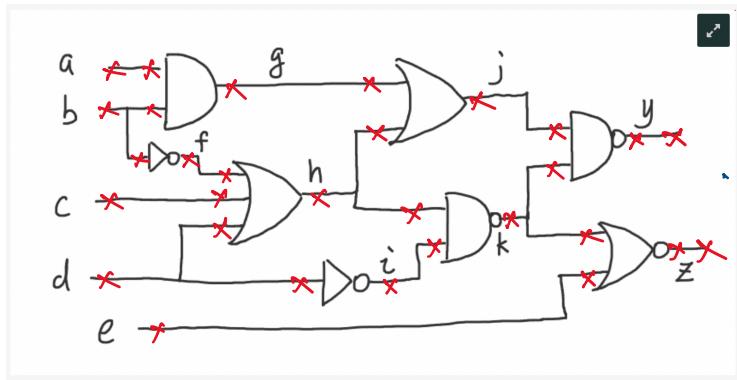


# HW3

Saturday, September 21, 2024

9:14 PM



Full Fault list and fault grouping  
based on fan out :-

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>✓ <math>a \cdot 0, g \cdot a \cdot 0</math></li> <li>✓ <math>b \cdot 0</math></li> <li>✓ <math>g \cdot b \cdot 0</math></li> <li>✓ <math>f \cdot b \cdot 0</math></li> <li>✓ <math>c \cdot 0, h \cdot c \cdot 0</math></li> <li>✓ <math>d \cdot 0</math></li> <li>✓ <del><math>k \cdot d \cdot 0</math></del></li> <li>✓ <math>i \cdot d \cdot 0</math></li> <li>✓ <math>e \cdot 0, z \cdot e \cdot 0</math></li> <li>✓ <math>g \cdot 0, j \cdot g \cdot 0</math></li> <li>✓ <math>h \cdot 0</math></li> <li>✓ <del><math>j \cdot h \cdot 0</math></del></li> <li>✓ <del><math>h \cdot k \cdot 0</math></del></li> <li>✓ <del><math>i \cdot 0, k \cdot i \cdot 0</math></del></li> </ul> | <ul style="list-style-type: none"> <li>✓ <math>a \cdot 1, g \cdot a \cdot 1</math></li> <li>✓ <math>b \cdot 1</math></li> <li>✓ <math>g \cdot b \cdot 1</math></li> <li>✓ <math>f \cdot b \cdot 1</math></li> <li>✓ <math>c \cdot 1, h \cdot c \cdot 1</math></li> <li>✓ <math>d \cdot 1</math></li> <li>✓ <math>h \cdot d \cdot 1</math></li> <li>✓ <math>i \cdot d \cdot 1</math></li> <li>✓ <math>e \cdot 1, z \cdot e \cdot 1</math></li> <li>✓ <math>g \cdot 1, j \cdot g \cdot 1</math></li> <li>✓ <math>h \cdot 1</math></li> <li>✓ <del><math>j \cdot h \cdot 1</math></del></li> <li>✓ <del><math>k \cdot h \cdot 1</math></del></li> <li>✓ <del><math>i \cdot 1, k \cdot i \cdot 1</math></del></li> </ul> | <ul style="list-style-type: none"> <li>✓ <math>f \cdot 1, h \cdot f \cdot 1</math></li> <li>✓ <math>k \cdot 1</math></li> <li>✓ <math>f \cdot 0, h \cdot f \cdot 0</math></li> </ul> |
|---|--|--|

- ✓  $j^0, y-j^0$
- ✓  $y-k^0$
- ✓  $z-k^0$
- ✓  $y^0, y_{\text{out}}^0$
- ✓  $z^0, z_{\text{out}}^0$

- ✓  $j^1, y-j^1$
- ✓  $y-k^1$
- ✓  $z-k^1$
- ✓  $y^1, y_{\text{out}}^1$
- ✓  $z^1, z_{\text{out}}^1$

### Fault collapsing around gates :-

- 1  $a^0, g-a^0, g-b^0, g^0, j^g-a^0$
- 2  $b^0$
- 3  $f-b^0, f^1, h-f^1, c^1, h-c^1, h-d^1 \rightarrow h^1$
- 4  $c^0, h-c^0$
- 5  $d^0$
- 6  $h-d^0$
- 7  $i^d-a^0, i^1, k-i^1$
- 8  $e^0, z-e^0$
- 9  $h^0,$
- 10  $j^h-a^0$
- 11  $k-h^0, k^1, i^0, i-k^0, i-d^1$
- 12  $j^0, y-j^0, y-k^0, y^1 \rightarrow y_{\text{out}}^1$
- 13  $z-k^0$
- 14  $y^0, y_{\text{out}}^0$
- 15  $z^0, z_{\text{out}}^0, z-k^1, e^1, z-e^1$
- 16  $a^1, g-a^1$
- 17  $b^1$
- 18  $g-b^1$

- 1  $f-b-1, f-0, h-f-0$   
 2  $d-1$   
 3  $g-1, j-g-1, j-1, y-j-1, j-h-1$   
 4  $h-h-1$   
 5  $y-k-1$   
 6  $z-1, z-out-1$   
 7  $k-0$

### Fault Dominance:-

- $g-1$  dominated by  $g-a-1, g-b-1$   
 $\Rightarrow$  TV 21 dominated by TV 16, TV 18
- $h-0$  dominated by  $h-f-0, h-c-0, h-d-0$   
 $\Rightarrow$  TV 9 dominated by TV 4, TV 6, TV 19
- $j-0$  dominated by  $j-g-0, j-h-0$   
 $\Rightarrow$  TV 12 dominated by TV 1, TV 10
- $k-0$  dominated by  $k-h-1, k-p-1$   
 $\Rightarrow$  TV 25 dominated by TV 7, TV 22
- $y-0$  dominated by  $y-k-1, y-j-1$   
 $\Rightarrow$  TV 14 dominated by TV 23, TV 21  
 $\Rightarrow$  TV 21 is dominated by TV 16, TV 18  
 $\Rightarrow$  ∴ TV 14 is dominated by TV 22, 16, 18
- $z-1$  dominated by  $z-k-0, z-l-0$   
 $\Rightarrow$  TV 24 dominated by TV 13, TV 8

Ans

1

①  $a=0$  and  $b=0$  are not equivalent  
(TV1 and TV2)

② any TV that detects  $g=0$  must detect  $a=0$   
⇒ From TV1  $g=0 \equiv a=0$

③  $y_0$  is dominated by  $y=j=1$   
⇒ TV 14 dominated by TV 2B, TV 2F  
⇒ D' O/P at NAND gate is dominated  
by SAI faults at P/P.  
⇒ Only by **fault dominance** TV for  
 $y=j=1$  detects  $y=0$  and not by  
**fault equivalence**

④ From TV 11,  $k=1 \equiv p=d=1$

⑤ TV 12 is dominated by TV1 and TV10  
⇒ TV for  $j=h=0$  detects  $j=0$

⑥ TV a is dominated by TV4, not the  
other way around.

i.e. all TV for  $c=0$  detects  $h=0$   
but not all TV for  $h=0$  can detect  $c=0$

⑦ By fault dominance,  $g=1$  is dominated by  
 $g=b=1$  and not  $b=1$

⑧ TV 14 is dominated by TV 2F  
⇒ D' O/P at NAND gate is dominated  
by SAI faults at P/P

⇒ so any TV that detects  $j=1$  will detect  
 $j=0$

⑨ and 1 more ...

④ TV 1 and TV 12 are not equivalent

But TV 12 is dominated by TV 1

⇒ ∴ Any TV that detects g-b-0 will also detect y-k-0

⑤ TV 9 and TV 14 are not equivalent

TV 14 is not dominated by TV 9

∴ Any TV that detects h-0 cannot detect y-0

⑥ TV 4 and TV 15 are not equivalent

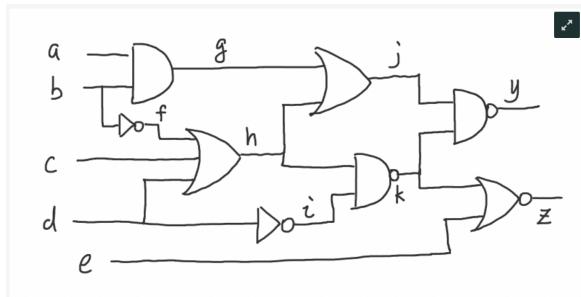
TV 4 does not dominate TV 15

⇒ any TV that detects c-0 does not detect z-0

⑦ TV 14 is dominated by TV 22, 16, 18

⇒ any TV for a-1 can detect y-0

Q3



For  $a \cdot 0$

⇒  $a=1$  For  $y=0$ ,  $b=1 \Rightarrow f=0 \rightarrow ①$

⇒ For  $g=0$ ,  $h=0 \Rightarrow k=1 \rightarrow ②$

⇒ For  $h=0$ ,  $f=0 \rightarrow$  satisfies ①

$c=0, d=0$

⇒ For  $y=0$ ,  $k=1 \rightarrow$  satisfies ②

∴  $TV(a \cdot 0) = 1100 \times$

For  $j \cdot h \cdot 0$

$j \cdot h = 0 \Rightarrow h=1 \Rightarrow f=1$  or  $c=1$  or  $d=1$

(i.e.)  $f=1$