4.6 (a) 原式 $= W\cdot X\cdot Y\cdot Z\cdot W\cdot X\cdot Y\cdot Z' + W\cdot X\cdot Y\cdot Z\cdot W\cdot X'\cdot Y Z + W\cdot X\cdot Y\cdot Z\cdot W\cdot X\cdot Y'\cdot Z$

$+ W\cdot X\cdot Y\cdot Z\cdot W X\cdot Y'\cdot Z$

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

$= 0+0+0+0 = 0$

4.7 (b)

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

(f)

A	B	C	D	E	F
0	0	0	0	0	1
0	0	0	0	1	1
0	0	0	1	0	1
0	0	0	1	1	1
0	0	1	0	0	1
0	0	1	0	1	1
0	0	1	1	0	1
0	0	1	1	1	1
0	1	0	0	0	1
0	1	0	0	1	1
0	1	0	1	0	1
0	1	0	1	1	1
0	1	1	0	0	0
0	1	1	0	1	0
0	1	1	1	0	1
0	1	1	1	1	0
1	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	0
1	0	1	1	0	1
1	0	1	1	1	1
1	1	0	0	0	0
1	1	0	0	1	0
1	1	0	1	0	0
1	1	0	1	1	0

A	B	C	D	E	F
1	1	1	0	0	0
1	1	1	0	1	0
1	1	1	1	0	0
1	1	1	1	1	0

4.10 (c) $F = \Sigma_{A,B,C,D}(1,2,5,6) = \Pi_{A,B,C,D}(0,3,4,7,8,9,10,11,12,13,14,15)$

(e) $F = A'B + B'C + A$

$= A'BC + A'BC' + AB'C + A'B'C + ABC + AB'C + ABC' + AB'C'$

$= \Sigma_{A,B,C}(1,2,3,4,5,6,7) = \Pi_{A,B,C}(0)$

4.15 (d)

WX \ YZ	00	01	11	10
00	1 (0)	1 (1)	1 (3)	1 (2)
01	0 (4)	0 (5)	1 (7)	0 (6)
11	0 (12)	0 (13)	1 (15)	0 (14)
10	1 (8)	0 (9)	1 (11)	1 (10)

$F = W'X' + YZ + X'Z'$

奇异'1'单元已勾出(共6个)

(e)

WX \ YZ	00	01	11	10
00	0 (0)	1 (1)	0 (3)	1 (2)
01	1 (4)	0 (5)	1 (7)	0 (6)
11	0 (12)	1 (13)	0 (15)	1 (14)
10	1 (8)	0 (9)	1 (11)	0 (10)

$F = W'X'(Y'Z + YZ') + W'X(Y'Z' + YZ) + WX(Y'Z + YZ') + WX'(Y'Z' + YZ)$

奇异'1'单元已勾出(共8个)

4.18 (c)

AB \ CD	00	01	11	10
00	0 (0)	0 (1)	0 (3)	0 (2)
01	1 (4)	0 (5)	1 (7)	1 (6)
11	d (12)	1 (13)	0 (15)	0 (14)
10	0 (8)	1 (9)	0 (11)	0 (10)

$F = A'BC + BC'D' + AC'D$

奇异'1'单元已勾出(共5个)

4.8 (d)

AB \ CD	00	01	11	10
00	0	1	3	2
01	4	5	d	6
11	12	13	15	14
10	8	d	11	10

$F = AB + C'D$

有异"1"单元已勾出(共5个)

4.19 (e)

WX \ YZ	00	01	11	10
00	0 1	1 1	3 1	2 1
01	4 1	5 0	7 0	6 1
11	12 1	13 0	15 0	14 1
10	8 1	9 1	11 0	10 0

→ $W'X'Z'$

存在1处静态冒险

无冒险电路:

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

(f)

WX \ YZ	00	01	11	10
00	0	1	0 3	2
01	0 4	5	0 7	6
11	0 12	0 13	0 15	14
10	8	9	11	10

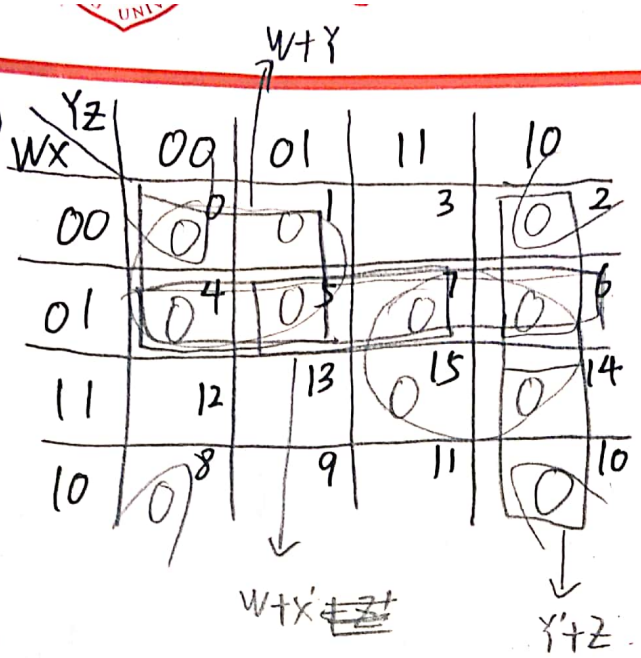
$W' + X' + Y$ $\quad$ $X' + Y' + Z'$

存在2处静态冒险

无冒险电路

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

4.19(g)



有4个静态冒险

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

4.24 $(X+Y)\cdot(X'+Z)=X\cdot X+XZ+X'\cdot Y+YZ$

$=XZ+X'\cdot Y+YZ(X+X')$

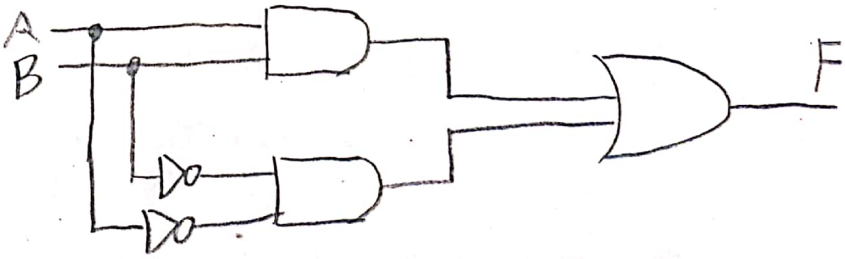
$=X'\cdot Y\cdot(1+Z)+X\cdot Z\cdot(1+Y)=XZ+X'\cdot Y$

4.36 真值表：

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

经过知：$F=X'\cdot Y'+X\cdot Y$

与-或电路



4.38. 选用 2输入的XNOR门

两端分别接输入和电压'0'

4.45 输入有4种可能的情况，所以有 $2^4=16$ 个不同的函数 $F(X,Y,Z)$

X	Y	Z	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{16}
0	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
1	0	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
1	1	0	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

$F_1(X,Y,Z)=X\cdot Y'\cdot Z'+X'\cdot Y\cdot Z'+X'\cdot Y'\cdot Z+X'\cdot Y'\cdot Z'$

$=0$

$F_2(X,Y,Z)=X\cdot Y\cdot Z$；$F_3(X,Y,Z)=X\cdot Y\cdot Z'$

$F_4(X,Y,Z)=X\cdot Y\cdot Z'+X\cdot Y\cdot Z=X\cdot Y$

$F_5(X,Y,Z)=X\cdot Y'\cdot Z$；$F_6(X,Y,Z)=X\cdot Y'\cdot Z+X\cdot Y\cdot Z=X\cdot Z$

$F_7(X,Y,Z)=X\cdot Y'\cdot Z+X\cdot Y\cdot Z'=X\cdot(Y'\cdot Z+Y\cdot Z')$

$F_8(X,Y,Z)=X\cdot Y'\cdot Z+X\cdot Y\cdot Z'+X\cdot Y\cdot Z=X\cdot(Y+Z)$

$F_9(X,Y,Z)=X'\cdot Y\cdot Z$；$F_{10}(X,Y,Z)=X'\cdot Y\cdot Z+X\cdot Y\cdot Z=Y\cdot Z$

$F_{11}(X,Y,Z)=X'\cdot Y\cdot Z+X\cdot Y\cdot Z'=Y\cdot(X'Z+XZ')$

$F_{12}(X,Y,Z)=X'\cdot Y\cdot Z+X\cdot Y\cdot Z'+X\cdot Y\cdot Z=Y\cdot(X+Z)$

$F_{13}(X,Y,Z)=X'\cdot Y\cdot Z+X\cdot Y'\cdot Z=Z\cdot(X'\cdot Y+X\cdot Y')$

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

$F_{15}(X,Y,Z)=X'\cdot Y\cdot Z+X\cdot Y'\cdot Z+X\cdot Y\cdot Z'=Z\cdot(X'\cdot Y+X\cdot Y')+X\cdot Y\cdot Z'$

$F_{16}(X,Y,Z)=1$.

4.6 根据对偶性原理

$(X \cdot Y) + (X \cdot Z) = (X+Y) \cdot (X+Z)$

$X \cdot (Y+Z) = X + (Y \cdot Z)$

$\because (X \cdot Y) + (X \cdot Z) = X \cdot (Y+Z) \quad \therefore (X+Y) \cdot (X+Z) = X + (Y \cdot Z)$

4.55

$Q_2Q_1Q_0$ \ $P_2P_1P_0$	000	001	011	010	110	111	101	100
000	0	0	0	0	0	0	0	0
001	1	0	0	0	0	0	0	0
011	1	1	0	1	0	0	0	0
010	1	1	0	0	0	0	0	0
110	1	1	1	1	0	0	1	1
111	1	1	1	1	1	0	1	1
101	1	1	1	1	0	0	0	1
100	1	1	1	1	0	0	0	0

$F = P_2' \cdot Q^2 + P_2' \cdot P_1' \cdot Q_1' + P_1' \cdot Q_2Q_1 + Q_2 \cdot Q_0 \cdot P_1' \cdot P_0'$

$+ Q_2'Q_1'Q_0 \cdot P_2'P_1'P_0' + P_2'P_1 \cdot P_0' \cdot Q_1 \cdot Q_0 + Q_2 \cdot Q_1 \cdot Q_0 \cdot P_1 \cdot P_0'$

4.56

X \ YZ	00	01	11	10
0	1	1	0	1
1	0	0	0	0

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

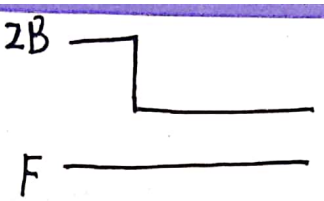
X \ YZ	00	01	11	10
0	0	1	0	0
1	1	0	0	1

$G = X \cdot Z' + X' \cdot Y' \cdot Z$

X \ YZ	00	01	11	10
0	1	1	0	1
1	1	0	0	1

$H = Z' + X' \cdot Y'$

4.61 定时图：



功能：无论输入是什么，输出总是高电平

为何得名：针对输入ZB，输出为 $ZB+\overline{ZB}$，即 ZB 或 $\overline{ZB}$

谐音 to be or not to be（为Hamlet经典台词）

4.59(c)

		VWXYZ
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 ✓

VWXYZ	
0,1 0000-	✓
0,2 000-0	✓
0,4 00-00	✓
1,3 000-1	✓
1,5 00-01	✓
2,3 0001-	✓
2,10 0-010	✓
4,5 0010-	✓
4,20 -0100	✓
3,11 0-011	✓
5,21 -0101	✓
10,11 0101-	✓
10,14 -1010	✓
10,26 -1010	✓
20,21 1010-	✓
24,25 1100-	✓
24,26 110-0	✓
24,28 11-00	✓
11,27 -1011	✓
14,30 -1110	✓
21,29 1-101	PI_{11}
25,27 110-1	✓
25,29 11-01	✓

VWXYZ	
26,27 110-1	✓
26,30 11-10	✓
28,29 1110-	✓
28,30 111-0	✓
0,1,2,3 000--	PI_1
0,1,4,5 00-0-	PI_2
2,3,10,11 0-01-	PI_3
4,5,20,21 -010-	PI_4
10,11,26,27 -101-	PI_5
10,14,26,30 -1-10	PI_6
20,21,28,29 1-10-	PI_7
24,25,28,29 11-0-	PI_8
24,25,26,27 110--	PI_9
24,26,28,30 11--0	PI_{10}

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0 1 2 3 4 5 10 11 14 20 21 24 25 26 27 28 29 30

0 1 2 3 4 5 10 11 14 20 21

$PI_1(0,1,2,3)$ x x x x

$PI_2(0,1,4,5)$ x x x x

$PI_3(2,3,10,11)$ x x x x

$PI_4(4,5,20,21)$ x x x x

$PI_5(10,11,26,27)$ x x x x

✓ $PI_6(10,14,26,30)$ x (x) x x

$PI_7(20,21,28,29)$ x x x x

$PI_8(24,25,28,29)$ x x x x

$PI_9(24,25,26,27)$ x x x x

$PI_{10}(24,26,28,30)$ x x x x

$PI_{11}(21,29)$ x x

0 1 2 3 4 5 10 20 21 24 25 27 28 29

PI_1 x x x x

PI_2 x x x x

PI_3 x x x

PI_4 x x x x

PI_5 x x

PI_7 x x x x

PI_8 x x x x

PI_9 x x x

× PI_{10} x x

× PI_{11} x x

删去 PI_{10} 和 PI_{11}，列 1, 5, 21, 25, 29

	0	2	3	4	11	20	24	27	28
PI_1	X	X	X						
PI_2	X			X					
PI_3		X	X		X				
PI_4				X		X			
PI_5					X			X	
PI_7						X			X
PI_8							X		X
PI_9							X	X	

选 PI_1, PI_4, PI_5, PI_8, P_6

$F = PI_1 + PI_4 + PI_5 + PI_6 + PI_8$

$= 000-- + -0\,0-- + -101- + -1-10 + 11-0-$

$= \bar{v}\bar{w}\bar{x} + \bar{w}x\bar{y} + w\bar{x}\bar{y} + wy\bar{z} + vw\bar{y}$

4.60(a) $v\,v\,w\,x\,y\,z$ →

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

→

1,5	000-01	✓	
1,9	00-001	✓	
5,13	00-101	✓	
5,21	0-0101	✓	
5,37	-00101	✓	
9,13	001-01	✓	
13,29	0-1101	✓	
13,45	-01101	✓	
21,23	0101-1	✓	
21,29	01-101	✓	
21,53	-1010 1	✓	
37,45	10-101	✓	
37,53	1-0101	✓	
23,31	01-111	✓	
29,31	0111-1	✓	
29,61	-1110 1	✓	
45,61	1-1101	✓	

→

1,5,9,13	00--01	PI_2
5,13,21,29	0--101	✓
5,21,37,53	--0101	✓
13,29,45,61	--1101	✓
21,29,23,31	01-1-1	PI_3
21,29,53,61	-1-101	PI_4
37,45,53,61	1--101	✓

→

5,13,21,29,37,45,53,61 ---101 PI_1

53,61 11-101 ✓

	1	5	9	13	21	23	29	31	37	45	53	61
PI_1		X		X	X		X		(X)	(X)	X	X
PI_2	(X)	X	X	X								
PI_3					X	(X)	X	X				
PI_4					X		X				X	X

$F = PI_1 + PI_2 + PI_3$

$= ---101 + 00--01 + 01-1-1$

$= X\bar{Y}Z + \bar{U}\bar{V}\bar{Y}Z + \bar{U}VXZ$