

3. 证. T2: 当 X 取 0 时, $X+1=1$ 成立
 当 X 取 1 时, $X+1=1$ 成立

T3: 当 X 取 0 时, $X+X=0=X$ 成立
 当 X 取 1 时, $X+X=1=X$ 成立

T4: 当 X 取 0 时, $\bar{X} = \bar{0} = 1 = X$ 成立
 当 X 取 1 时, $\bar{X} = \bar{1} = 0 = X$ 成立

T5: 当 X 取 0 时, $X+\bar{X}=0+1=1$ 成立
 当 X 取 1 时, $X+\bar{X}=1+0=1$ 成立

5. 错因: 德摩根律做变换时应保证优先级不变.
 正确应为 $X+Y \cdot Z = \bar{X} \cdot (\bar{Y} + \bar{Z})$

$$\begin{aligned}
 (1) \quad F &= W \cdot X \cdot Y \cdot Z \cdot (\bar{W} \cdot X \cdot Y \cdot Z + W \cdot \bar{X} \cdot Y \cdot Z + W \cdot X \cdot \bar{Y} \cdot Z + W \cdot X \cdot Y \cdot \bar{Z}) \\
 &= (W \cdot \bar{W}) \cdot X \cdot Y \cdot Z + (X \cdot \bar{X}) \cdot W \cdot Y \cdot Z + (Y \cdot \bar{Y}) \cdot W \cdot X \cdot Z + (Z \cdot \bar{Z}) \cdot W \cdot X \cdot Y \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 7. (5) \quad F &= \overline{W \cdot X} \cdot \overline{Y + Z} \\
 &= (\bar{W} + \bar{X}) \cdot (\bar{Y} \cdot \bar{Z})
 \end{aligned}$$

$$\begin{aligned}
 (8) \quad F &= \overline{\overline{A+B+C} + D} \\
 &= \overline{(\bar{A} \bar{B}) + \bar{C} + D} \\
 &= (A+B) \cdot C + D = \overline{(A+B) \cdot C} \cdot \bar{D} = (\bar{A} \bar{B} + \bar{C}) \cdot \bar{D}
 \end{aligned}$$

W X Y Z	F(W, X, Y, Z)	A B C D	F(A, B, C, D)
0 0 0 0	0	0 0 0 0	1
0 0 0 1	0	0 0 0 1	0
0 0 1 0	0	0 0 1 0	1
0 0 1 1	1	0 0 1 1	0
0 1 0 0	0	0 1 0 0	1
0 1 0 1	0	0 1 0 1	0
0 1 1 0	0	0 1 1 0	0
0 1 1 1	1	0 1 1 1	0
1 0 0 0	0	1 0 0 0	1
1 0 0 1	0	1 0 0 1	0
1 0 1 0	0	1 0 1 0	0
1 0 1 1	1	1 0 1 1	0
1 1 0 0	0	1 1 0 0	1
1 1 0 1	0	1 1 0 1	0
1 1 1 0	0	1 1 1 0	0
1 1 1 1	0	1 1 1 1	0

$$8. (1) F(A, B, C) = \sum m(2, 4, 6, 7)$$

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

$$F(A, B, C) = \prod M(0, 1, 3, 5)$$

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

$$(2) F(X, Y, Z) = \prod M(0, 1, 3, 4, 5)$$

$$= (\bar{X} + \bar{Y} + \bar{Z}) \cdot (\bar{X} + \bar{Y} + Z) \cdot (\bar{X} + Y + Z) \cdot (X + \bar{Y} + \bar{Z}) \cdot (X + \bar{Y} + Z)$$

$$F(X, Y, Z) = \sum m(2, 6, 7)$$

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

$$(4) F = \bar{V} + \bar{W}X$$

$$= \bar{V} + WX$$

$$= \bar{V}(W + \bar{W})(X + \bar{X}) + W\bar{X}(\bar{V} + V)$$

$$= \bar{V}WX + \bar{V}W\bar{X} + V\bar{W}X + V\bar{W}\bar{X}$$

$$F = \prod M(4, 5, 7)$$

$$= (X + \bar{Y} + \bar{Z}) \cdot (X + \bar{Y} + Z) \cdot (X + Y + Z)$$

12. 2输入与非门能构成:

证: 将两输入与非门一个输入端接高电平, 另一端接A信号,

得到非门. (因为 $F = (1 \cdot A) = 0 + \bar{A} = \bar{A}$)

将两输入与非门的输入端接两个非门, 构成或门

(因为 $F = \overline{\bar{A}\bar{B}} = A + B$)

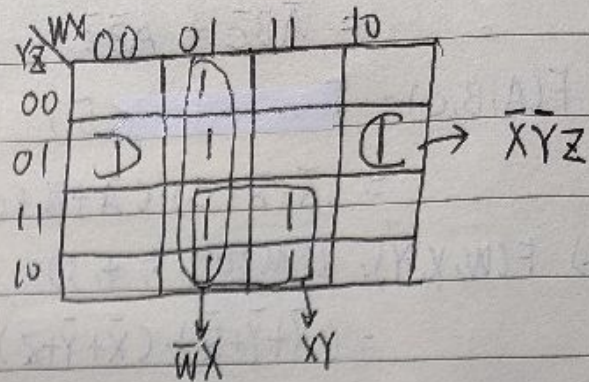
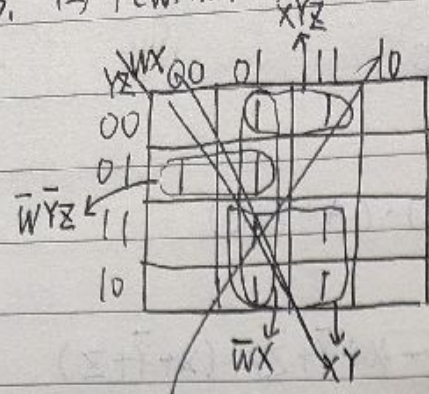
将与非门的输出端接非门, 得到与门

(因为 $F = \overline{\bar{A}\bar{B}} = AB$)

\therefore 是完备集.

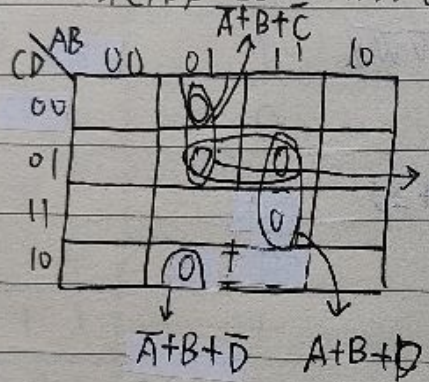
2输入异或门不是完备集

3. (2) $F(W, X, Y, Z) = \sum m(1, 4, 5, 6, 7, 9, 14, 15)$



$$\begin{aligned}
 F(W, X, Y, Z) &= WX + WY + XY \\
 &= (X+Y)(W+X)(X+Y+Z) \\
 &= \overline{XY} \overline{WX} (\overline{X} \overline{Y} \overline{Z})
 \end{aligned}$$

(5). $F(A, B, C, D) = \prod M(4, 5, 6, 13, 15)$



$$\begin{aligned}
 \therefore F(A, B, C, D) &= (A+B+D) \cdot (\overline{A+B+C}) \cdot (\overline{B+C+D}) \\
 &= B + AD + AC\overline{D} \\
 &= \overline{B} \cdot \overline{AD} \cdot \overline{AC\overline{D}}
 \end{aligned}$$