第4章作业:

4.6 (a) $F = W·X·Y·Z·Z' + W·X·X'·Y·Z + W·W'·X·Y·Z + W·X·Y·Y'·Z$

$= W·X·Y·0 + W·0·Y·Z + 0·X·Y·Z + W·X·0·Z = 0+0+0+0 = 0.$

4.7 (b)

W X Y Z	W'X	Y'Z	X'Z	F
0 0 0 0	0	0	0	0
0 0 0 1	0	1	1	1
0 0 1 0	0	0	0	0
0 0 1 1	0	0	1	1
0 1 0 0	1	0	0	1
0 1 0 1	1	1	0	1
0 1 1 0	1	0	0	1
0 1 1 1	1	0	0	1
1 0 0 0	0	0	0	0
1 0 0 1	0	1	1	1
1 0 1 0	0	0	0	0
1 0 1 1	0	0	1	1
1 1 0 0	0	0	0	0
1 1 0 1	0	1	0	1
1 1 1 0	0	0	0	0
1 1 1 1	0	0	0	0

(#)

A B C D E	B'CD	D·E'	A'+B'C·D	B+C'+D·E'	F
0 0 0 0 0	0	0	1	1	1
0 0 0 0 1	0	0	1	1	1
0 0 0 1 0	0	1	1	1	1
0 0 0 1 1	0	0	1	1	1
0 0 1 0 0	0	0	1	1	1
0 0 1 0 1	0	0	1	1	1
0 0 1 1 0	1	1	1	1	1
0 0 1 1 1	1	0	1	1	1
0 1 0 0 0	0	0	1	1	1
0 1 0 0 1	0	0	1	1	1
0 1 0 1 0	0	1	1	1	1
0 1 0 1 1	0	0	1	1	1
0 1 1 0 0	0	0	1	0	0
0 1 1 0 1	0	0	1	0	0
0 1 1 1 0	0	1	1	1	1
0 1 1 1 1	0	0	1	0	0
1 0 0 0 0	0	0	0	1	0
1 0 0 0 1	0	0	0	1	0
1 0 0 1 0	0	1	0	1	0
1 0 0 1 1	0	0	0	1	0
1 0 1 0 0	0	0	0	1	0
1 0 1 0 1	0	0	0	1	0
1 0 1 1 0	1	1	1	1	1
1 0 1 1 1	1	0	1	1	1
1 1 0 0 0	0	0	0	1	0
1 1 0 0 1	0	0	0	1	0

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

10, (C) $F = \Sigma_{A,B,C,D}(1,2,5,6) = A'\cdot B'\cdot C'\cdot D + A'\cdot B'\cdot C\cdot D' + A'\cdot B\cdot C'\cdot D + A'\cdot B\cdot C\cdot D'$

$F = \pi_{A,B,C,D}(0,3,4,7,8,9,10,11,12,13,14,15) = (A'+B'+C+D')\cdot(A'+B'+C+D)\cdot(A'+B+C'+D')\cdot$

$(A'+B+C+D) \bullet (A+B'+C'+D')\cdot(A+B'+C'+D)\cdot(A+B'+C+D')\cdot(A'+B'+C+D)\cdot(A+B+C'+D')\cdot$

$(A'+B+C'+D)\cdot(A+B+C+D')\cdot(A+B+C+D)$

(11)
A	B	C	A'·B	B'·C	F
0	0	0	0	0	0
0	0	1	0	1	1
0	1	0	1	0	1
0	1	1	1	0	1
1	0	0	0	0	1
1	0	1	0	1	1
1	1	0	0	0	1
1	1	1	0	0	1

$F = \Sigma_{A,B,C}(1,2,3,4,5,6,7) = A'\cdot B'\cdot C + A'\cdot B\cdot C' +$
$A'\cdot B\cdot C + A\cdot B\cdot C' + A\cdot B'\cdot C + A\cdot B\cdot C' + A'\cdot B'\cdot C'.$

$F = \pi_{A,B,C}(0) = A'+B'+C'.$

(15) (d)
YZ \ WX	00	01	11	10
00	1	0	0	1
01	1	0	0	0
11	1	1	1	1
10	1	0	0	1

(e)
YZ \ WX	00	01	11	10
00	0	1	0	1
01	1	0	1	0
11	0	1	0	1
10	1	0	0	1

$F = W'\cdot X' + Y\cdot Z + X'\cdot Z'.$

$F = W'\cdot X'\cdot Y'\cdot Z + W'\cdot X'\cdot Y\cdot Z' + W'\cdot X\cdot Y'\cdot Z' + W'\cdot X\cdot Y\cdot Z +$
$W\cdot X\cdot Y'\cdot Z' + W\cdot X'\cdot Y'\cdot Z + W\cdot X\cdot Y'\cdot Z + W\cdot X\cdot Y\cdot Z'.$

18. (c)
CD \ AB	00	01	11	10
00	0	1	d	0
01	0	0	1	1
11	0	1	0	0
10	0	1	0	0

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

$F = B\cdot C'\cdot D' + A\cdot C'\cdot D + A'\cdot B\cdot C.$ $F = A\cdot B + C'\cdot D.$

8. (e) $F = (W'+X+Y')\cdot(X'+Z')$ 　　　　　　　(f) $F = (W+Y'+Z')\cdot(W+X'+Z')\cdot(X'+Y+Z)$

$YZ\backslash WX$	00	01	11	10
00	1	1	1	1
01	1	0	0	1
11	1	0	0	0
10	1	1	1	0

$YZ\backslash WX$	00	01	11	10
00	1	0	0	1
01	1	1	0	1
11	0	0	0	1
10	1	1	1	1

存在 X+X' 可能出现静态冒险　　　　　　　　存在 Z+Z', W+W' 可能出现静态冒险.

$F^* = (W'+X+Y')\cdot(X'+Z')\cdot(W'+Y'+Z')$ 　　$F^* = (W+Y'+Z')\cdot(W+X'+Z')\cdot(X'+Y+Z)\cdot(W+X'+Y')\cdot(X'+Y+Z)$

(g) $F = (W+Y+Z')\cdot(W+X'+Y+Z)\cdot(X+Y')\cdot(X+Z)$

$YZ\backslash WX$	00	01	11	10
00	0	0	0	0
01	0	0	1	0
11	1	0	0	1
10	0	0	0	0

$YZ\backslash WX$	00	01	11	10
00	0	0	1	0
01	0	0	1	1
11	1	0	0	1
10	0	0	0	0

存在 X+X', Z+Z', Y+Y' 可能出现静态冒险.

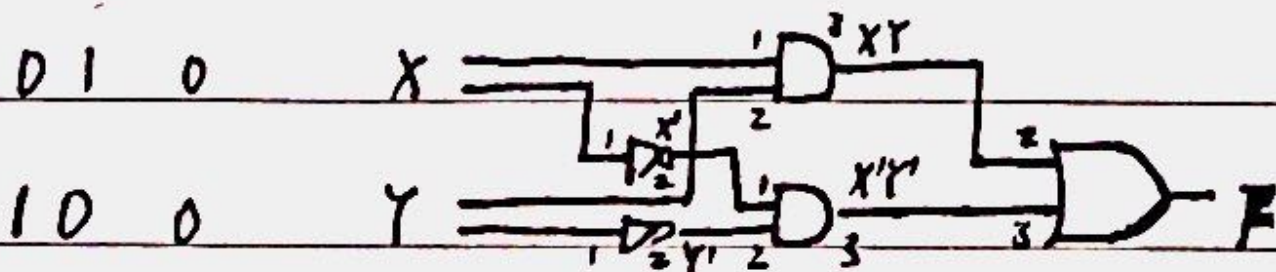$F^* = (W+Y+Z')\cdot(W+X+Y+Z)\cdot(X'+Y')\cdot(X+Z)\cdot(W+Z)\cdot(W+Y)\cdot(W'+Y+Z)$.

27. $(X+Y')\cdot Y = X\cdot Y + Y'\cdot Y = X\cdot Y + 0 = X\cdot Y.$ (看牛行了)

29. $(X+Y)\cdot(X'+Z) = X\cdot X' + X\cdot Y + X\cdot Z + Y\cdot Z = X\cdot Y + X\cdot Z + 0 = X\cdot Y + X\cdot Z.$

36.

X	Y	F
0	0	1
0	1	0
1	0	0
1	1	1

由真值表可得 $F = X\cdot Y + X'\cdot Y'$

38. 由36中真值表可知 $Y=0$ 时 $F=X'$, 则使用 XNOR 门并将 Y 接地即可.

45. X Y Z 取值有 011、101、110 和 111, 则有 $2^4 = 16$ 个不同函数 (周见下页)

~~1) $F=0$　　2) $F=XYZ$,　　3) $F=X'YZ$,　　4) $F=XY'Z$,~~

~~5) $F=XYZ'$,　　6)~~

1)

Z\XY	00	01	11	10
0	\	\	0	\
1	⊠	0	0	0

2)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	0	0	0

3)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	1	0	0

4)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	0	■	0

5)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	0	0	1

6)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	1	0	0

7)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	0	1	0

8)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	0	0	1

9)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	1	1	0

10)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	1	0	1

11)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	0	1	1

12)

Z\XY	00	01	11	10
0	\	\	0	\
1	\	1	1	1

13)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	0	1	1

14)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	1	0	1

15)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	1	1	0

16)

Z\XY	00	01	11	10
0	\	\	1	\
1	\	1	1	1

(1) $F_0 = 0$

(2) $F_1 = Z'$

(3) $F_3 = X'$

(4) $F_4 = XYZ$

(5) $F_5 = Y'$

(6) $F_6 = X'+Z'$

(7) $F_7 = XY$

(8) $F_8 = Y'+Z'$

(9) $F_9 = YZ$

(10) $F_{10} = XY'+X'Y$

(11) $F_{11} = XZ$

(12) $F_{12} = Z$

(13) $F_{13} = X$

(14) $F_{14} = X'+Y'+Z'$

(15) $F_{15} = Y$

(16) $F_{16} = 1$

46. 78: $(X+Y)\cdot(X+Z)=X+Y\cdot Z$, 左边对偶式为 $X'\cdot Y'+X'\cdot Z'$, 右边为 $X'+(Y'+Z')$

又 $X'\cdot Y'+X'\cdot Z'=X'\cdot(Y'+Z')$ (78)=右边, 即所 $(X+Y)\cdot(X+Z)$ 与 $X+(Y\cdot Z)$ 的对偶式相等.
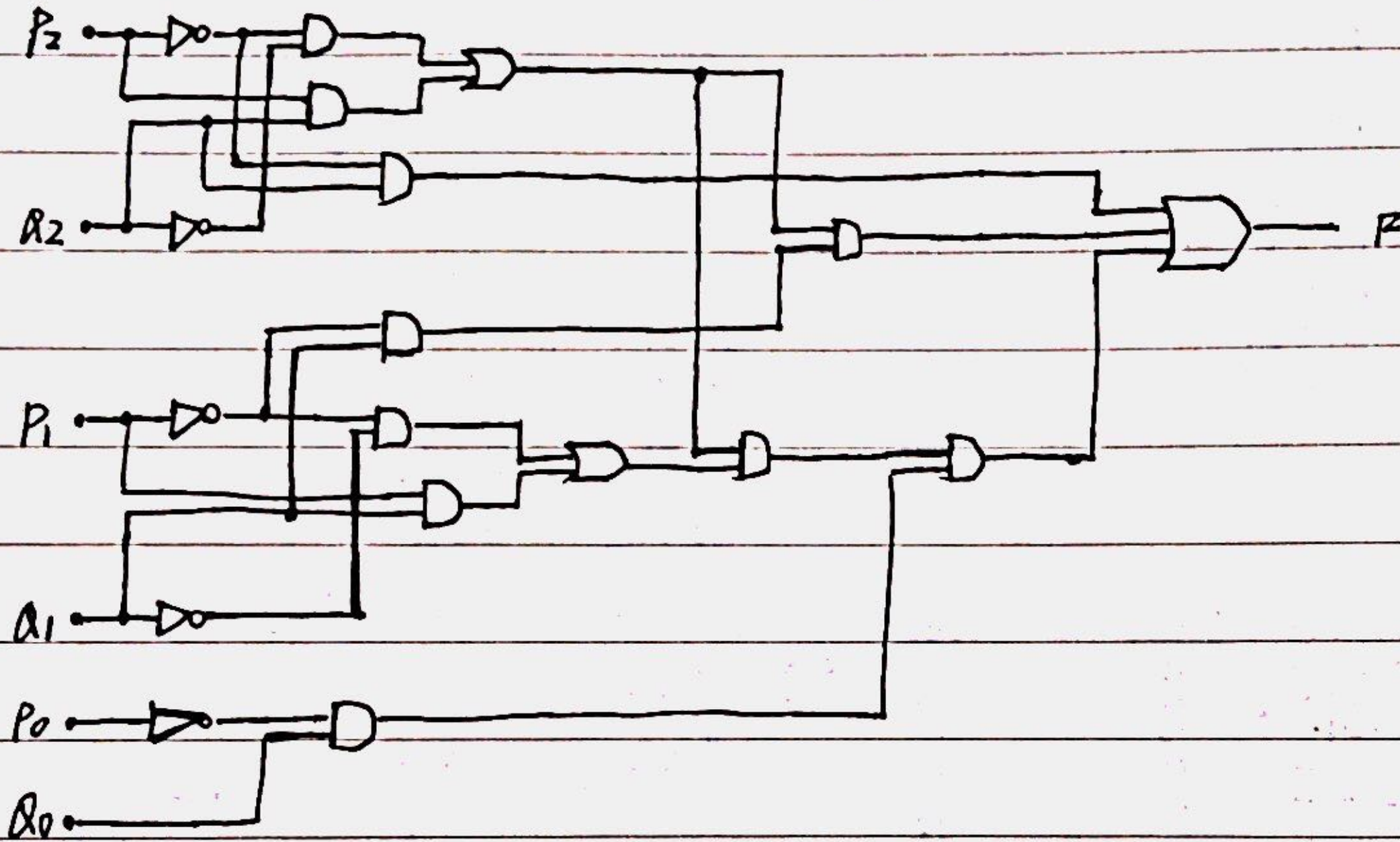
则 $78'$即 $(X+Y)\cdot(X+Z)=X+Y\cdot Z$ 成立.

55. 对 $P<Q$ 有 $P_2<Q_2$ 或 $P_2=Q_2$ 且 $P_1<Q_1$ 或 $P_2=Q_2, P_1=Q_1$ 且 $P_0<Q_0$

$P_n<Q_n$ 当且仅当 $P_n=0$ 且 $Q_n=1$，用 $P_n'\cdot Q_n$ 表示。

$P_n=Q_n$ 当且仅当 $P_n=0, Q_n=0$ 或 $P_n=1, Q_n=1$，用 $P_nQ_n+P_n'Q_n'$ 表示。

当且仅当 $P<Q$ 辛输出1，$F = P_2'\cdot Q_2 + (P_2'\cdot Q_2' + P_2\cdot Q_2)\cdot P_1'\cdot Q_1 + (P_2'\cdot Q_2' + P_2\cdot Q_2)\cdot(P_1'\cdot Q_1' + P_1\cdot Q_1)\cdot P_0'\cdot Q_0$

56. (1) $F=\Sigma XYZ(0,1,2)$　　(2) $G=\Sigma X.Y.Z(1,4,6)$　　(3) $H=\Sigma X,Y,Z(0,1,2,4,6)$

Z\XY	00	01	11	10
0	1	1	0	0
1	1	0	0	0

Z\XY	00	01	11	10
0	0	1	1	1
1	1	0	0	0

Z\XY	00	01	11	10
0	1	1	1	1
1	1	0	0	0

$F=X'\cdot Y' + X'\cdot Z'$.　　$G=X\cdot Z' + X'\cdot Y'\cdot Z$.　　$H=X'\cdot Y' + Z'$.

61. 2B

功能：不论输入2B为何，

辛输出F为高电平。

Hamilea: 2B OR NOT 2B.
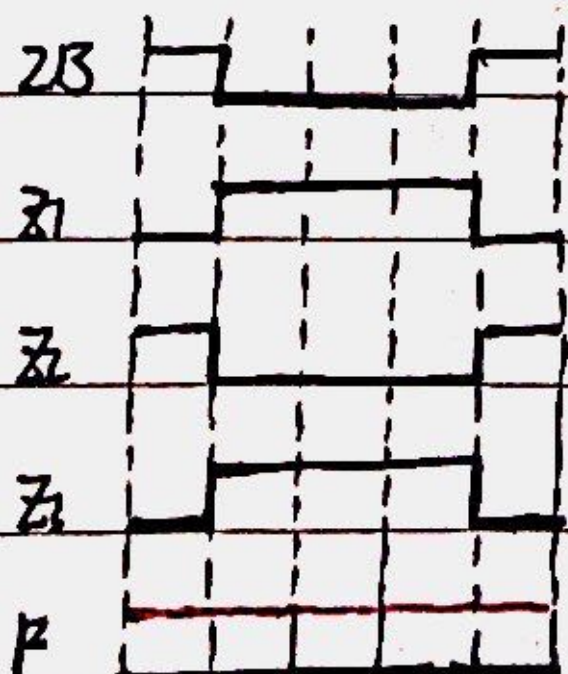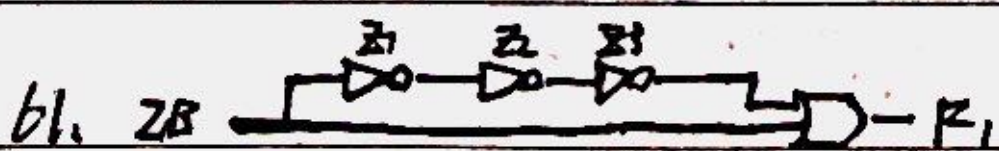
59. (C) $F = \Sigma_{VWXYZ}(0,1,2,3,4,5,10,11,14,20,21,24,25,26,27,28,29,30)$

组别	最小项	VWXYZ	合并否
0	0	00000	✓
1	1	00001	✓
	2	00010	✓
	4	00100	✓
2	3	00011	✓
	5	00101	✓
	10	01010	✓
	20	10100	✓
	24	11000	✓
3	11	01011	✓
	14	01110	✓
	21	10101	✓
	25	11001	✓
	26	11010	✓
	28	11100	✓
4	27	11011	✓
	29	11101	✓
	30	11110	✓

组别	最小项组	VWXYZ	合并否
0	0,1	0000-	✓
	0,2	000-0	✓
	0,4	00-00	✓
1	1,3	000-1	✓
	1,5	00-01	✓
	2,3	0001-	✓
	2,10	0-010	✓
	4,5	0010-	✓
	4,20	-0100	✓
2	3,11	0-011	✓
	5,21	-0101	✓
	10,11	0101-	✓
	10,14	01-10	✓
	20,21	1010-	✓
	24,25	1100-	✓
	24,26	110-0	✓
	24,28	11-00	✓
3	11,27	-1011	✓
	14,30	-1110	✓
	28,29	1-101	✓
	25,27	110-1	✓
	25,29	11-01	✓
	26,27	1101-	✓
	26,30	11-10	✓
	28,29	1110-	✓
	28,30	111-0	✓

组别	最小项	VWXYZ	合并项
0	0,1,2,3	000--	P1
	0,1,4,5	00-0-	P2
1	2,3,10,11	0-01-	P3 ←
2	4,5,20,21	-010-	P4 ←
	10,11,26,27	-101-	P5 ←
	10,14,26,30	-1-10	P7
	20,21,28,29	1-10-	P8
	24,25,26,27	110--	P9
	24,25,28,29	11-0-	P10
	24,26,28,30	11--0	P11

质蕴含	0	1	2	3	4	5	10	11	14	20	21	24	25	26	27	28	29	30
P1	✗	⊗	⊗	⊗														
P2	✗	⊗		⊗	⊗													
P3	✓		⊗	⊗			✗	✗										
P4	✗				✗	✗				✗	✗							
P5	✗						⊗	⊗						⊗	⊗			
P7	✗						⊗		⊗					⊗				⊗
P8	✓									⊗	⊗					⊗	⊗	
P9	✗											⊗	⊗	⊗	⊗			
P10	✗											⊗	⊗			⊗	⊗	
P11	✗											⊗		⊗		⊗		⊗

$$F = P_3 + P_5 + P_8 + P_9 + P_8 = V'W'Y' + V'X'Y + WY'Z' + V'X'Y' + VW'X'$$

60. (a) $F = \Sigma_{UVWXYZ}(1,5,9,13,21,23,29,31,37,45,53,61)$

组别	最小项	UVWXYZ	合并否
1	1	000001	✓
	5	000101	✓
2	9	001001	✓
	13	001101	✓
	21	010101	✓
3	37	100101	✓
	23	010111	✓
4	29	011101	✓
	45	101101	✓
	53	110101	✓
5	31	011111	✓
	61	111101	✓

组别	最小项组	UVWXYZ	合并否
1	1,5	000-01	✓
	1,9	00-001	✓
2	5,13	00-101	✓
	5,21	0-0101	✓
	5,37	-00101	✓
	9,13	001-01	✓
4	21,23	01-111	✓
	29,61	-11101	✓
	45,61	1-1101	✓
3	13,29	0-1101	✓
	13,45	-01101	✓
	21,23	0101-1	✓
	21,29	0-1101	✓
	37,45	10-101	✓
	37,53	1-0101	✓

组别	最小项组	UVWXYZ	合并否
1	1,5,9,13	00--01	⌇
2	5,13,21,29	0---01 ?	⌇
	5,13,37,45	-0-101	⌇
	5,21,37,53	--0101	⌇
3	21,23,29,31	01-1-1	⌇
	13,29,45,61	--1101	⌇
	21,29,53,61	--1101	⌇
	37,45,53,61	1--101	⌇

$$0---01, ---101,$$

$$F = U'Y'Z + X'Y'Z + U'VW'X'Z$$