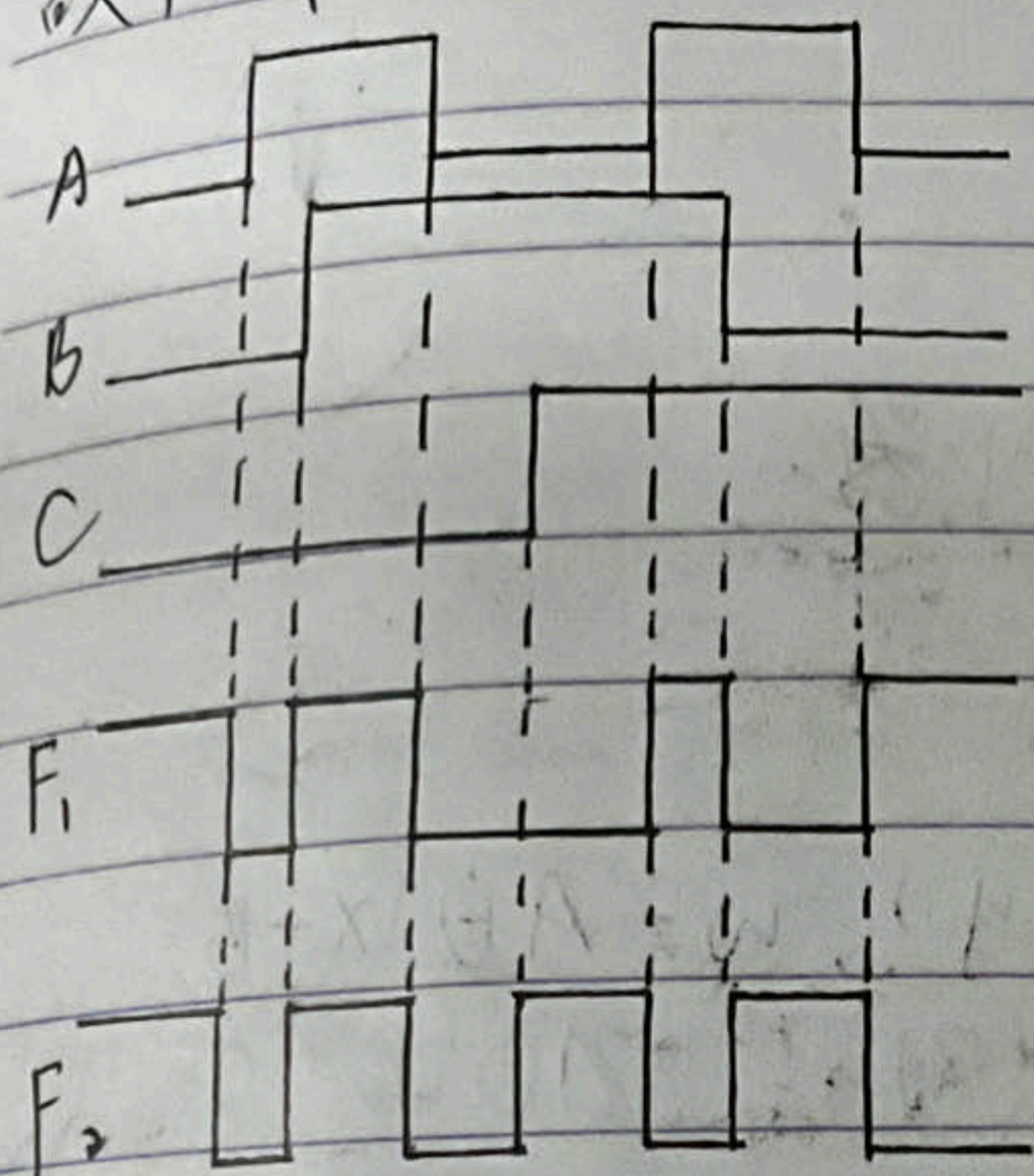


2.1

$$F_1 = \bar{A}B, F_2 = A\bar{B}$$

$$F_1 = \bar{A}B + A\bar{B} = A \oplus B, F_2 = F_1 \oplus C$$

故 F_1, F_2 波形图:



即为所示

2.2

$$A_1 = \bar{B}_1, A_2 = B_2, A_4 = B_2 \oplus B_4, A_8 = B_8 + B_4 + B_2$$

真值表:

B_8	B_4	B_2	B_1	A_8	A_4	A_2	A_1
0	0	0	0	1	0	0	1
0	0	0	1	1	0	0	0
0	0	1	0	0	1	1	1

$B_8 \ B_4 \ B_2 \ B_1 \ A_8 \ A_4 \ A_2 \ A_1$

0	0	1	1	0	1	1	0
0	1	0	0	0	1	0	1
0	1	0	1	0	1	0	0
0	1	1	0	0	0	1	1
0	1	1	1	0	0	1	0
1	0	0	0	0	0	0	1
1	0	0	1	0	0	0	0

知电路为 BCD 码对 9 的变补器

2.3

$$z = D, y = C \oplus D, x = B \oplus (C + y), w = A \oplus (x + B)$$

$$\text{真值表:} \quad = B \oplus (C + D) \quad = A \oplus (B + C + D)$$

A	B	C	D	w	x	y	z
0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1
0	0	1	0	1	1	1	0
0	0	1	1	1	1	0	1
0	1	0	0	1	1	0	0
0	1	0	1	1	0	1	1
0	1	1	0	1	0	1	0
0	1	1	1	1	0	0	1
1	0	0	0	1	0	0	0

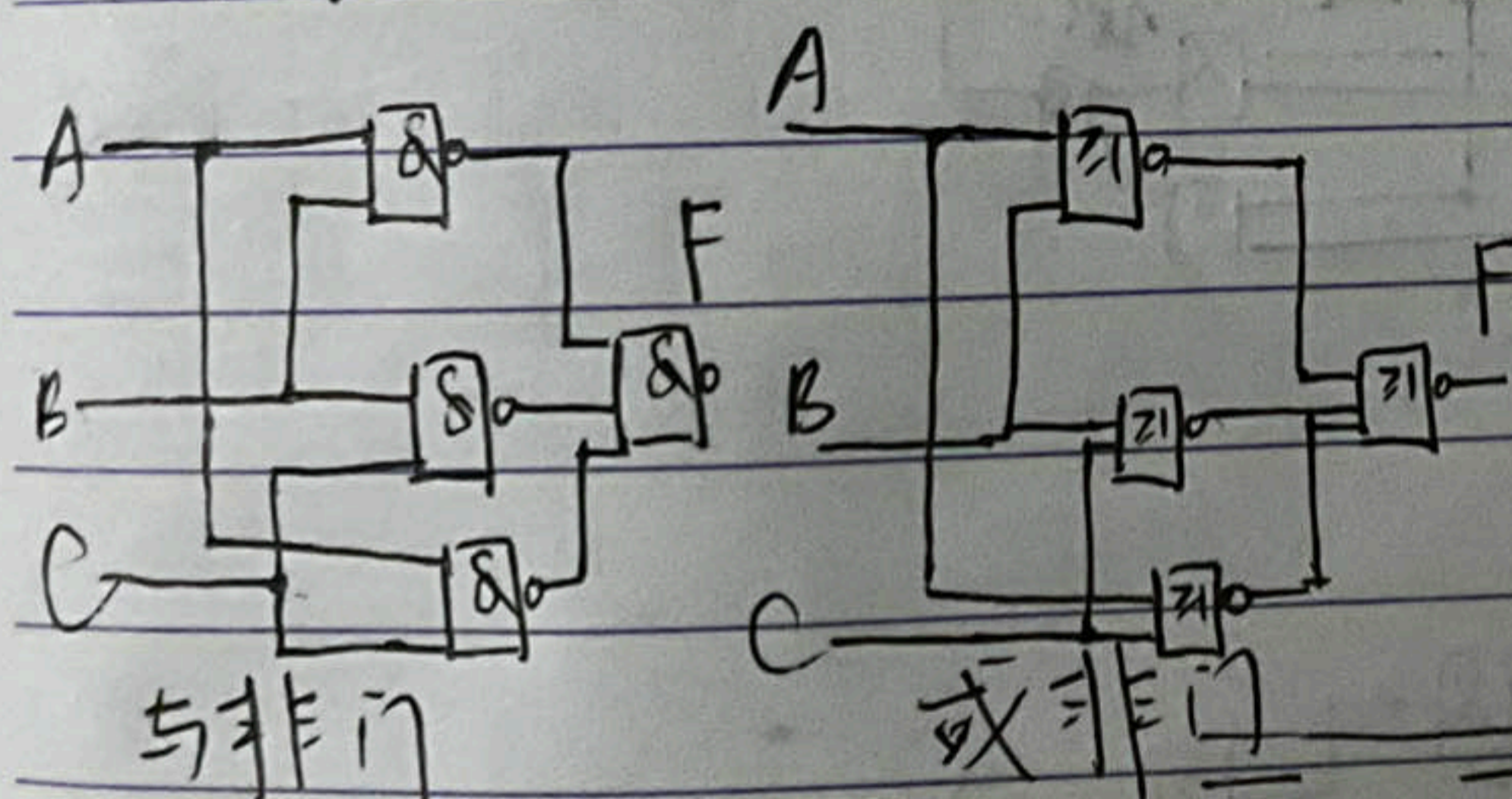
1	0	0	1	0	1	1	1
1	0	1	0	0	1	1	0
1	0	1	1	0	1	0	1
1	1	0	0	0	1	0	0
1	1	0	1	0	0	1	1
1	1	1	0	0	0	1	0
1	1	1	1	0	0	0	1

即得电路为
16变判器

2.4

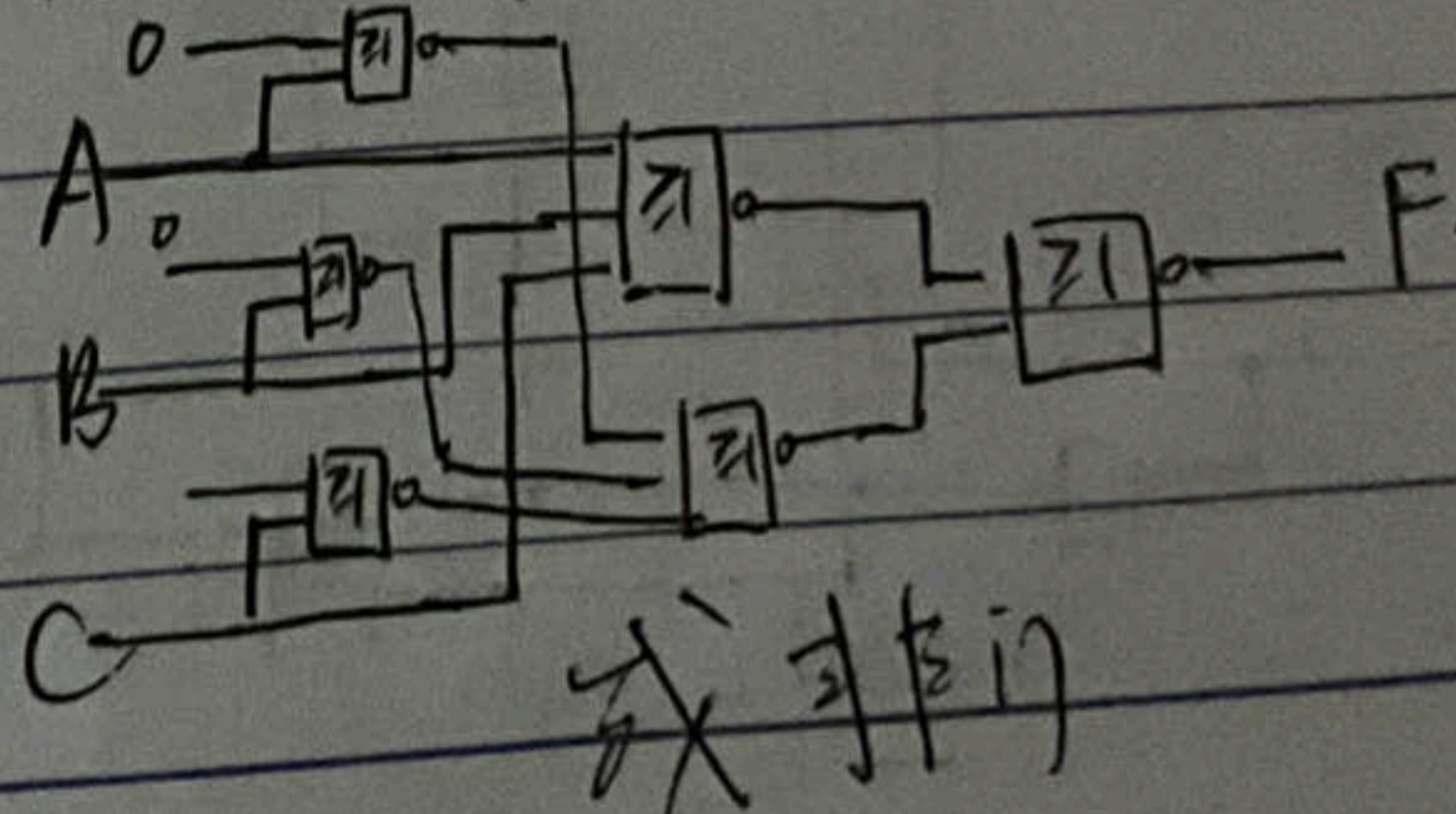
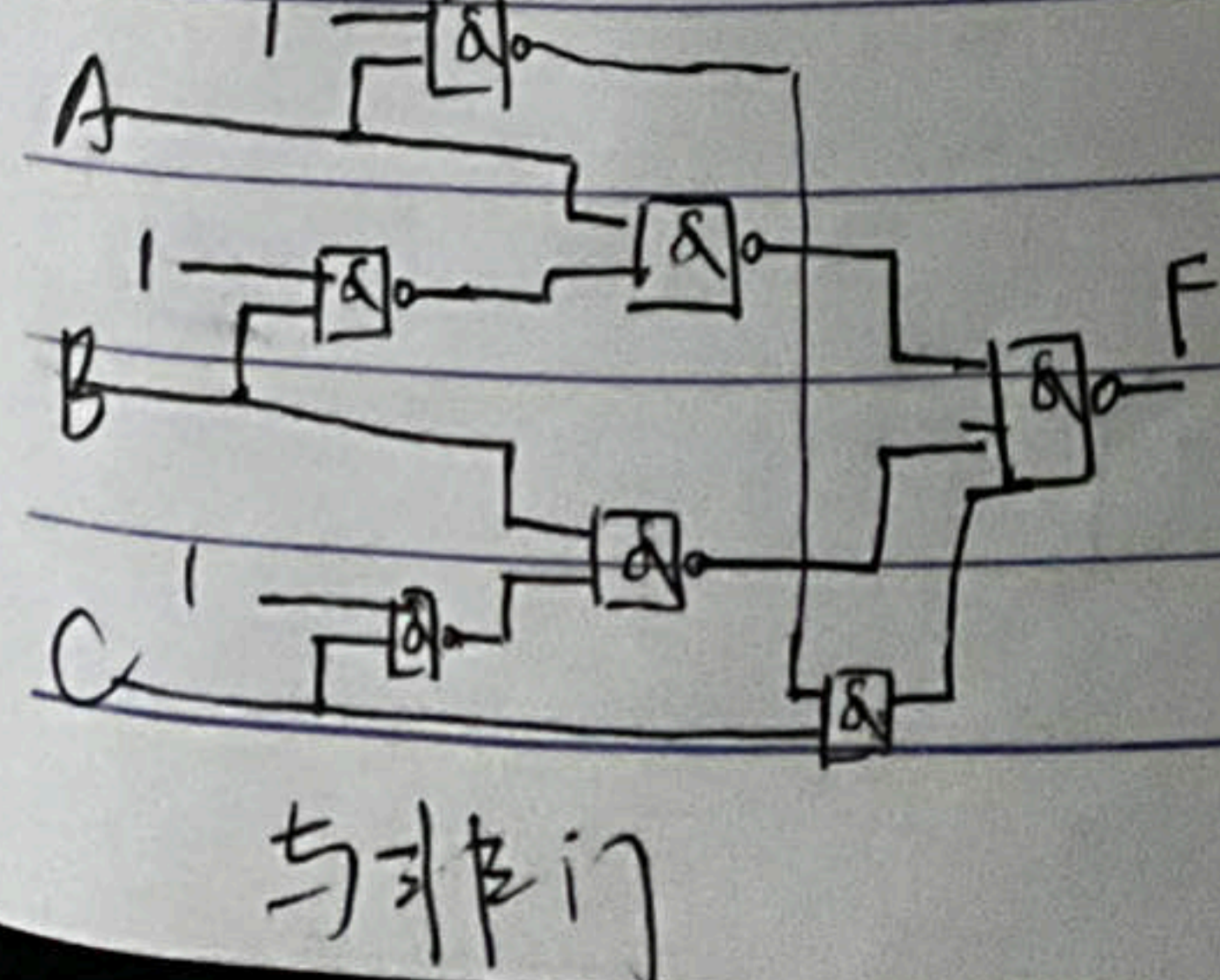
$$(1) F = AB + AC + BC = \overline{AB} \cdot \overline{AC} \cdot \overline{BC} = \overline{A+B+C} = \overline{AB+AC+BC}$$

电路图: 与非门 或非门 或非门 与非门



$$(2) F = A\bar{B} + B\bar{C} + \bar{A}C = \overline{A\bar{B} \cdot B\bar{C} \cdot \bar{A}C} = \overline{A+B+C+A+B+C} = \overline{AB+AC+BC}$$

电路图: 或非门 或非门 或非门 或非门

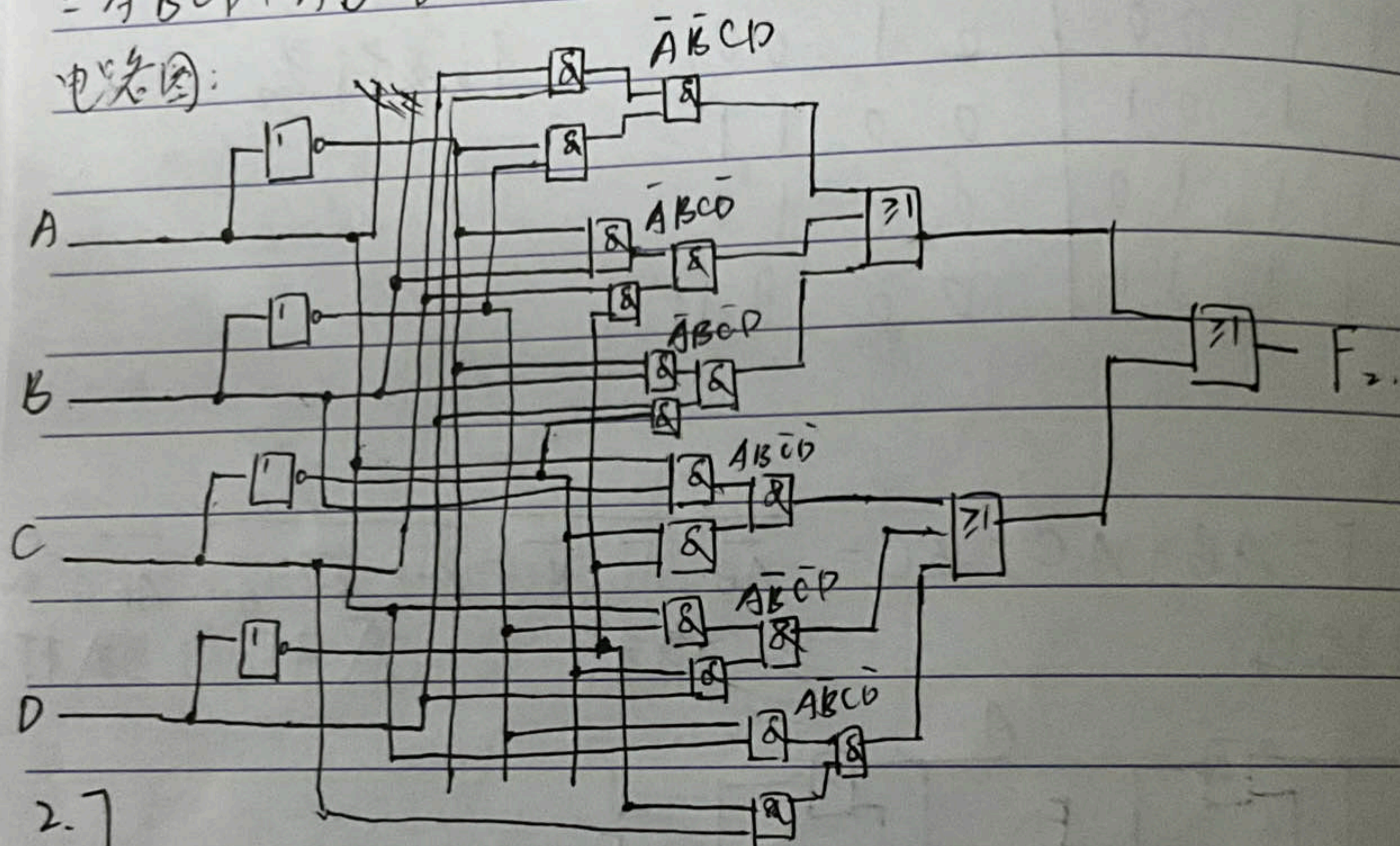


2.5

(2) 由卡诺图. 知 $F = \sum m^4(3, 5, 6, 9, 10, 12)$

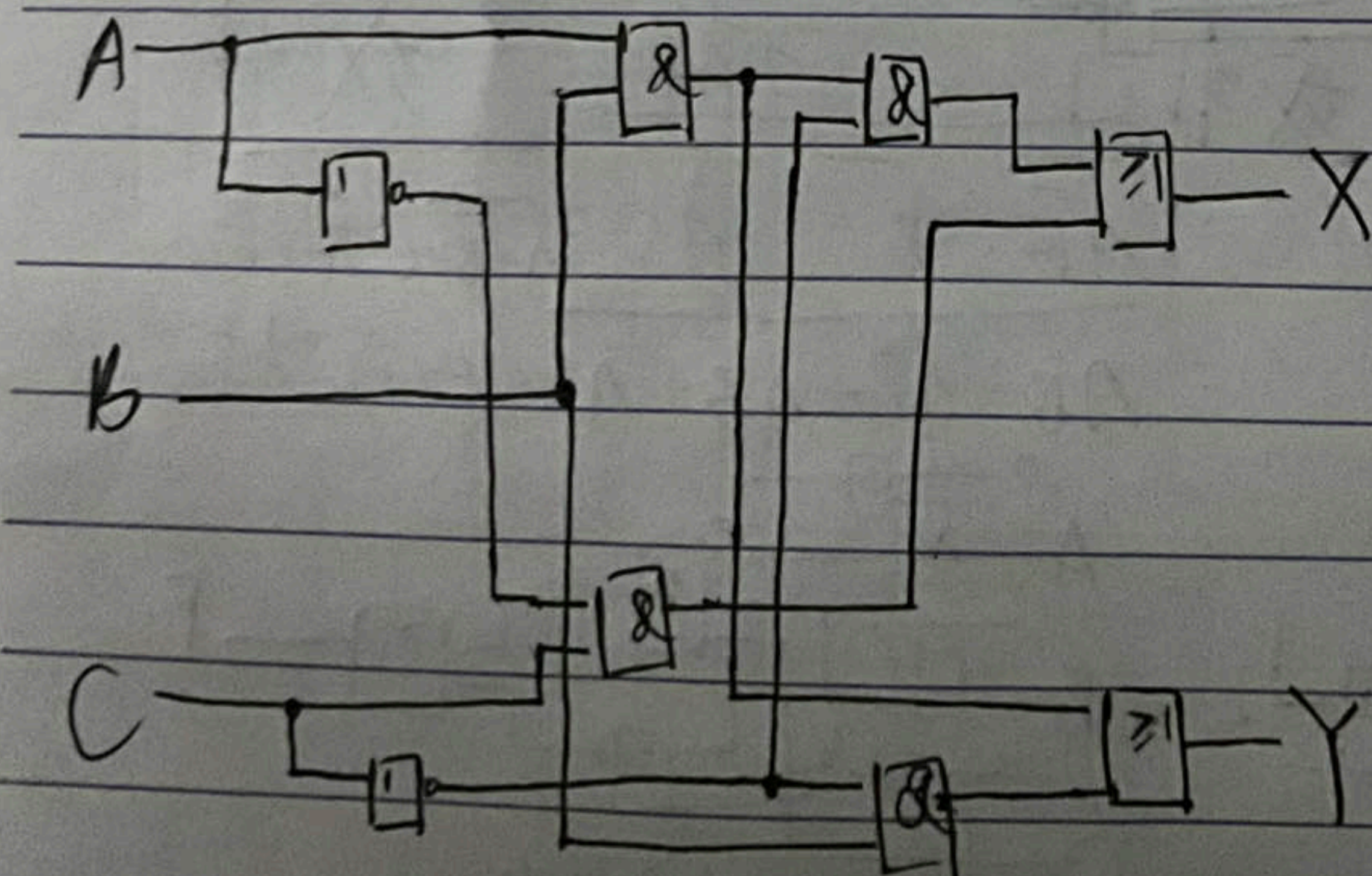
$$= \bar{A}\bar{B}CD + \bar{A}BC\bar{D} + \bar{A}BCD + A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D}$$

电路图:

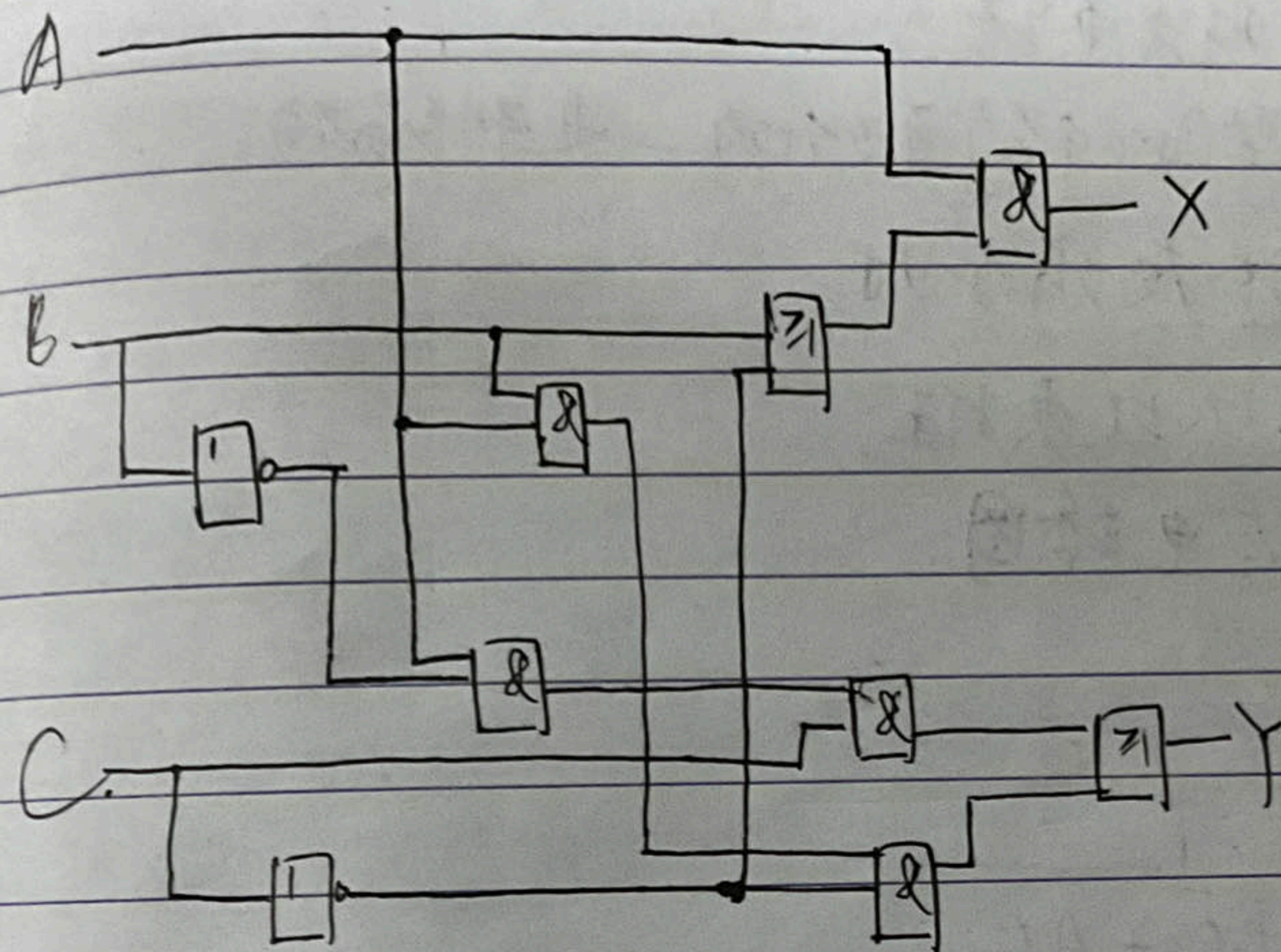


2.7

a.

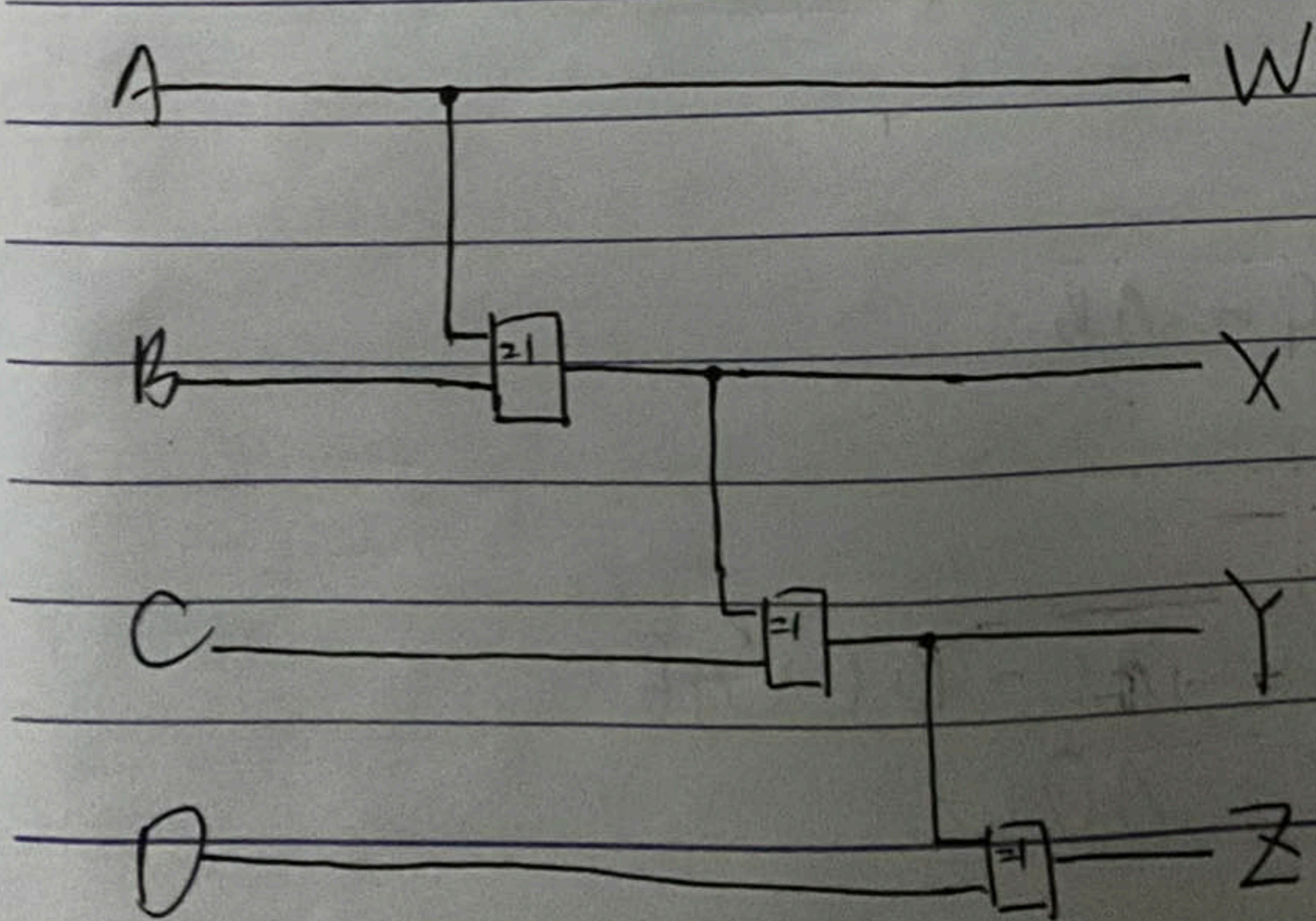


b.



2.9

对于格雷码 $ABCD$, 设二进制编码为 $WXYZ$
 应有 $W=A$, $X=A \oplus B$, $Y=A \oplus B \oplus C$, $Z=A \oplus B \oplus C \oplus D$.



即上图为所求电路。

可将典型Gray码转化为二进制编码。

当编码长度增加时，

可同理以此类推。

画出对应电路图。

2.11

$$(1) F = \bar{A}B + \bar{B}C + AC$$

当 $A=1, B=0$ 使 $F = C + \bar{C}$ 存在静态“1”险象。

$B=1, C=1$ 时, $F = A + \bar{A}$, 存在静态“1”险象。

卡诺图: $A=C=0, F = B + \bar{B}$, 存在静态“1”险象

C \ AB				
	00	01	11	10
0	1	1		1
1		1	1	1

增加项 $\bar{A}\bar{C} + BC + A\bar{B}$

即可消除险象。

$$F = \bar{A}B + \bar{B}C + AC + \bar{A}\bar{C} + BC + A\bar{B}$$

$$= A \oplus B + B \odot C + A \odot C$$

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

$A = C = D = 0, F = B \cdot \bar{B}$ 存在静态"0"险象

$A = 0, B = 1, C = 0, F = D \cdot \bar{D}$ 存在静态"0"险象

$A = 0, B = 1, D = 0, F = C \cdot \bar{C}$ 存在静态"0"险象

$A = 0, B = 1, D = 1, F = C \cdot \bar{C}$ 存在静态"0"险象

卡诺图:

CD \ AB	00	01	11	10
00	0	0	0	0
01	0	0		
11			0	
10	0	0	0	0

增加项 ~~0~~

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

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

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

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

2.12

$$(1) F = \sum m^4(0, 1, 5, 7, 10, 11, 14, 15)$$

CD \ AB	00	01	11	10
00	1			
01	1	1		
11		1	1	1
10			1	1

增加项: $\bar{A}\bar{C}D, BCD$

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

$$(2) F = \prod M^4(0, 1, 2, 3, 4, 5, 6, 10, 11, 14) \\ = \sum m^4(7, 8, 9, 12, 13, 15)$$

卡诺图:

		AB			
CD		00	01	11	10
				1	1
00				1	1
01				1	1
11			1	1	
10					

添加项 ABD

$$F = A\bar{C} + BCD + ABD$$