第3次作业

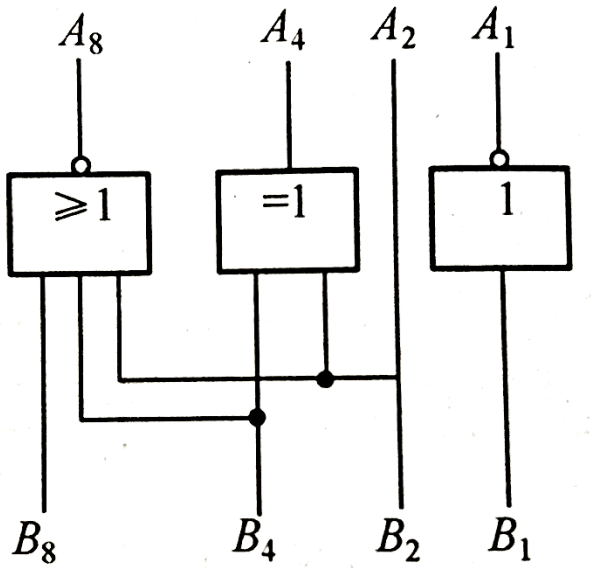
2.2 列出如图所示电路的输出函数表达式，并化简该表达式

$$A_8 = \overline{B_8 + B_4 + B_2} = \overline{B_8}\,\overline{B_4}\,\overline{B_2}$$

$$A_4 = B_4 \oplus B_2$$

$$A_2 = B_2$$

$$A_1 = \overline{B_1}$$



电路功能：BCD码对9变补器

2.2 列出如图所示电路的输出函数表达式，并化简该表达式

$$A_8 = \overline{B_8 + B_4 + B_2} = \overline{B_8}\,\overline{B_4}\,\overline{B_2}$$

$$A_4 = B_4 \oplus B_2$$

$$A_2 = B_2$$

$$A_1 = \overline{B_1}$$

电路功能：BCD码对9变补器

B8 B4 B2 B1	A8 A4 A2 A1
0000	1001
0001	1000
0010	0111
0011	0110
0100	0101
0101	0100
0110	0011
0111	0010
1000	0001
1001	0000
1010	0111
1011	0110
1100	0101
1101	0100
1110	0011
1111	0010

2.4 分别用与非门、或非门和与或非门设计如下电路

（1）3变量多数表决电路，以判决多数赞同

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

$$F = AB + BC + AC$$
$$= (A + B)(B + C)(A + C)$$

与非式 $F = \overline{\overline{AB}\ \overline{BC}\ \overline{AC}}$

或非式 $F = \overline{\overline{A + B} + \overline{B + C} + \overline{A + C}}$

与或非式 $F = \overline{\overline{AB + BC + AC}}$

2. 5 设4位二进制数，试设计下述要求的判断电路

（1）4位二进制数中间有偶数个1

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

$$F = \sum m_4(0,3,5,6,9,10,12,15) = \overline{A \oplus B \oplus C \oplus D}$$

（2）4位二进制数中间有两个1

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

$$F = \sum m_4(3,5,6,9,10,12)$$

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

$$= \bar{A}\bar{B}CD + AB\bar{C}\bar{D} + (A \oplus B)(C \oplus D)$$

（3）4位二进制数中间有一个1

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

$$F = \sum m_4(1,2,4,8)$$

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

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

2.8 用与非门设计一个将8421码转换成2421码的转换电路

真值表

$ABCD$	Y_4	Y_3	Y_2	Y_1
0000	0	0	0	0
0001	0	0	0	1
0010	0	0	1	0
0011	0	0	1	1
0100	0	1	0	0
0101	1	0	1	1
0110	1	1	0	0
0111	1	1	0	1
1000	1	1	1	0
1001	1	1	1	1

$$Y_4 = \sum m_4(5,6,7,8,9)$$

$$= BD + BC + A$$

CD \ AB	00	01	11	10
00	0	0	d	1
01	0	1	d	1
11	0	1	d	d
10	0	1	d	d

$$Y_3 = \sum m_4(4,6,7,8,9)$$

$$= B\overline{D} + BC + A$$

CD \ AB	00	01	11	10
00	0	1	d	1
01	0	0	d	1
11	0	1	d	d
10	0	1	d	d

$$Y_2 = \sum m_4(2,3,5,8,9)$$

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

CD \ AB	00	01	11	10
00	0	0	d	1
01	0	1	d	1
11	1	0	d	d
10	1	0	d	d

$$Y_1 = \sum m_4(1,3,5,7,9) = D$$

CD \ AB	00	01	11	10
00	0	0	d	0
01	1	1	d	1
11	1	1	d	d
10	0	0	0	0

2.11 用代数法判断下列函数是否存在逻辑险象，如果有的话，设法消除之

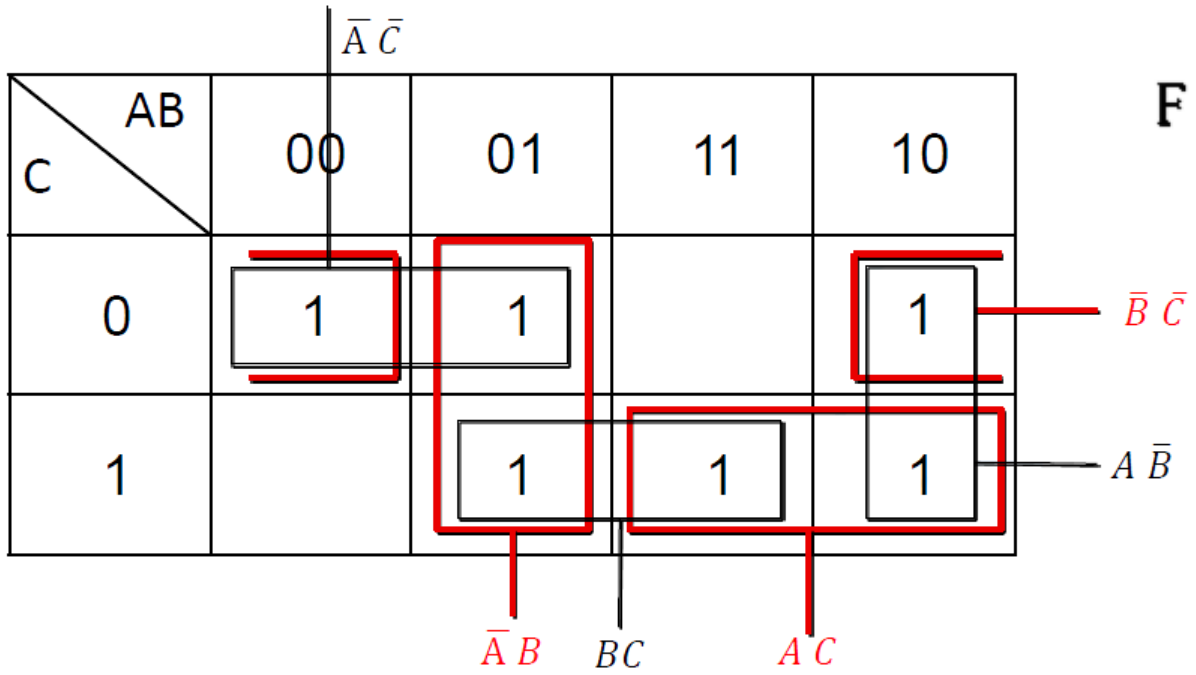
（1）$F = \bar{A}B + \bar{B}\bar{C} + AC$

A、B、C具备竞争条件

当BC=11时，$F = \bar{A} + A$，存在静态“1”险象

当AC=00时，$F = B + \bar{B}$，存在静态“1”险象

当AB=10时，$F = \bar{C} + C$，存在静态“1”险象



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

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

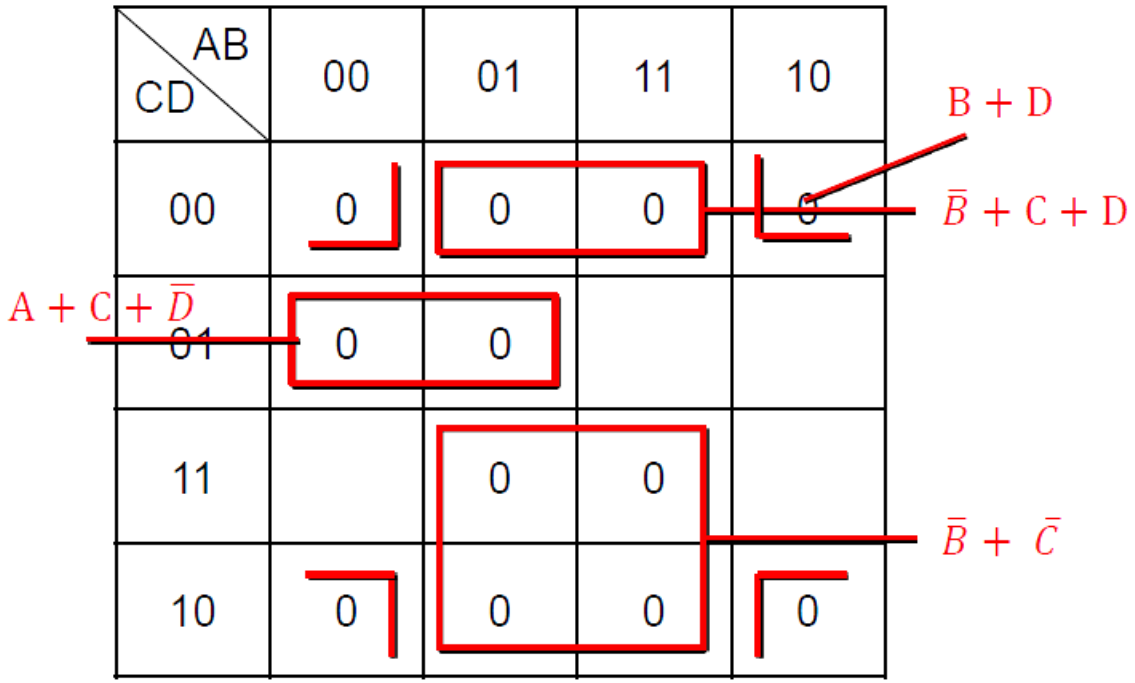
B、C、D具备竞争条件

A=0

当CD=00,10时，$F=\bar{B}B$，存在静态“0”险象

当BD=10,11时，$F=C\bar{C}$，存在静态“0”险象

当BC=00,10时，$F=\bar{D}D$，存在静态“0”险象



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

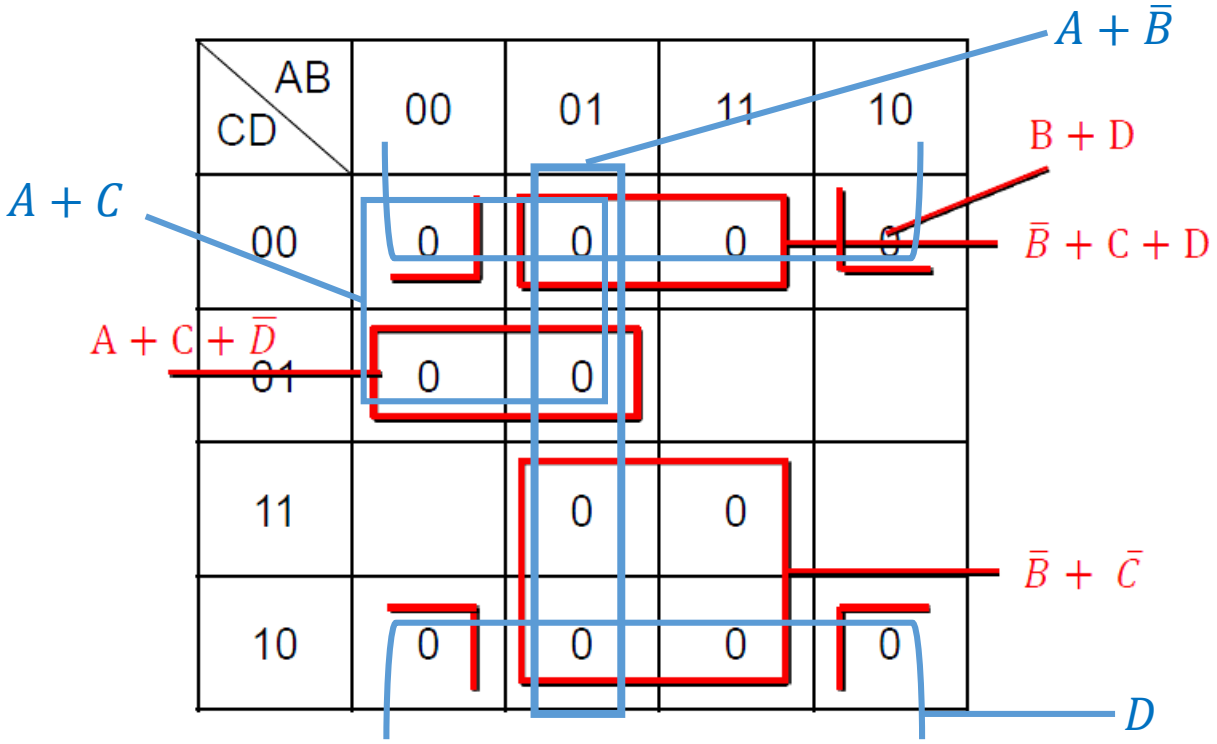
B、C、D具备竞争条件

A=0

当CD=00,10时，$F=\bar{B}B$，存在静态“0”险象

当BD=10,11时，$F=C\bar{C}$，存在静态“0”险象

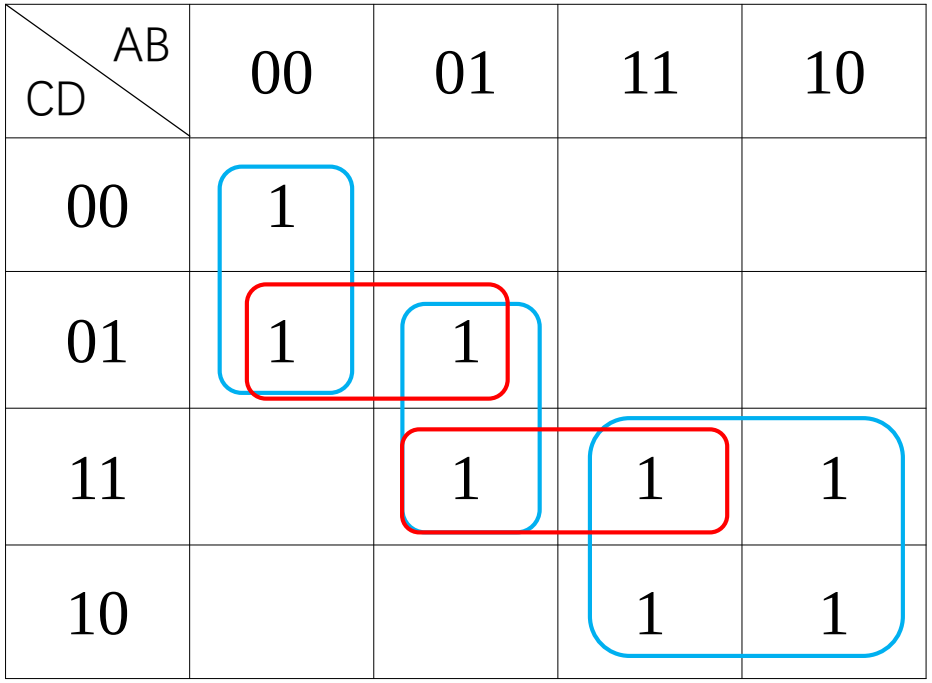
当BC=00,10时，$F=\bar{D}D$，存在静态“0”险象



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

2. 12 用卡诺图化简下列函数，所得函数中不得有逻辑险象

（1）$F=\sum m^4(0,1,5,7,10,11,14,15)$



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

（2）$F = \prod M^4(0,1,2,3,4,5,6,10,11,14)$

$= \sum m^4(7,8,9,12,13,15)$

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

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