

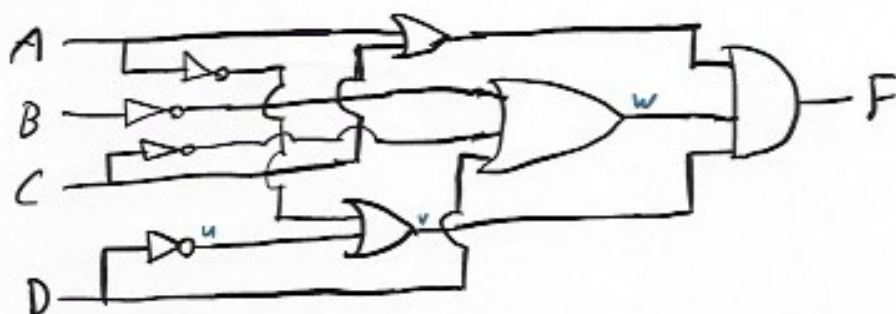
NEELU SARASWATI BHATLA (SRNS2)

1. (a) A combinational logic block takes one or more inputs, performs one or more logic functions on them, and produces one or more outputs. *What is seq logic in that case?*

(b) Static hazards: The output changes briefly when it should remain unchanged. *+ static-zero static-one*

Dynamic hazards: The output changes several times when it should just change once.

2. (a)



(b)

F'

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

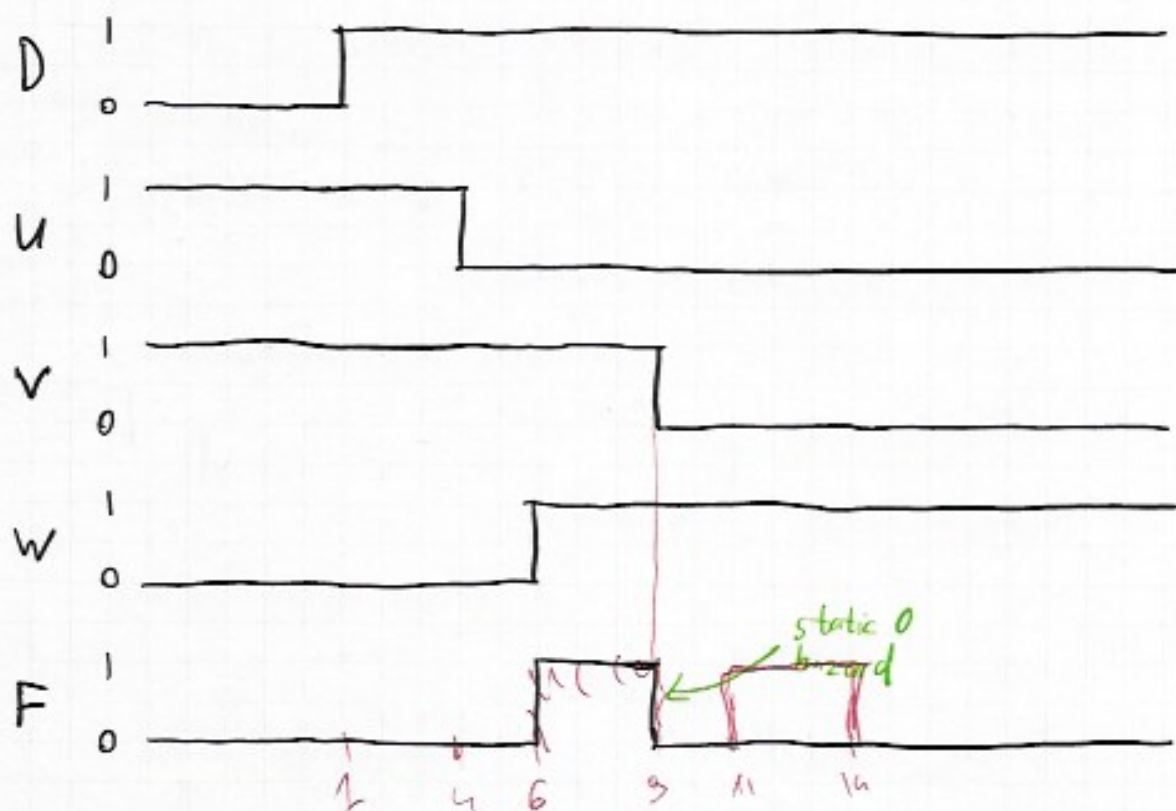
added terms to remove hazard

$$F' = A'C' + AD + BCD' + C'D + ABC$$

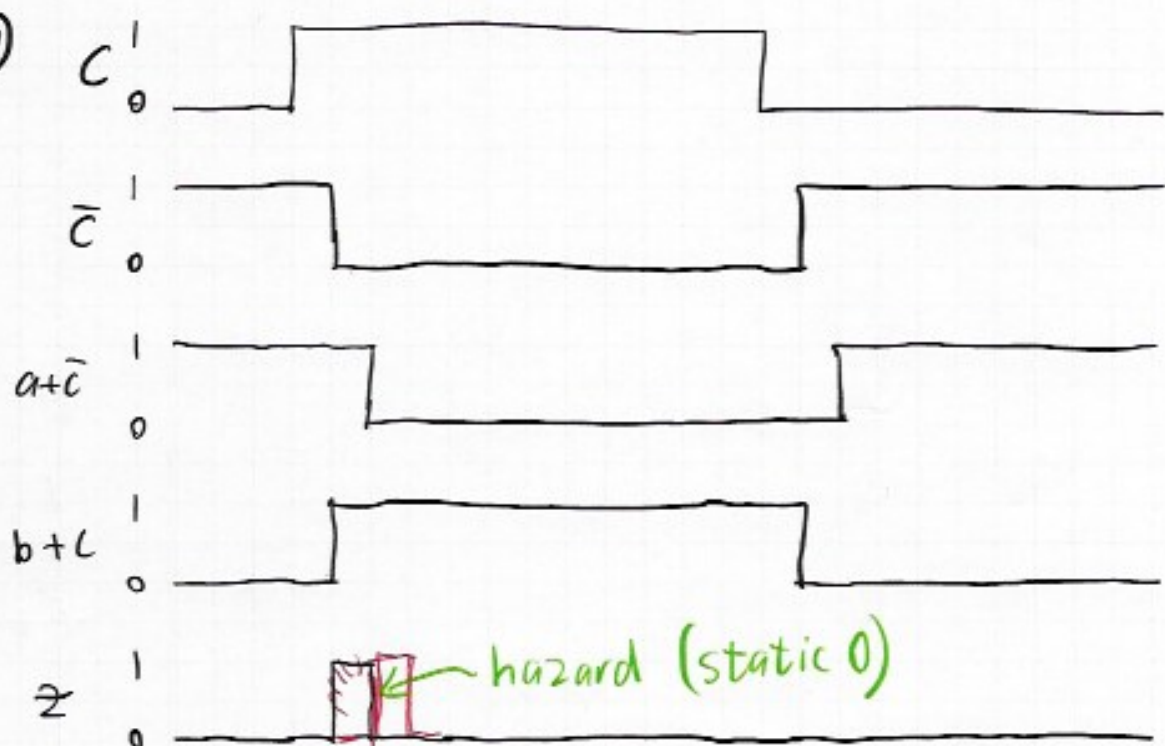
$$F = (A+C) \cdot (A'+D) \cdot (B'+C'+D) \cdot (C+D) \cdot (A'+B'+C')$$

$$= (A+B+D)$$

© Let $A \rightarrow B \rightarrow C = 1$



3. a)



$$\textcircled{b} \quad z = (a + \bar{c}) \cdot (b + c)$$

$$= a \cdot b + b \cdot \bar{c} + a \cdot c + c \cdot \bar{c}$$

$$= a \cdot b \cdot c + a \cdot b \cdot \bar{c} + \cancel{a \cdot b \cdot c} + \bar{a} \cdot b \cdot \bar{c} + \cancel{a \cdot b \cdot c} + a \cdot \bar{b} \cdot c$$

$$= a \cdot c (b + \bar{b}) + b \cdot \bar{c} (a + \bar{a})$$

$$= \underline{\underline{a \cdot c + b \cdot \bar{c}}}$$

$$z' = \overline{a \cdot c + b \cdot \bar{c}}$$

$$= (\bar{a} \cdot \bar{c}) \cdot (\bar{b} \cdot \bar{\bar{c}})$$

$$= (\bar{a} + \bar{c}) \cdot (\bar{b} + c)$$

$$= \bar{a} \cdot \bar{b} + \bar{b} \cdot \bar{c} + \bar{a} \cdot c + c \cdot \bar{c}$$

$$= \bar{a} \cdot \bar{b} + \bar{b} \cdot \bar{c} + \bar{a} \cdot c$$

$$= \bar{a} \cdot c + \bar{b} \cdot \bar{c} \quad \checkmark$$

\textcircled{c}

		$\underline{z'}$			
	ab				
c		00	01	11	10
	0	1			1
	1	1	1		

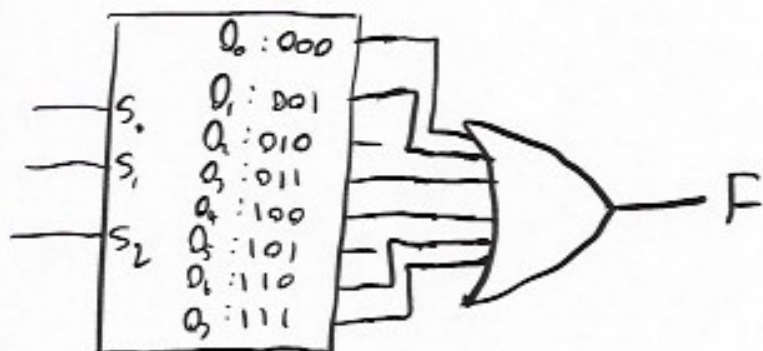
Add another term to link these terms, as shown in green on the K-map.

$$\bar{z} = ac + b\bar{c} + \bar{a}\bar{b}$$

$$z = (a + \bar{c})(b + c)(a + \bar{b})$$

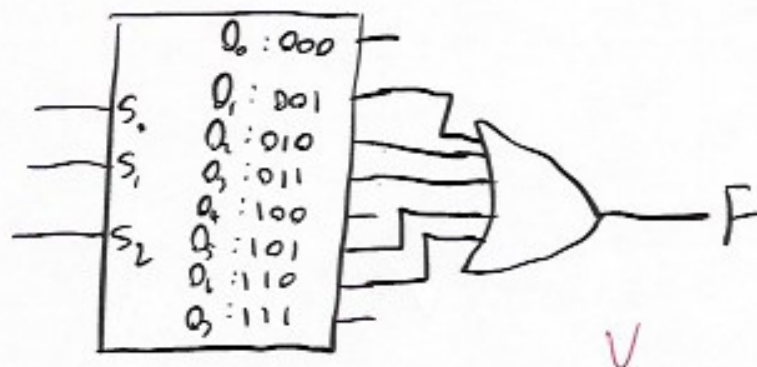
4. a) $F = \sum m(0, 1, 3, 4, 6, 7)$

000
001
011
100
110
111



b) $F = \sum m(1, 2, 3, 5, 6)$

001
010
011
101
110

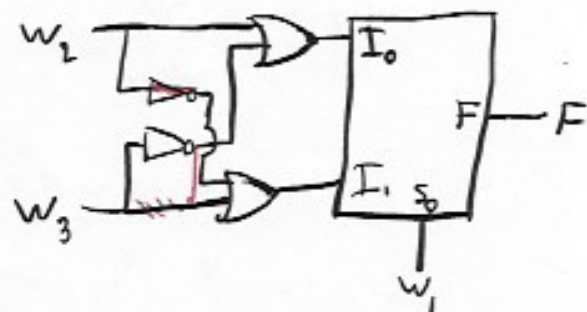


5. $F = w_1'w_3' + w_2w_3' + w_1'w_2$

w_1	w_2	w_3	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

$I_0 = (w_2'w_3)'$
 $= w_2 + w_3'$ ✓

$I_1 = w_2w_3'$
 $= w_2' + w_3 -$



$w_2 + w_3'$

6.

$a \oplus b \oplus c$			
a	b	c	$a \oplus b \oplus c$
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

$I_0 = b \oplus c$

$I_1 = \overline{b \cdot c}$
 $= \overline{b \cdot c}$

$b \oplus c$		
b	c	$b \oplus c$
0	0	0
0	1	1
1	0	1
1	1	0

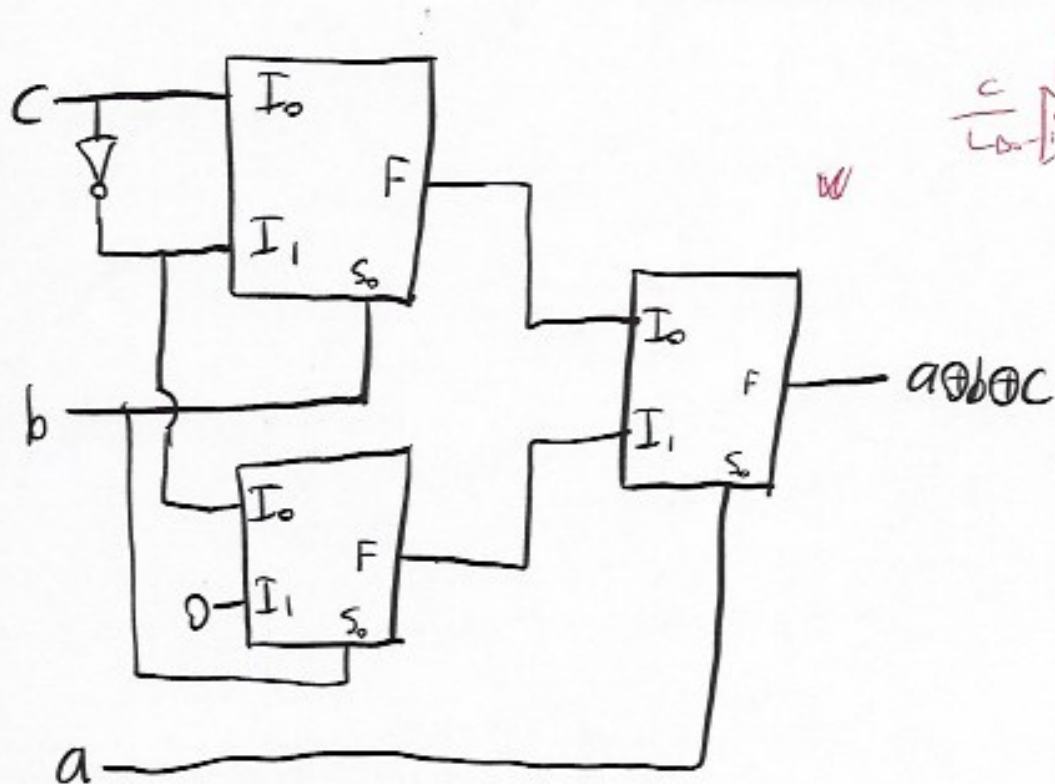
$I_0 = c$

$I_1 = \bar{c}$

$\bar{b} \cdot \bar{c}$		
b	c	$\bar{b} \cdot \bar{c}$
0	0	1
0	1	0
1	0	0
1	1	0

$I_0 = \bar{c}$

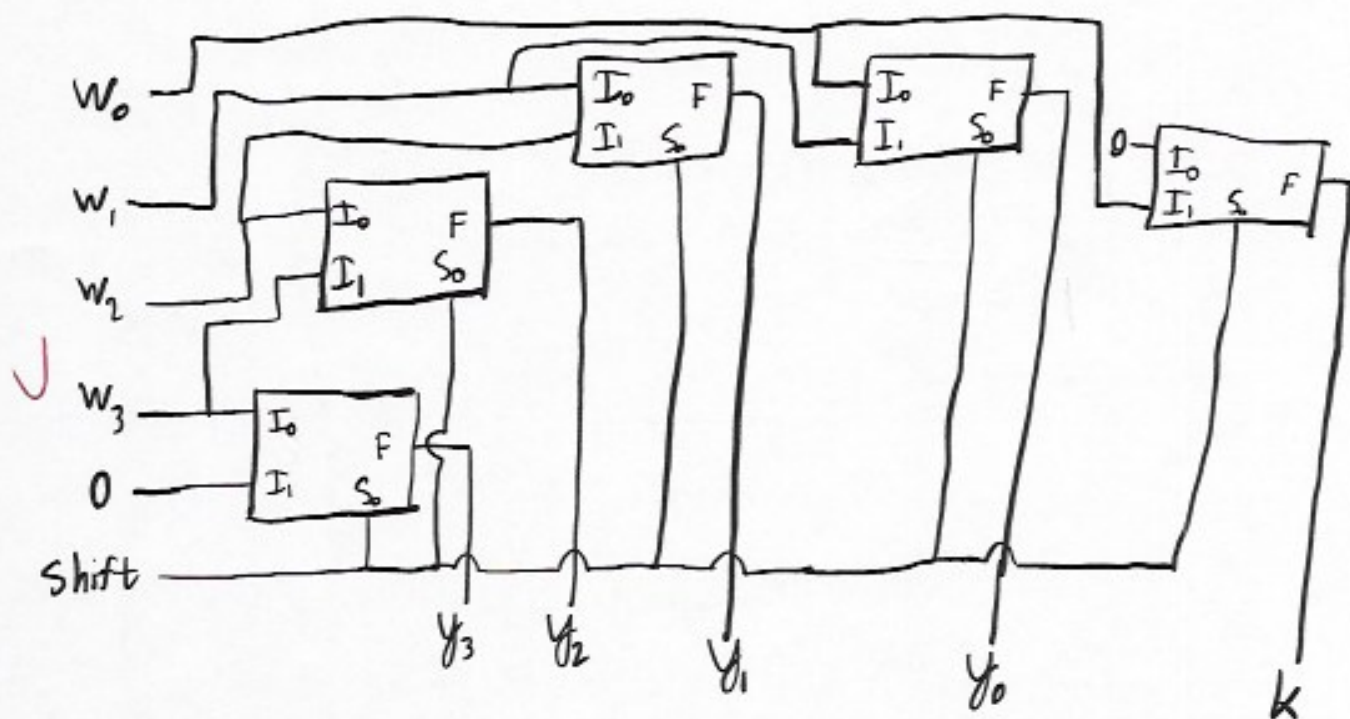
$I_1 = 0$



$$\frac{c}{\bar{c}} \cdot \frac{b}{\bar{b}} \cdot \frac{a}{\bar{a}} = f$$

7.

Shift	y_3	y_2	y_1	y_0	k
0	w_3	w_2	w_1	w_0	0
1	0	w_3	w_2	w_1	w_0



8.

s_1	s_0	y_3	y_2	y_1	y_0
0	0	w_3	w_2	w_1	w_0
✓ 0	1	w_0	w_3	w_2	w_1
1	0	w_1	w_0	w_3	w_2
1	1	w_2	w_1	w_0	w_3

(continued on next page)

