9.25   week 4.

P58. 2.31 .

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

$Y = BD + AC + AD$

AB\CP	00	01	11	10
00	0	1	X	X
01	0	X	X	X
11	0	1	1	X
10	1	0	1	0

$$Y = A\bar{B}\bar{C}\bar{D} + \bar{A}D + BD + CD$$

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

化简多输出逻辑函数 .

$F_1(a,b,c,d) = \Sigma m(3,7,8,9,10,11,13,14,15)$

ab\cd	00	01	11	10
00	0	0	1	0
01	0	0	1	0
11	0	1	1	1
10	1	1	1	1

$Y = a\bar{b} + cd + ad + ac$

$F_2(a,b,c,d) = \Sigma m(6,7,8,10,14,15)$

ab\cd	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	0	0	1	1
10	1	0	0	1

$Y = bc + a\bar{b}\bar{d}$

Pg8.   2.35. 输入有4个. 输出有2个. 输入是A, 代表从0~15的一个数,
如果这个输入的数是素数, 则输出P为 true。如果输入的数可被
3整除. 则输出D为 true .

设 x y z w 为这4个输入, 代表4位二进制数构成A.

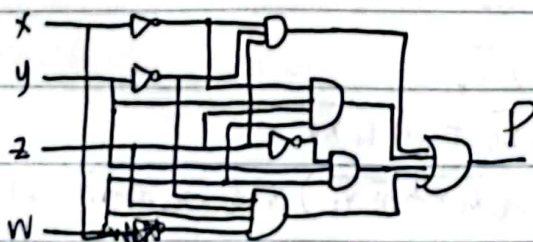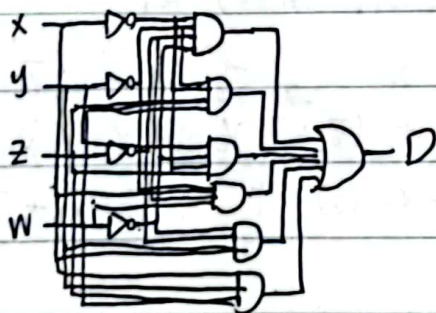| x	y	z	w	D	P
0	0	0	0	1	0
0	0	0	1	0	0
0	0	1	0	0	1
0	0	1	1	1	1
0	1	0	0	0	0
0	1	0	1	0	1
0	1	1	0	1	0
0	1	1	1	0	1
1	0	0	0	0	0
1	0	0	1	1	0
1	0	1	0	0	0
1	0	1	1	0	1
1	1	0	0	1	0
1	1	0	1	0	1
1	1	1	0	0	0
1	1	1	1	1	0

$$D = \bar{x}\bar{y}\bar{z}\bar{w} + \bar{x}\bar{y}zw + \bar{x}yz\bar{w} +$$
$$x\bar{y}\bar{z}w + xy\bar{z}\bar{w} + xyzw$$
$$= (\bar{x}\bar{y}+xy)(\bar{z}\bar{w} + zw) + \bar{x}yz\bar{w}+x\bar{y}\bar{z}w$$
$$= (x+\bar{y})(\bar{x}+y)(z+\bar{w})(\bar{z}+w) + \sim$$
$$= xy \cdots \qquad 无法化简$$

xy\zw	00	01	11	10
00	1	0	1	0
01	0	0	0	1
11	1	0	1	0
10	0	1	0	0

$$P = \bar{x}\bar{y}z\bar{w} + \bar{x}\bar{y}zw + \bar{x}y\bar{z}w +$$
$$\bar{x}yzw + x\bar{y}zw + xy\bar{z}w$$
$$= \bar{x}\bar{y}z + y\bar{z}w + zw(\bar{x}y +x\bar{y})$$

xy\zw	00	01	11	10
00	0	0	1	1
01	0	1	1	0
11	0	1	0	0
10	0	0	1	0

$$= \bar{x}\bar{y}z + \bar{x}\bar{z}w + \bar{x}yw + y\bar{z}w + x\bar{y}zw$$

2.38. 3:7 三进制-温度计码转换器.

$\overset{ABC}{000} \rightarrow 0000000$

$001 \rightarrow 0000001$

$010 \rightarrow 0000011$

$011 \rightarrow 0000111$

$100 \rightarrow 0001111$

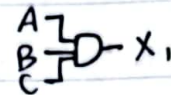$101 \rightarrow 0011111$

$110 \rightarrow 0111111$

$111 \rightarrow 1111111$

7个输出从左到右依次记为 $X_1 \sim X_7$.

3个输入记为 $A. B. C$

① $X_1 = ABC$

② $X_2 = AB$

③ $X_3 = AB + A\bar{B}C = AC(B + \bar{B}C) = AC(B + \bar{B})(B + C)$
$= AB + AC$

④ $X_4 = AB + A\bar{B} = A$ $A - X_4$

⑤ $X_5 = A + \overline{AB} \bar{A}BC$ $= (A + \bar{A})(A + BC) = A + BC$

⑥ $X_6 = A + \bar{A}B = (A + \bar{A})(A + B) = A + B$

⑦ $X_7 = A + \bar{A}B + \bar{A}\bar{B}C = A + B + \bar{A}\bar{B}C = (A + \bar{A})(A + \bar{B}C) + B$
$= A + B + \bar{B}C = A + (B + \bar{B})(B + C) = A + B + C$

分析电路: ① $Y_3 = X_3$

② $Y_2 = X_2 \oplus X_3 = X_2\bar{X_3} + \bar{X_2}X_3$

③ $(\overline{X_2 M})(\overline{M Y_2})$ ④ $X_1 = Y_1 =$

$= (X_2 M + \bar{M}Y_2)\bar{X_1} + \overline{(X_2 M + \bar{M}Y_2)} X_1$

$= (X_2 M + \bar{M}Y_2)\bar{X_1} + \overline{X_2 M} \cdot \overline{\bar{M}Y_2} \cdot X_1$ $\rightarrow \bar{X_2}MX_1 + \bar{X_2}Y_2X_1 + \overset{\bar{M}\bar{Y_2}X_1}{}$

$= \bar{X_1}X_2 M + \bar{X_1}\bar{M} X_2\bar{X_3} + \bar{X_1}\bar{M}\bar{X_2}X_3 + (\bar{X_2} + \bar{M})(M + Y_2)(X_1)$

$= \bar{X_1}X_2 M + X_1\bar{X_2}M + \bar{X_1}\bar{M}(X_2\bar{X_3} + \bar{X_2}X_3) + X_1\bar{Y_2}(\bar{X_2} + \bar{M})$

④ $(\overline{M X_1})(\overline{M Y_1})$ ⑤ $X_0 = Y_0 =$

$(\overline{M X_1})(\overline{M Y_1})X_0 + \overline{(\overline{M X_1})(\overline{M Y_1})} \bar{X_0}$

$= (\bar{M} + \bar{X_1})(M + \bar{Y_1})X_0 + (MX_1 + \bar{M}Y_1)\bar{X_0}$

$= \bar{M}\bar{Y_1}X_0 + \bar{X_1}MX_0 + \bar{X_1}\bar{Y_1}X_0 + MX_1\bar{X_0} + \bar{M}Y_1\bar{X_0}$

$= M(X_0\bar{X_1} + X_1\bar{X_0}) + (\bar{M}X_0 + \bar{X_1}X_0)\overline{((X_2M + \bar{M}Y_2)\bar{X_1} + (X_2M + \bar{M}Y_2)X_1)}$

$+ \bar{M}\bar{X_0}($

X_0	X_1	X_2	X_3	M		Y_0	Y_1	Y_2	Y_3
0	0	0	0	0		0	0	0	0
0	0	0	0	1		0	0	0	0
0	0	0	1	0					1
0	0	0	1	1					1

...... 画图太矗了.

$$(\bar{X_2}M + \bar{X_2}\bar{Y_2} + \bar{M}\,\overline{Y_2})$$

$$Y_1 = X_1 \oplus \overline{(\overline{X_2 M})(\overline{M Y_2})} = \bar{X_1}(X_2 M + \bar{M}Y_2) + X_1(\bar{X_2}+\bar{M})(M + \overline{Y_2})$$

$$= \bar{X_1}X_2 M + \bar{X_1}\bar{M}Y_2 + X_1\bar{X_2}M + X_1\bar{X_2}\overline{Y_2} + X_1\bar{M}\,\overline{Y_2} \quad (\bar{X_2}\bar{X_3} + X_2 X_3)$$

$$= M(\bar{X_1}X_2 + X_1\bar{X_2}) + \bar{X_1}\bar{M}(X_2 \bar{X_3} + \bar{X_2}X_3) + \cancel{(\bar{X_2}\bar{X_3} + X_2 X_3)}(X_1)(\bar{X_2}+\bar{M})$$

$$\underset{X_1 X_2 X_3 + X_1 X_2 X_3 \bar{M}}{}$$

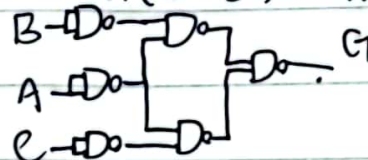$$= \quad 没 \text{乘} 法化简 a \quad ?$$

保密锁:

C	B	A	F	G
0	0	0	0	1
0	0	1	0	0
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	X	1	0

$$F = AB\bar{C} + A\bar{B}C + ABC = AB\bar{C} + AC$$
$$= A(C+B)(C+\bar{C}) = AB + AC$$
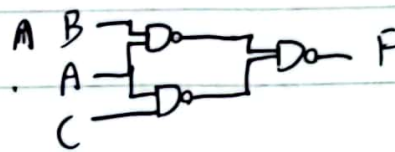
$$G = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C = \bar{A}\bar{C} + \bar{A}\bar{B}C$$
$$= \bar{A}(\bar{C}+\bar{B}) = \bar{A}\bar{B} + \bar{A}\bar{C}$$

4管5入电路:

A	B	C	D	F	$G = \bar{F}$
0	0	0	0	0	1
0	0	0	1	0	1
0	0	1	0	0	1
0	0	1	1	0	1
0	1	0	0	0	1
0	1	0	1	1	

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

$$F = \bar{G} = \overline{\bar{A}\bar{B} \cdot \overline{\bar{A}\bar{C}\bar{D}}} = (A+B)(A+C+D)$$
$$= A + BC + BD$$

下列函数是否会产生险象？（hazard）

(1) $F_1 = AB + A\bar{C} + \bar{C}D$　　没有以互补形式出现的逻辑变量. 不会.

(2) $F_2 = AB + \bar{A}CD + BC$　　有 $A\bar{A}$ 互补出现：

BCD	F_2
000	0
001	0
010	0
011	$\bar{A}$
100	A
101	A
111	1

无 $A+\bar{A}$ 或 $A\cdot\bar{A}$ 形式出现，
故不会产生 hazard.