

(1)

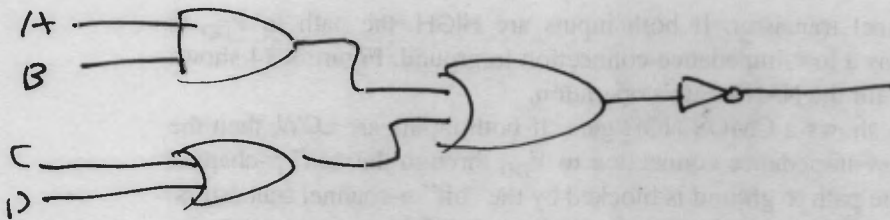
(a) A B C D Q₁ Q₂ Q₃ Q₄ Q₅ Q₆ Q₇ Q₈ Z

0 0 0 0

1 1 1 1

(b)

$$Z = \left((A \cdot B) + (C + D) \right)'$$



4.30

$$f = B'C + ACD' + A'C + EB' + E \cdot (A+C)(A'+D')$$

$$= B'(C+E) + ACD' + A'C + \cancel{EAA'} + EAD' + ECA' + ECD'$$

$$= B'(C+E) + D'(AC + EC + AE) + A'C(1+E)$$

$$= B'(C+E) + D'(AC + EC + AE) + A'C$$

4.6.

(a) $F = 0$.

$$\begin{aligned} (b) F &= AB + ABC'D + ABDE' + A'Bc'E + A'B'c'E \\ &= AB(1 + C'D + DE') + A'C'E(B + B') \\ &= AB + A'C'E \end{aligned}$$

$$\begin{aligned} (c) F &= MRP + QO'R' + \overbrace{MN + ONM} + QPMO' \\ &= MRP + MPQO' + QO'R' + MN(1 + 0) \\ &= MN + MRP + QO'(MP + R') \\ &= M(N + RP) + QO'(MP + R') \end{aligned}$$

4.8.

(a)

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

(c)

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

$$e) F = 0 + 0 + xyz' + 0$$

x	y	z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

$$\begin{aligned}
 (8) \quad F &= B + \cancel{A}BC' + C(AB + A'B') \\
 &= B + \overset{\nearrow}{A}BC' + \overset{\nearrow}{A}BC + A'B'C
 \end{aligned}$$

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

4.9.

$$a) F = \sum_{xy} (1, 2)$$

$$= x'y + xy'$$

$$= (x' + y)(x + y')$$

$$b) F = \prod_{AB} (0, 1, 2)$$

$$= (\cancel{A+B})(A'+B')(A'+B)$$

$$= A \cdot B$$

$$c) F = \sum_{A,B,C} (1, 2, 4, 6)$$

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

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

$$\begin{array}{r} 001 \\ 010 \\ 100 \\ 110 \end{array}$$

$$\begin{array}{r} 010 \\ \oplus 101 \\ \hline 111 \end{array} \quad \begin{array}{r} 7 \\ 0 \end{array}$$

$$d) F = \prod_{w,x,y} (0, 2, 3, 6, 7)$$

$$= (\cancel{w+x+y})(w+x'+y)(w+x'+y')(w'+x'+y)(w'+x'+y')$$

$$= w'x'y + wx'y' + wx'y$$

$$\begin{array}{r} 010 \quad 110 \\ 011 \quad 111 \end{array}$$

(E)

$$(e) F = x' + y \cdot z$$

$$= \frac{x'y'z'}{0} + \frac{x'y'z}{1} + \frac{x'yz'}{2} + \frac{x'yz}{3} + \cancel{\frac{xyz}{6}} + \frac{xyz}{7}$$

$$= (x' + y + z)(x' + y + z')(x' + y' + z)$$

100

101

110

$$(f) F = v + (w \cdot x)'$$

$$= v + (w' + x)$$

$$= v + w' + x$$

$$= vx' + vw'x + vwx' + vwx + v'w'x' + v'w'x + v'w'x' + v'w'x + v'w'x' + v'w'x + v'w'x' + v'w'x + v'w'x'$$

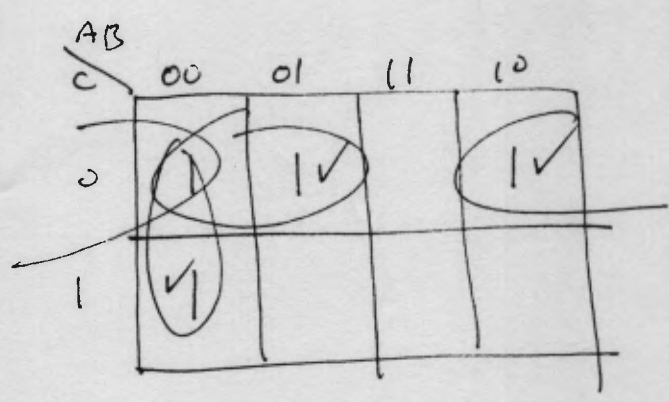
$$= (v + w' + x)$$

100	— 4
101	— 5
110	— 6
111	— 7
000	— 0
001	— 1
010	— 2
011	— 3

010

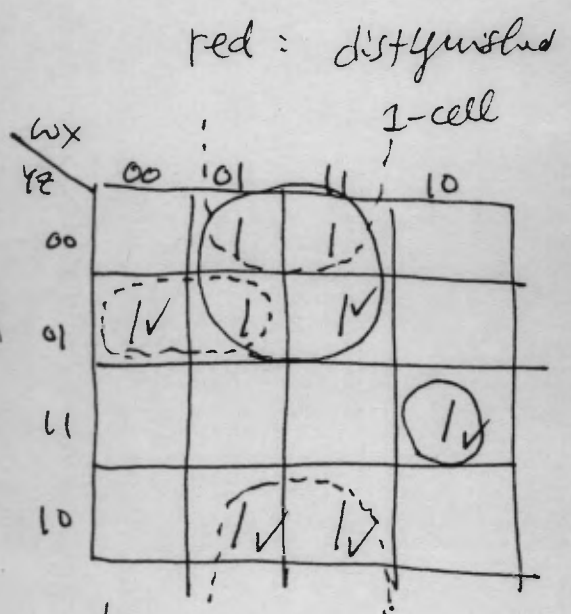
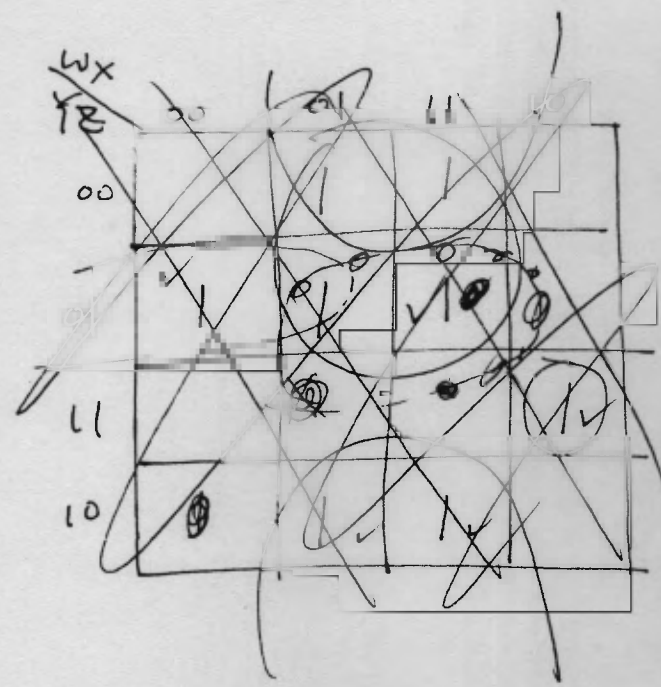
4, 15

(a)



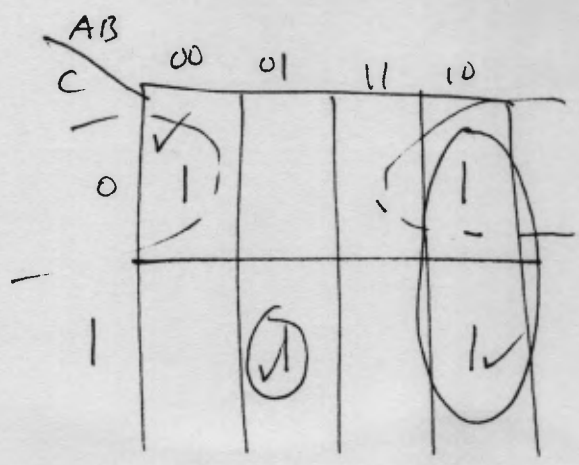
$F = A'B' + A'B + B'C'$, distinguished 1-cell = 1, 2, 3

(b)



$F = XY' + XZ' + W'Y'Z + WX'YZ$

(c)



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

(d)

wx yz	00	01	11	10
00	1			1 ✓
01	1 ✓			
11	1	1 ✓	1 ✓	1 1
10	1			1 1

$$F = yz + w'x' + x'z'$$

(e)

wx yz	00	01	11	10
00		1 ✓		1 ✓
01	1 ✓		1 ✓	
11		1 ✓		1 ✓
10	1 ✓		1 ✓	

$$F = w'x'y'z + w'x'yz' + \dots$$

(f)

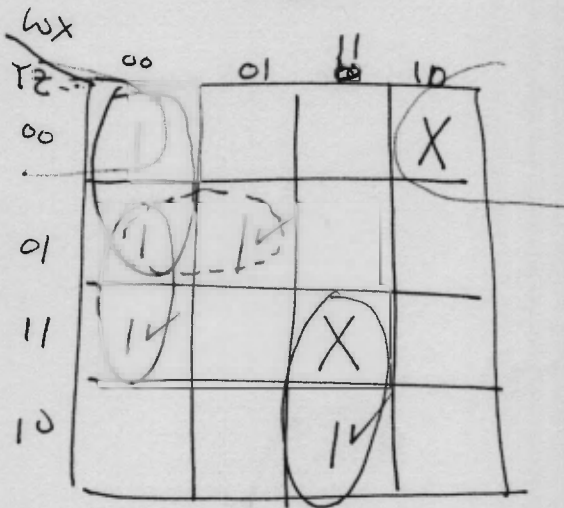
0, 2, 8, 10, 11, 15

A \ B				
	00	01	11	10
00	✓ 1			1 ✓
01				
11			1 ✓	1 ✓
10	✓ 1			1 ✓

$$F = B'D' + ACD$$

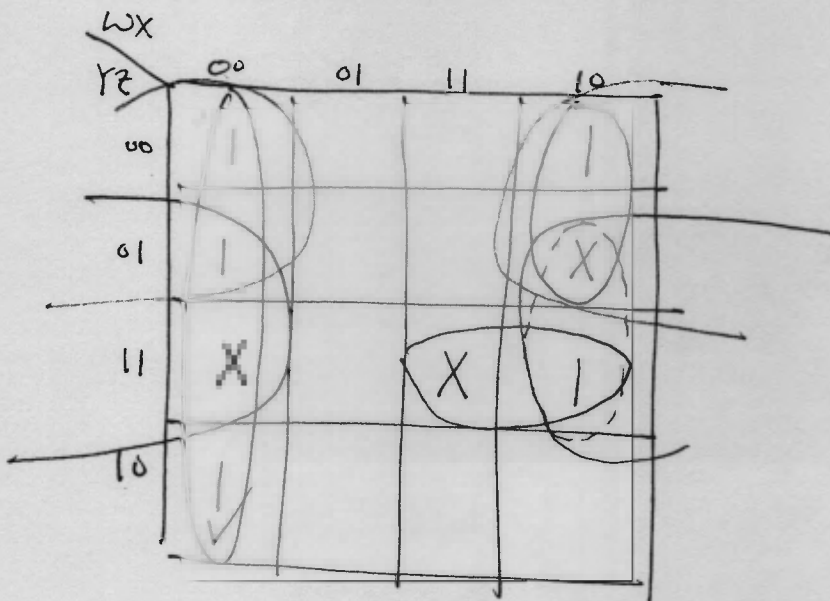
4.18

(a)



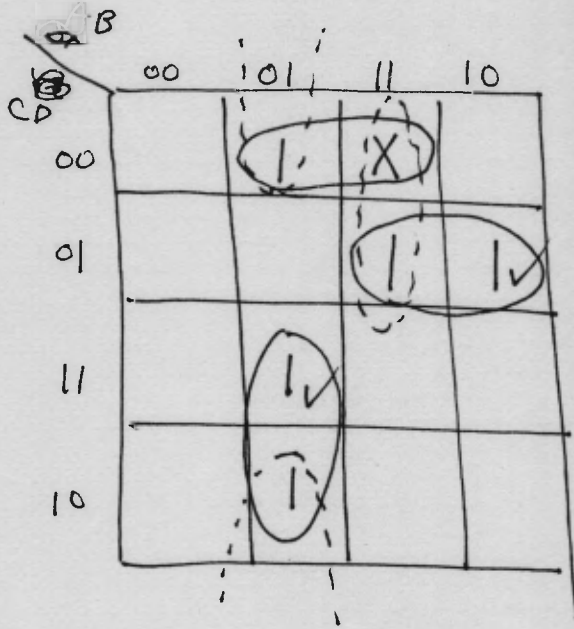
$$F = wx'y + w'x'z + w'y'z + w'x'y'$$

(b)



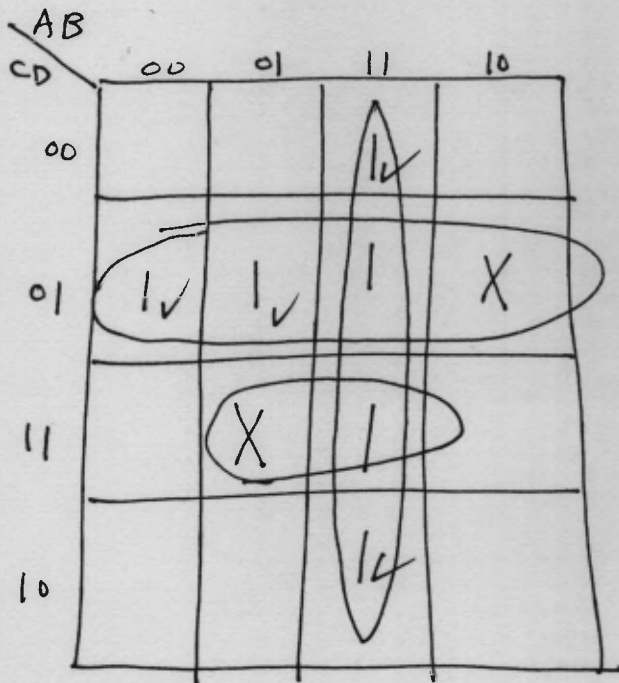
$$F = w'x' + x'y' + x'z$$

(c)



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

(d)



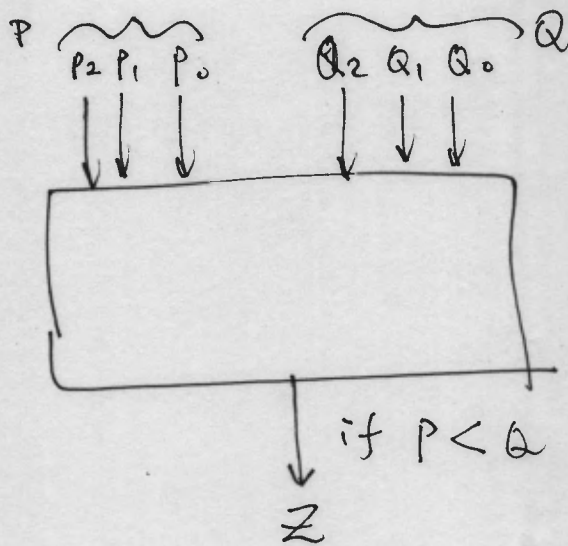
$$F = AB + C'D$$

2

$wx \backslash yz$	00	01	11	10
00	X	1✓	X	
01	X	1✓	1	1✓
11		X	1✓	X
10				

• $f = xy' + wz$

4.55



$$Z = \cancel{P_2 Q_2} \neq$$

$$\bar{P}_2 Q_2 + (P_2 Q_2 + \bar{P}_2 \bar{Q}_2) \cdot \bar{P}_1 Q_1 + (P_2 Q_2 + \bar{P}_2 \bar{Q}_2) \cdot (P_1 Q_1 + \bar{P}_1 \bar{Q}_1) \cdot \bar{P}_0 Q_0$$

or

$$Z = \bar{P}_2 Q_2 + P_2 Q_2 \bar{P}_1 Q_1 + \bar{P}_2 \bar{Q}_2 \bar{P}_1 Q_1 +$$

$$P_2 Q_2 P_1 Q_1 \bar{P}_0 Q_0 + P_2 Q_2 \bar{P}_1 \bar{Q}_1 \bar{P}_0 Q_0 +$$

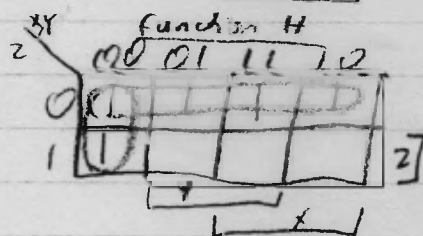
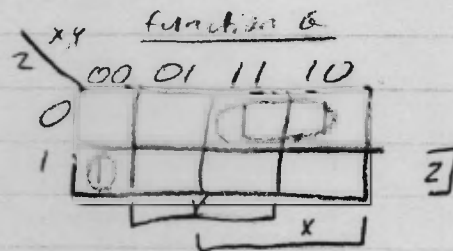
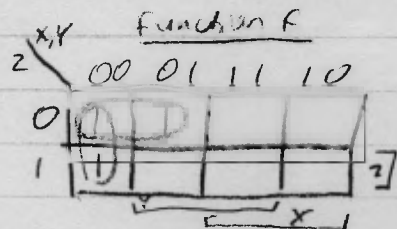
$$\bar{P}_2 \bar{Q}_2 P_1 Q_1 \bar{P}_0 Q_0 + \bar{P}_2 \bar{Q}_2 \bar{P}_1 \bar{Q}_1 \bar{P}_0 Q_0$$

Chris Direnzi

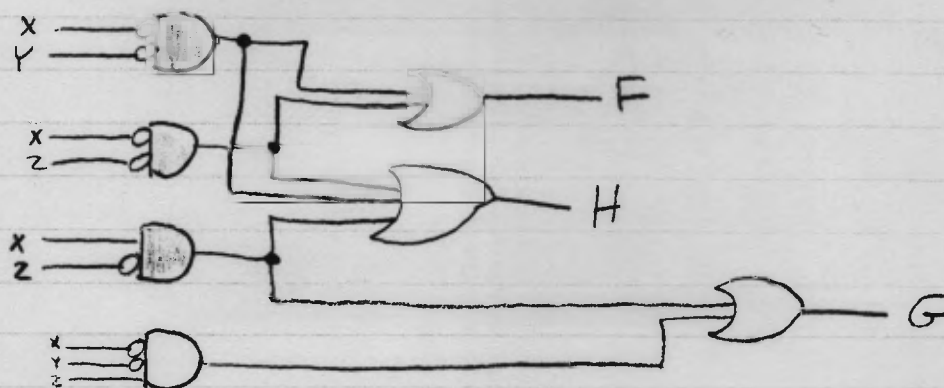
✓ 4.56

#	X	Y	Z	F	G	H
0	0	0	0	1	0	1
1	0	0	1	1	1	1
2	0	1	0	1	0	1
3	0	1	1	0	0	0
4	1	0	0	0	1	1
5	1	0	1	0	0	0
6	1	1	0	0	1	1
7	1	1	1	0	0	0

Function H is
Function G OR function F



$$\begin{aligned}
 F &= X'Y' + X'Z' \\
 G &= XZ' + X'Y'Z \\
 H &= X'Y' + Z' \quad \text{---OR---} \\
 &= X'Y' + XZ' + X'Z'
 \end{aligned}$$



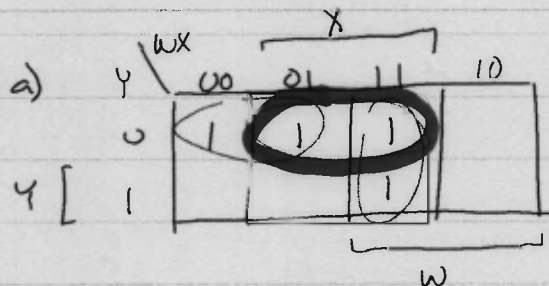
Homework 4

Kyle Murphy

Note Title

1/31/2006

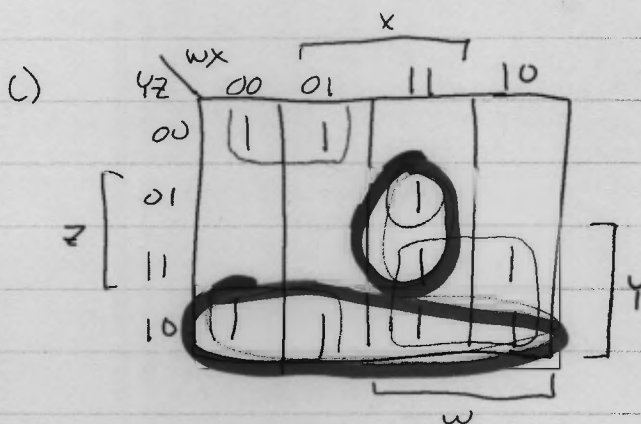
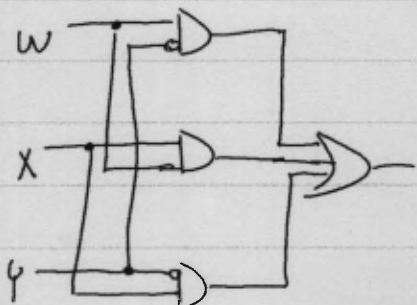
4.19



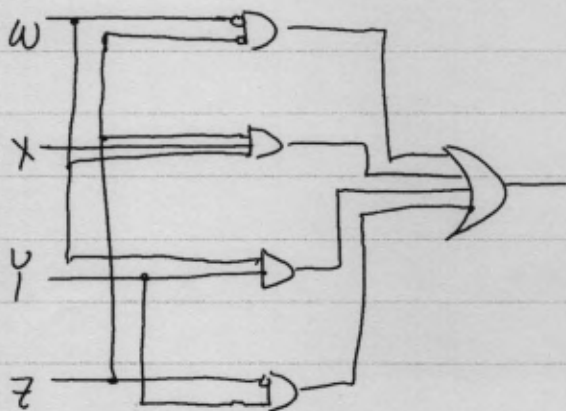
4.19: (a) (c) (e) (g), 4.56, 6.9, 6.43, 6.51

BLUE = STATIC HAZARD

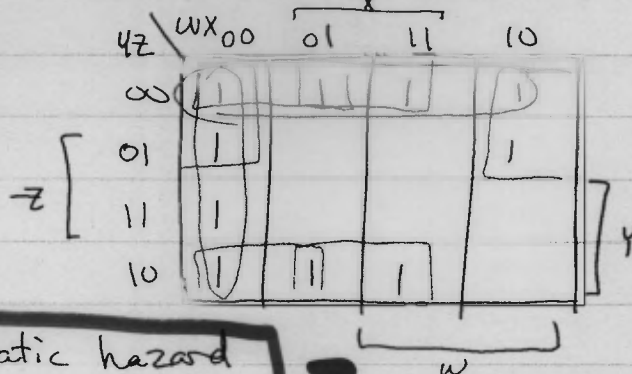
$$F = wx + w'y' + xy'$$



$$F = z'w' + yw + zxw + yz'$$



e) $F = x'w' + x'y' + z'w' + xz' + y'z'$

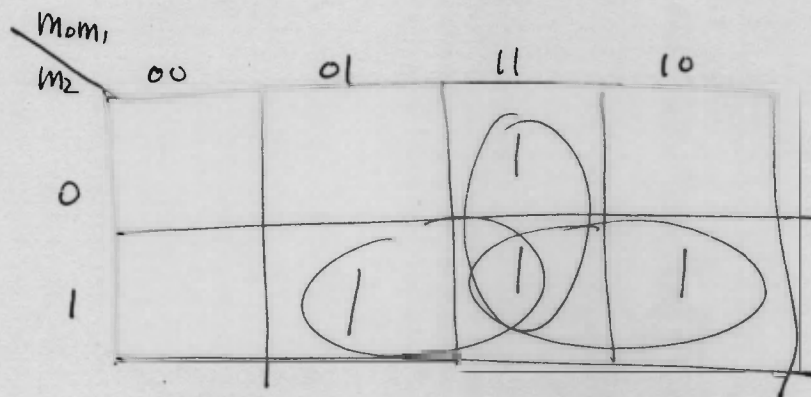


There are no static hazard possibilities

✓ (a)

$m_0 m_1 m_2$

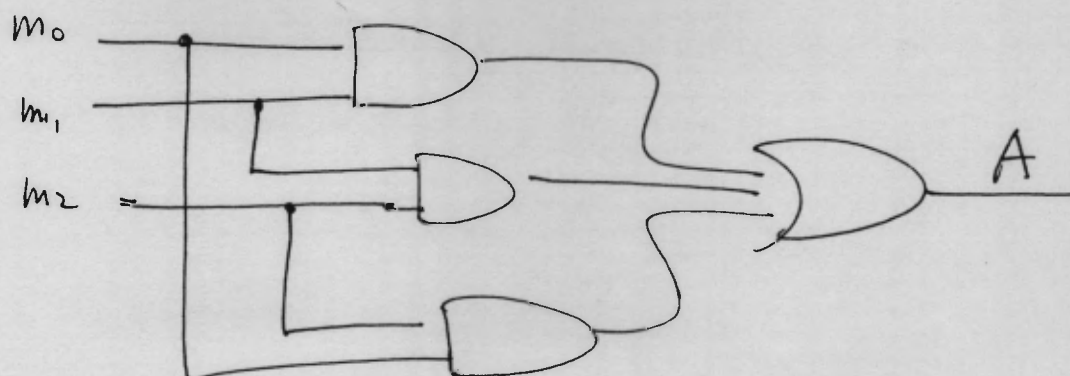
$$A = m_0 m_1 + m_0 m_2 + m_1 m_2 + m_1 m_2 m_3$$



(b) $m_0 m_1 + m_1 m_2 + m_0 m_2$

(c) $m_0 m_1, m_1 m_2, m_0 m_2$ ← Essential PI's
 • There is no secondary Essential PI's

(d)

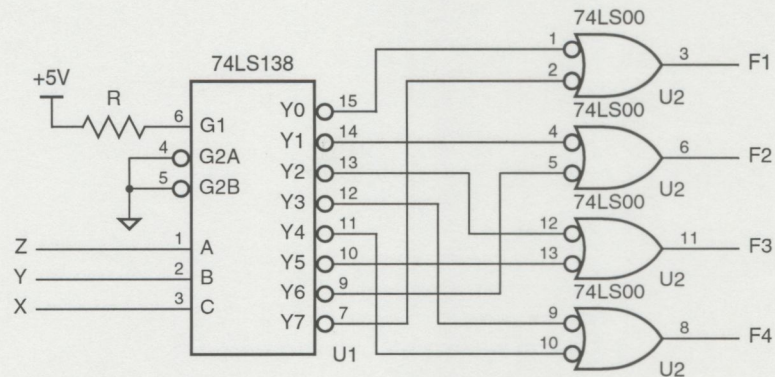


2

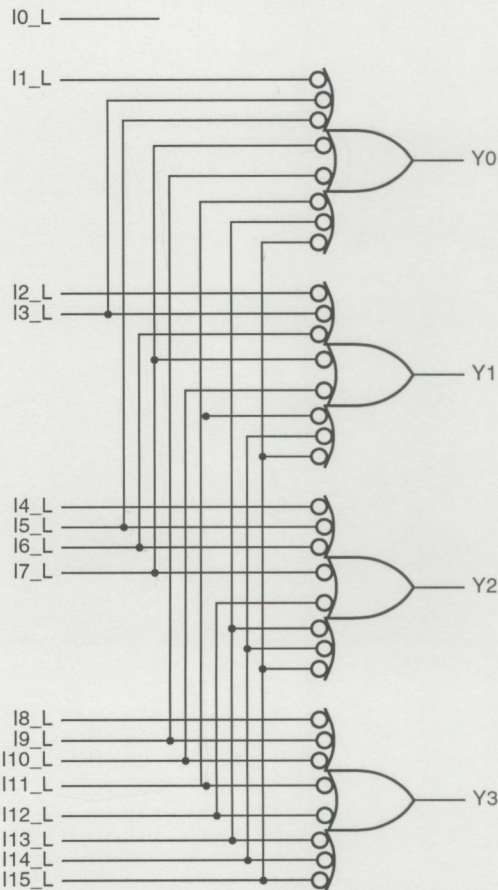
$$\begin{aligned} \text{Safe} = & m_0' m_1' m_2' \dots m_q' + m_0' m_1' m_2' \dots m_q' \\ & + m_0' m_1' m_2' \dots m_q' \\ & \vdots \\ & + m_0' m_1' \dots m_g' m_q' \end{aligned}$$

$$\text{Alarm} = \text{safe}'$$

3e5.82 6.43



3e5.46 6.51 The inputs are active low and the outputs are active high in this design.



16-4 decoder

I1,
I3,
I5
I7
I9
I11
I13
I15