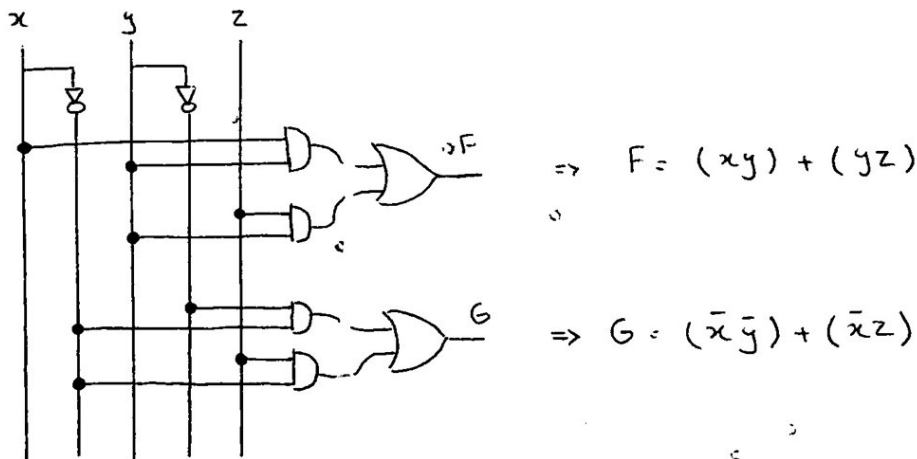


$$F = \left[ ((A \oplus D) + (BC)) \cdot (\bar{C} + (\overline{BC})) \right] + (ACD)$$



#2

a	b	$w = a \oplus b$
0	0	0
0	1	1
1	0	1
1	1	0

a	b	$\bar{w} = \overline{(a \oplus b)} \equiv a \otimes b \equiv (a \equiv b)$
0	0	1
0	1	0
1	0	0
1	1	1

$\Rightarrow \begin{matrix} a \\ b \end{matrix} \text{ XOR } \bar{w} \equiv \begin{matrix} a \\ b \end{matrix} \text{ XNOR } \equiv a \equiv b \text{ OR } a \otimes b$

XNOR

#3 a)  $F(A,B,C,D) = \prod (1,2,3,5,8,10) \xrightarrow[0 \text{ to } 15]{2^4} F(A,B,C,D) = \sum (0,4,6,7,9,11,12,13,14,15)$

b)  $G(X,Y,Z) = \sum (2,3,7) \xrightarrow[0 \text{ to } 7]{2^3} G(X,Y,Z) = \prod (0,4,5,6)$

c)  $F(X,Y,Z) = \prod (2,4,5,7) \xrightarrow[0 \text{ to } 7]{2^3} F(X,Y,Z) = \sum (0,1,3,6)$

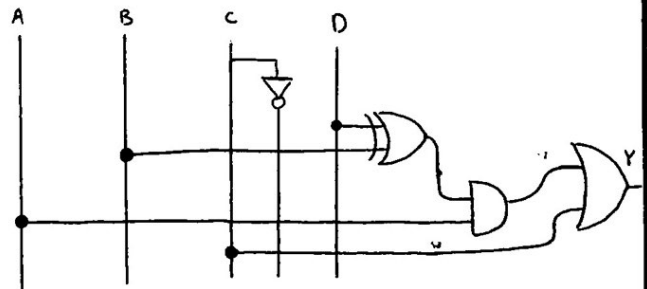
d)  $G(A,B,C,D) = \sum (1,5,9,15) = \prod (0,2,3,4,6,7,8,10,11,12,13,14)$

#4  $F(A,B,C,D) = \sum (0,2,4,6,8,10,12,14)$

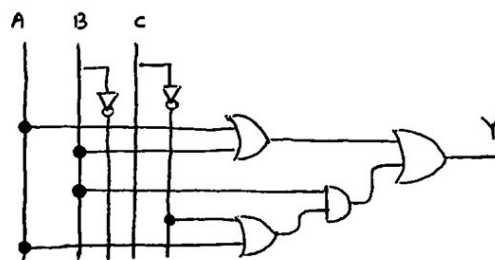
A \ B	C \ D			
	00	01	11	10
00	1			1
01	1			1
11	1			1
10	1			1

$\Rightarrow F(A,B,C,D) = \bar{D}$

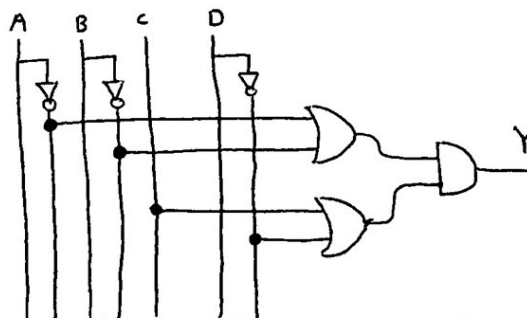
#5 a)  $Y = A(B \oplus D) + \bar{C}$



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



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



#6

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

$$\Rightarrow \bar{F} = \overline{(B\bar{C} + \bar{A}D)(\bar{A}\bar{B} + C\bar{D})} = \overline{(B+C) \cdot (A+\bar{D})} + \overline{(\bar{A}+B) \cdot (\bar{C}+D)} = Z$$

A	B	C	D	$B\bar{C}$	$\bar{A}D$	$\bar{A}\bar{B}$	$C\bar{D}$	$B\bar{C} + \bar{A}D$	$\bar{A}\bar{B} + C\bar{D}$	F	$\bar{F}$	Z
0	0	0	0	0	0	0	0	0	0	0	1	1
0	0	0	1	0	1	0	0	1	0	0	1	1
0	0	1	0	0	0	0	1	0	1	0	1	1
0	0	1	1	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	1	0	0	1	0	1	1
0	1	0	1	0	1	0	0	1	0	0	1	1
0	1	1	0	0	0	0	1	0	1	0	1	1
0	1	1	1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	0	0	1	0	1	1
1	0	0	1	0	1	0	0	1	0	0	1	1
1	0	1	0	0	0	0	1	0	1	0	1	1
1	0	1	1	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	1	0	0	1	0	1	1
1	1	0	1	0	1	0	0	1	0	0	1	1
1	1	1	0	0	0	0	1	0	1	0	1	1
1	1	1	1	0	0	0	0	0	0	0	0	0

#7 a)  $\bar{x} + x(x+\bar{y})(y+\bar{z}) = \bar{x} + xxy + xx\bar{z} + x\cancel{y}\bar{y} + x\bar{y}\bar{z} = \bar{x} + xy + x\bar{z} + x\bar{y}\bar{z}$   
 $= \bar{x}(y+\bar{y})(z+\bar{z}) + xy(z+\bar{z}) + x\bar{z}(y+\bar{y}) + x\bar{y}\bar{z} = \bar{x}yz + \bar{x}y\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z} + xyz + xy\bar{z}$   
 $\Rightarrow F(x,y,z) = \sum (0,1,2,3,6,7) \xrightarrow{m=\bar{m}} F(x,y,z) = \prod (4,5)$

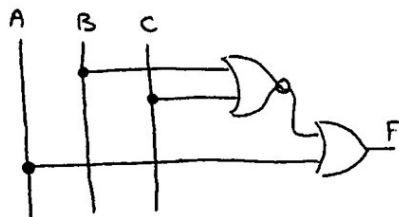
b)  $A(BC + \bar{A}\bar{D}) + \bar{A} = A(BC + \bar{A} + \bar{D}) + \bar{A} = ABC + \cancel{A\bar{A}} + A\bar{D} + \bar{A}$   
 $= ABC(D+\bar{D}) + A\bar{D}(B+\bar{B})(C+\bar{C}) + \bar{A}(B+\bar{B})(C+\bar{C})(D+\bar{D})$   
 $= ABCD + ABC\bar{D} + \cancel{AB\bar{C}D} + \cancel{AB\bar{C}\bar{D}} + \cancel{A\bar{B}CD} + \cancel{A\bar{B}C\bar{D}} + \cancel{A\bar{B}\bar{C}D} + \cancel{A\bar{B}\bar{C}\bar{D}} + \cancel{A\bar{B}C\bar{D}} + \cancel{A\bar{B}\bar{C}D}$   
 $+ \cancel{A\bar{B}C\bar{D}} + \cancel{A\bar{B}\bar{C}D} + \cancel{A\bar{B}\bar{C}\bar{D}} = \boxed{ABCD} + ABC\bar{D} + A\bar{B}C\bar{D} + A\bar{B}\bar{C}D + A\bar{B}\bar{C}\bar{D} + \bar{A}BCD + \bar{A}B\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}\bar{C}D$   
 $\Rightarrow F(A,B,C,D) = \sum (15,14,12,10,8,13,11,9) = \prod (0,1,2,3,4,5,6,7)$

#8  $F = \overline{[\bar{A}B(\bar{C}D + \bar{D}) + B(A + \bar{A}CD)]} = (A + \bar{B}) + ((C + \bar{D}) \cdot D) \cdot \bar{B} + (\bar{A} \cdot (A + \bar{C} + \bar{D}))$

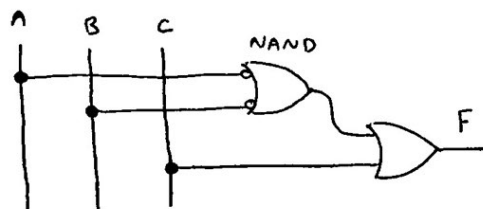
$$= A + \bar{B} + BCD + \bar{A}\bar{C} + \bar{A}\bar{D}$$

$$G = XY + X(WZ + W\bar{Z}) = XY + XWZ + XW\bar{Z}$$

#9



a	b	c	$\overline{(B+C)}$	F
0	0	0	1	1
0	0	1	0	0
0	1	0	0	0
1	0	0	1	1
0	1	1	0	0
1	0	1	0	1
1	1	0	0	1
1	1	1	0	1



A	B	C	$\overline{AB}$	F
0	0	0	1	1
0	0	1	1	1
0	1	0	1	1
1	0	0	1	1
1	1	0	0	0
1	0	1	1	1
0	1	1	1	1
1	1	1	0	1