z=XY+\overline{X}\overline{Y}Z$

⑥ $F=\overline{A}\overline{C}+ABC+A\overline{C}$
$F=(\overline{A}+A)\overline{C}+ABC=\overline{C}+ABC=\overline{C}(AB+1)+ABC$
$=AB\overline{C}+\overline{C}+ABC=AB(\overline{C}+C)+\overline{C}=AB+\overline{C}$

⑦ $F=(\overline{\overline{CD}+A})+A+CD+AB$
$F=\overline{\overline{C}+\overline{D}+A}+A+CD+AB=\overline{A}CD+A+CD+AB=(\overline{A}+1)CD+A(1+B)=A+CD$

6. 드모르간의 정리

$F=XY+\overline{X}\overline{Y}+\overline{Y}Z$

$F = XY + \overline{X}\overline{Y} + \overline{Y}Z = \overline{\overline{XY} + \overline{X}\overline{Y} + \overline{Y}Z}$
$= \overline{\overline{XY}} \cdot \overline{\overline{X}\overline{Y}} \cdot \overline{\overline{Y}Z}$ (AND와 not으로 표현)
$= (\overline{X} + \overline{Y}) \cdot (X + Y) \cdot (Y + \overline{Z})$
$= \overline{X} + \overline{Y} + \overline{X} + \overline{Y} + \overline{Y} + \overline{Z}$ (OR와 not으로 표현)

7. 논리식의 부정

① $F = X\overline{Y} + \overline{X}Y$

$\overline{F} = \overline{X\overline{Y} + \overline{X}Y} = (\overline{X} + Y) \cdot (X + \overline{Y})$

② $F = (A\overline{B} + C)\overline{D} + E$

$\overline{F} = \overline{(A\overline{B} + C)\overline{D} + E} = ((\overline{A} + B)\overline{C} + D)\overline{E}$

③ $F = AB(\overline{C}D + C\overline{D}) + \overline{A}\overline{B}(\overline{C} + D)(C + \overline{D})$

$\overline{F} = \overline{AB(\overline{C}D + C\overline{D}) + \overline{A}\overline{B}(\overline{C} + D)(C + \overline{D})} = (\overline{A} + \overline{B} + (C + \overline{D})(\overline{C} + D))(A + B + C\overline{D} + \overline{C}D)$

④ $\overline{F} = (A + \overline{B} + C)(\overline{A} + \overline{C})(A + B)$

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

⑤ $f = ab\overline{d} + \overline{b}\,\overline{c} + \overline{a}cd + \overline{a}b\overline{c}d$

$\overline{f} = \overline{ab\overline{d} + \overline{b}\,\overline{c} + \overline{a}cd + \overline{a}b\overline{c}d} = (\overline{a} + \overline{b} + d)(b + c)(a + \overline{c} + \overline{d})(a + \overline{b} + c + \overline{d})$

⑥ $f = (a + \overline{b} + c)(\overline{a} + b + c)(a + \overline{b} + \overline{c})$

$\overline{f} = \overline{(a + \overline{b} + c)(\overline{a} + b + c)(a + \overline{b} + \overline{c})} = \overline{a}b\overline{c} + a\overline{b}\,\overline{c} + \overline{a}bc$

⑦ $f = (a + b)(\overline{b} + c) + \overline{d}(\overline{a}b + c)$

$\overline{f} = \overline{(a + b)(\overline{b} + c) + \overline{d}(\overline{a}b + c)} = (\overline{a}\,\overline{b} + b\overline{c})(d + (a + \overline{b})\overline{c})$

8. 최소항과 최대항

① $F = (XY + Z)(Y + XZ)$

$F = (XY + Z)(Y + XZ) = XY + XYZ + YZ + XZ$
$= XY(Z + \overline{Z}) + XYZ + (X + \overline{X})YZ + X(Y + \overline{Y})Z$
$= XY\overline{Z} + XYZ + \overline{X}YZ + X\overline{Y}Z$

$Minterm = \Sigma m(3,5,6,7)$

기호	X	Y	Z	F
m_0	0	0	0	0
m_1	0	0	1	0
m_2	0	1	0	0
m_3	0	1	1	1
m_4	1	0	0	0
m_5	1	0	1	1
m_6	1	1	0	1
m_7	1	1	1	1

$Maxterm = \Pi M(0,1,2,4) = (X + Y + Z)(X + Y + \overline{Z})(X + \overline{Y} + Z)(\overline{X} + Y + Z)$

② $F = (\overline{A} + B)(\overline{B} + C)$

$F = (\overline{A} + B)(\overline{B} + C) = \overline{A}\overline{B} + \overline{A}C + B\overline{B} + BC$
$= \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}\overline{B}C + \overline{A}BC + \overline{A}BC + ABC = \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}BC + ABC$

$Minterm = \Sigma m(0,1,3,7)$

기호	X Y Z	F
m_0	0 0 0	1
m_1	0 0 1	1
m_2	0 1 0	0
m_3	0 1 1	1
m_4	1 0 0	0
m_5	1 0 1	0
m_6	1 1 0	0
m_7	1 1 1	1

$Maxterm = \Pi M(2,4,5,6) = (A+\overline{B}+C)(\overline{A}+B+C)(\overline{A}+B+\overline{C})(\overline{A}+\overline{B}+C)$

③ $F = \overline{Y}Z + WX\overline{Y} + WX\overline{Z} + \overline{W}\overline{X}XZ$

$F = (W+\overline{W})(X+\overline{X})\overline{Y}Z + WX\overline{Y}(Z+\overline{Z}) + WX(Y+\overline{Y})\overline{Z} + \overline{W}\overline{X}(Y+\overline{Y})Z$

$= \overline{W}\overline{X}\overline{Y}Z + \overline{W}\overline{X}YZ + \overline{W}X\overline{Y}Z + W\overline{X}\overline{Y}Z + W\overline{X}YZ + WX\overline{Y}Z + WXYZ$

$Minterm = \Sigma m(1,3,5,9,12,13,14)$

기호	$WXYZ$	F	기호	$WXYZ$	F
m_0	0000	0	m_8	1000	0
m_1	0001	1	m_9	1001	1
m_2	0010	0	m_{10}	1010	0
m_3	0011	1	m_{11}	1011	0
m_4	0100	0	m_{12}	1100	1
m_5	0101	1	m_{13}	1101	1
m_6	0110	0	m_{14}	1110	1
m_7	0111	0	m_{15}	1111	0

$Maxterm = \Pi M(0,2,4,6,7,8,10,11,15)$

$= (W+X+Y+Z)(W+X+\overline{Y}+Z)(W+\overline{X}+Y+Z)(W+\overline{X}+\overline{Y}+Z)(W+\overline{X}+\overline{Y}+\overline{Z})$

$(\overline{W}+X+Y+Z)(\overline{W}+X+\overline{Y}+Z)(\overline{W}+X+\overline{Y}+\overline{Z})(\overline{W}+\overline{X}+\overline{Y}+\overline{Z})$

④ $F = A + \overline{B}C$

$F = A + \overline{B}C = A(B+\overline{B})(C+\overline{C}) + (A+\overline{A})\overline{B}C = A\overline{B}C + A\overline{B}\overline{C} + A\overline{B}C + AB\overline{C} + ABC$

$Minterm = \Sigma m(1,4,5,6,7)$

기호	A B C	F
m_0	0 0 0	0
m_1	0 0 1	1
m_2	0 1 0	0
m_3	0 1 1	0
m_4	1 0 0	1
m_5	1 0 1	1
m_6	1 1 0	1
m_7	1 1 1	1

$Maxterm = \Pi M(0,2,3) = (A+B+C)(A+\overline{B}+C)(A+\overline{B}+\overline{C})$

⑤ $f = \overline{a}\overline{c}\overline{d} + \overline{a}c\overline{d} + bc$

$f = \overline{a}\overline{c}\overline{d} + \overline{a}c\overline{d} + bc = \overline{a}(b+\overline{b})\overline{c}\overline{d} + \overline{a}(b+\overline{b})c\overline{d} + (a+\overline{a})bc(d+\overline{d})$

$= \overline{a}\overline{b}\overline{c}\overline{d} + \overline{a}\overline{b}c\overline{d} + \overline{a}b\overline{c}\overline{d} + \overline{a}bc\overline{d} + a\overline{b}c\overline{d} + abc\overline{d} + abcd$

$Minterm = \Sigma m(0,2,4,6,7,14,15)$

기호	$abcd$	F	기호	$abcd$	F
m_0	0000	1	m_8	1000	0
m_1	0001	0	m_9	1001	0
m_2	0010	1	m_{10}	1010	0
m_3	0011	0	m_{11}	1011	0
m_4	0100	1	m_{12}	1100	0
m_5	0101	0	m_{13}	1101	0
m_6	0110	1	m_{14}	1110	1
m_7	0111	1	m_{15}	1111	1

$$Maxterm = \Pi M(1,3,5,8,9,10,11,12,13)$$
$$= (a+b+c+\bar{d})(a+b+\bar{c}+\bar{d})(a+\bar{b}+c+\bar{d})(\bar{a}+b+c+d)(\bar{a}+b+c+\bar{d})$$
$$(\bar{a}+b+\bar{c}+d)(\bar{a}+b+\bar{c}+\bar{d})(\bar{a}+\bar{b}+c+d)(\bar{a}+\bar{b}+c+\bar{d})$$

⑥ $f = wx\bar{y}+x\bar{y}z+w\bar{x}\bar{z}$

$$f = wx\bar{y}+x\bar{y}z+w\bar{x}\bar{z} = wx\bar{y}(z+\bar{z})+(w+\bar{w})x\bar{y}z+w\bar{x}(y+\bar{y})\bar{z}$$
$$= wxy\bar{z}+wx\bar{y}z+\bar{w}x\bar{y}z+w\bar{x}\bar{y}\bar{z}+w\bar{x}y\bar{z}$$

기호	$wxyz$	F	기호	$wxyz$	F
m_0	0000	0	m_8	1000	1
m_1	0001	0	m_9	1001	0
m_2	0010	0	m_{10}	1010	1
m_3	0011	0	m_{11}	1011	0
m_4	0100	0	m_{12}	1100	1
m_5	0101	1	m_{13}	1101	1
m_6	0110	0	m_{14}	1110	0
m_7	0111	0	m_{15}	1111	0

$$Minterm \text{ 식} = wx\bar{y}\bar{z}+wx\bar{y}z+\bar{w}x\bar{y}z+w\bar{x}\bar{y}\bar{z}+w\bar{x}y\bar{z} = \Sigma m(5,8,10,12,13)$$

$$Maxterm \text{ 식} = \Pi M(0,1,2,3,4,6,7,9,11,14,15)$$
$$= (w+x+y+z)(w+x+y+\bar{z})(w+x+\bar{y}+z)(w+x+\bar{y}+\bar{z})(w+\bar{x}+y+z)$$
$$(w+\bar{x}+\bar{y}+z)(w+\bar{x}+\bar{y}+\bar{z})(\bar{w}+x+y+\bar{z})(\bar{w}+x+\bar{y}+\bar{z})(\bar{w}+\bar{x}+\bar{y}+z)$$
$$(\bar{w}+\bar{x}+\bar{y}+\bar{z})$$

9. 최소항과 최대항

① E의 Minterm : $\bar{X}\bar{Y}\bar{Z}$, $\bar{X}\bar{Y}Z$, $\bar{X}Y\bar{Z}$

F의 Minterm : $\bar{X}Y\bar{Z}$, $\bar{X}YZ$, $XY\bar{Z}$, XYZ

E의 Maxterm : $X+\bar{Y}+\bar{Z}$, $\bar{X}+Y+Z$, $\bar{X}+Y+\bar{Z}$, $\bar{X}+\bar{Y}+Z$, $\bar{X}+\bar{Y}+\bar{Z}$

F의 Maxterm : $X+Y+Z$, $X+Y+\bar{Z}$, $\bar{X}+Y+Z$, $\bar{X}+Y+\bar{Z}$

② $\bar{E}$의 Minterm : $\bar{X}YZ$, $X\bar{Y}\bar{Z}$, $X\bar{Y}Z$, $XY\bar{Z}$, XYZ

$\bar{F}$의 Minterm : $\bar{X}\bar{Y}\bar{Z}$, $\bar{X}\bar{Y}Z$, $X\bar{Y}\bar{Z}$, $X\bar{Y}Z$

③ $E = \bar{X}\bar{Y}\bar{Z}+\bar{X}\bar{Y}Z+\bar{X}Y\bar{Z}$

$F = \bar{X}Y\bar{Z}+\bar{X}YZ+XY\bar{Z}+XYZ$

④ $E = \bar{X}\bar{Y}+\bar{X}\bar{Z}$

$F = Y$

10. 논리회로의 논리식 표현

① $X = \bar{A}+B$

② $X = AB+B$

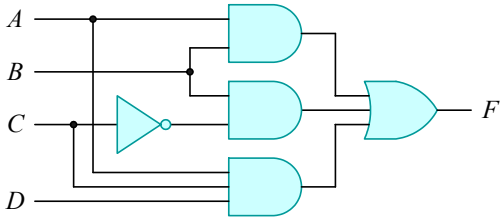
③ $X = (A+B)+AB$

④ $X = (A+B)(\bar{B}+C)$

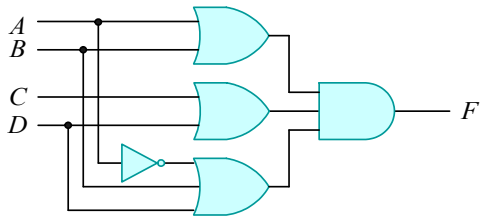
⑤ $X=\overline{A}+\overline{A}B+AC$ ⑥ $X=\overline{\overline{A}B+\overline{A}CD+BD\overline{D}}$

11. 논리식의 논리회로 표현

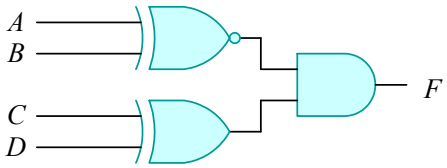
① $F=B\overline{C}+AB+ACD$



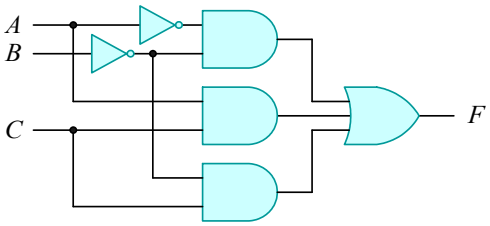
② $F=(A+B)(C+D)(\overline{A}+B+D)$



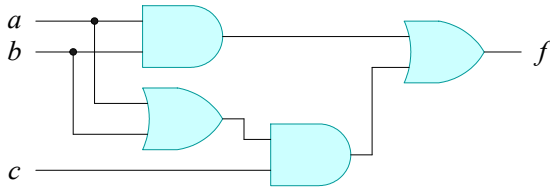
③ $F=(AB+\overline{A}\overline{B})(C\overline{D}+\overline{C}D)$



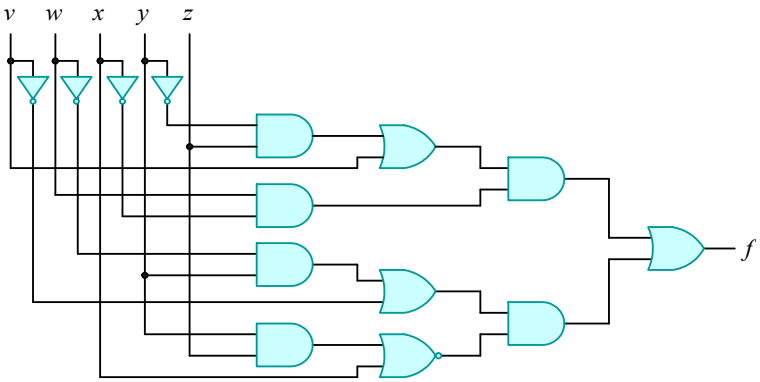
④ $F=\overline{A}\overline{B}+AC+\overline{B}C$



⑤ $f=ab+c(a+b)$



⑥ $f=w\overline{x}(v+\overline{y}z)+(\overline{w}y+\overline{v})\overline{(x+yz)}$



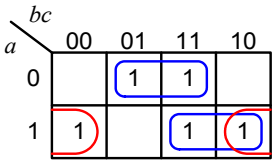
12. 최소항 및 최대항

① $f(a,b,c)=\Sigma m(1,3,4,6,7)$

② $f(a,b,c)=\overline{a}\,\overline{b}c+\overline{a}bc+a\overline{b}\,\overline{c}+ab\overline{c}+abc$

③ $f(a,b,c)=ab+a\overline{c}+\overline{a}c$

④ $\overline{f}(a,b,c)=\overline{\Sigma m(1,3,4,6,7)}=\Sigma m(0,2,5)$



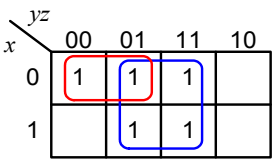
13. SOP 표현 및 간소화

① $f(x,y,z)=\Sigma m(0,1,3,5,7)$

x y z	f
0 0 0	1
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	1

② $f(x,y,z)=\bar{x}\bar{y}\bar{z}+\bar{x}\bar{y}z+\bar{x}yz+x\bar{y}z+xyz$

③ $f(x,y,z)=\bar{x}\bar{y}+z$



④ $\bar{f}(x,y,z)=\overline{\Sigma m(0,1,3,5,7)}=\Sigma m(2,4,6)$

14. 최소항 표현

① $f(a,b,c)=a\bar{b}+\bar{b}\bar{c}=a\bar{b}c+a\bar{b}\bar{c}+a\bar{b}\bar{c}+\bar{a}\bar{b}\bar{c}=a\bar{b}c+a\bar{b}\bar{c}+\bar{a}\bar{b}\bar{c}$

② $f(x,y,z)=\bar{x}+yz+\bar{y}\bar{z}=\bar{x}(y+\bar{y})(z+\bar{z})+(x+\bar{x})yz+(x+\bar{x})\bar{y}\bar{z}$
$=\bar{x}\bar{y}\bar{z}+\bar{x}\bar{y}z+\bar{x}y\bar{z}+\bar{x}yz+x\bar{y}\bar{z}+xyz$

③ $f(a,b,c,d)=a\bar{b}c+bd+\bar{a}\bar{d}$
$=a\bar{b}c(d+\bar{d})+(a+\bar{a})b(c+\bar{c})d+\bar{a}(b+\bar{b})(c+\bar{c})\bar{d}$
$=\bar{a}\bar{b}\bar{c}\bar{d}+\bar{a}\bar{b}cd+\bar{a}b\bar{c}\bar{d}+\bar{a}b\bar{c}d+\bar{a}bcd+a\bar{b}cd+a\bar{b}cd+ab\bar{c}d+abcd$