

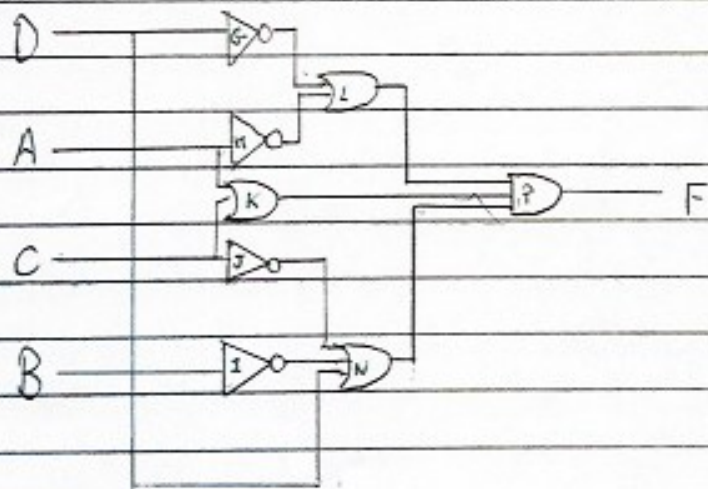
Digital Electronics Supervision II

1a A combinational logic block takes ~~boolean~~ ^{boolean} inputs in the form of high or low ~~logic~~ ^{voltage} levels along wires, and, using logic gates, produces ~~boolean~~ ^{boolean} outputs \rightarrow Comb v seq logic?

b A static hazard is when, due to propagation delay in the logic gates, even when the output should theoretically stay constant for a given change to the inputs, it briefly bounces to the opposite state before returning

✓ A dynamic hazard is when the output is supposed to toggle to the opposite state in response to a change in the inputs, but briefly bounces back to its original state before settling.

2a



b

		B			
CD \ AB		00	01	11	10
D	C	0	0	1	1
	0	0	0	0	0
	1	1	1	0	0
	0	1	0	0	1

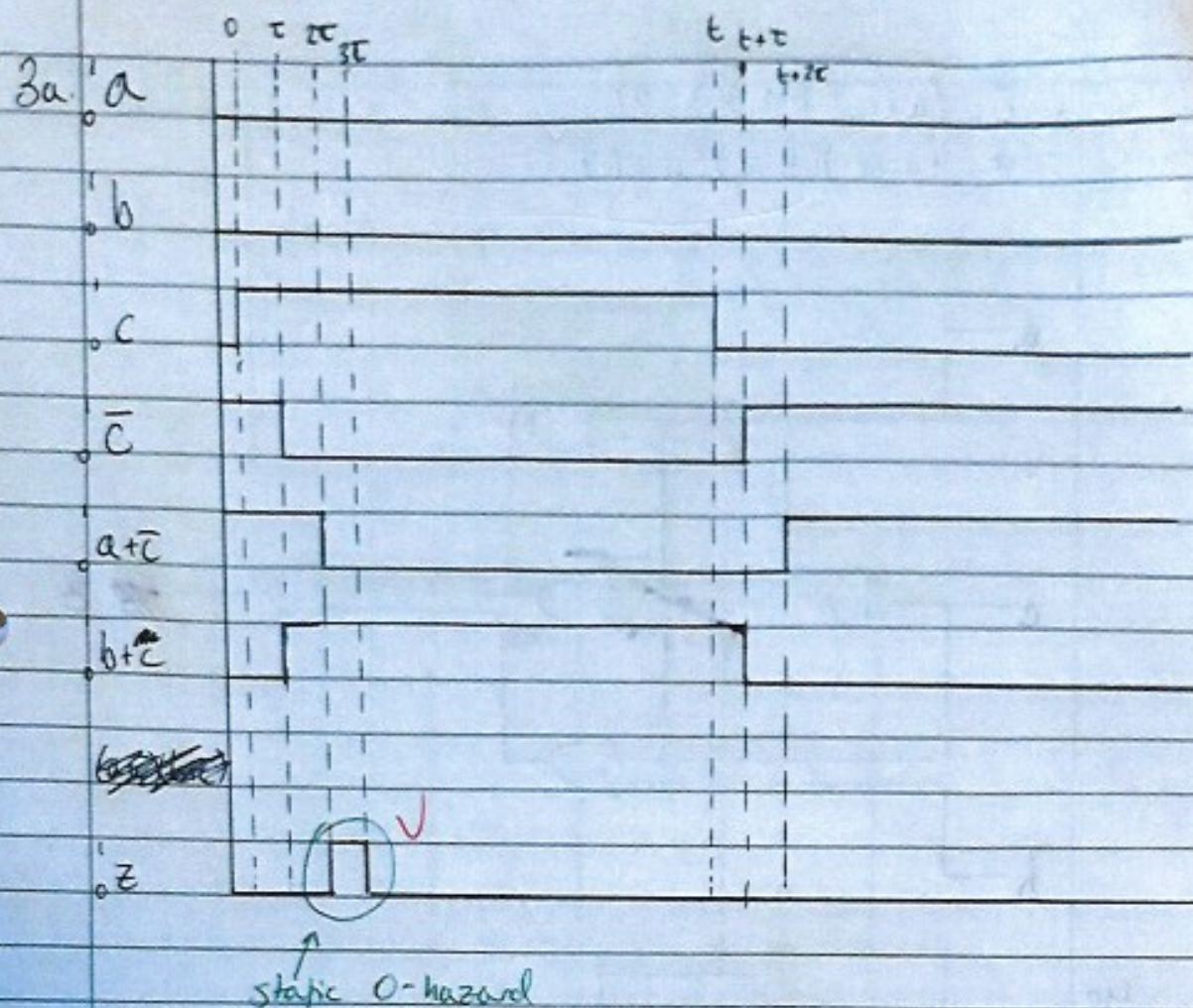
→ bigger group

Eliminate the static 0-hazard by writing

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



Static 0-hazard



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

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

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

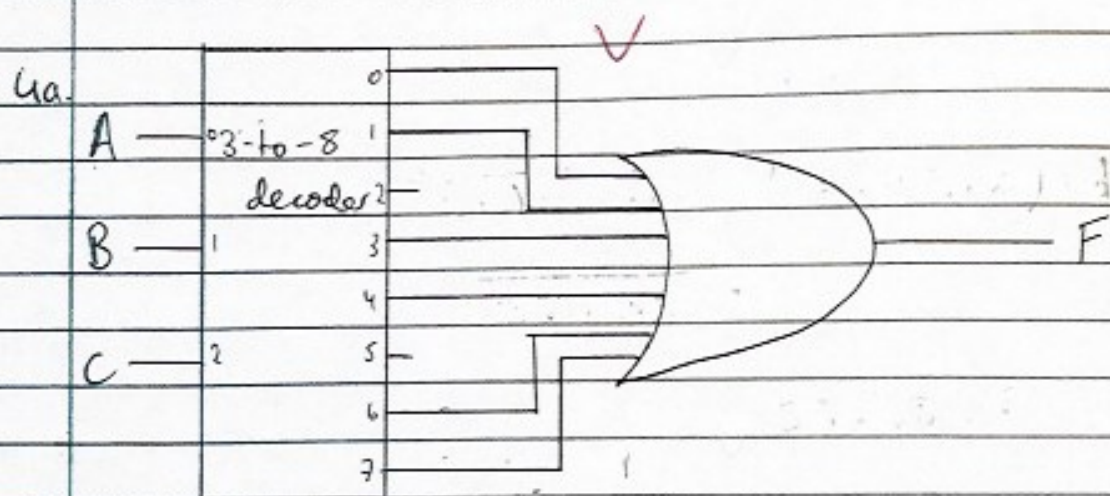
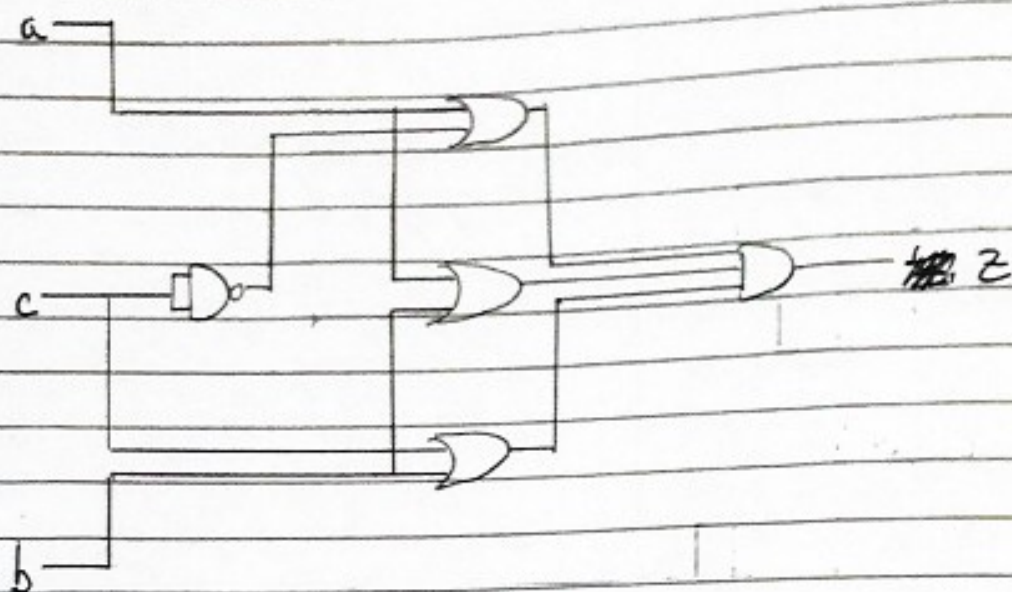
		b			
	c \ ab	00	01	11	10
\bar{z}	0	0	0	0	0
	1	0	0	0	0

∴ To fix the hazard: $\bar{z} = \bar{a}c + \bar{b}\bar{c} + \bar{a}b$

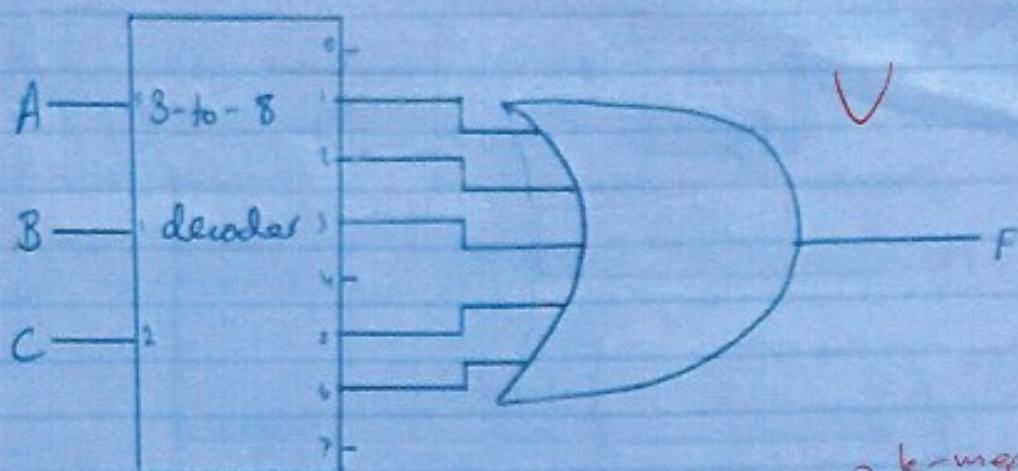
$$= \overline{(a + \bar{c})} + \overline{(b + c)} + \overline{(a + b)}$$

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

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



b.

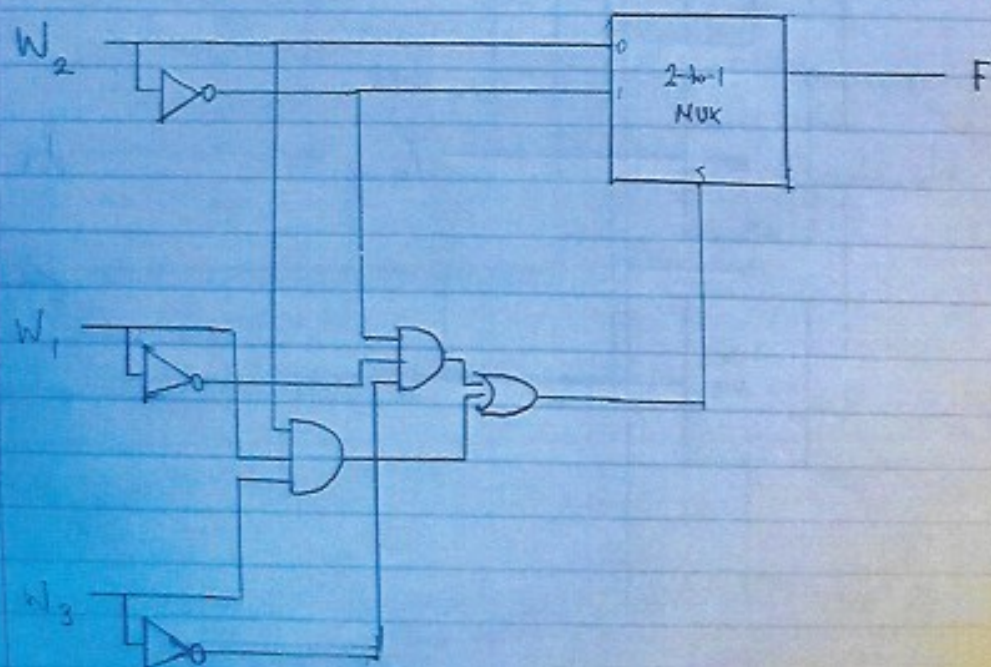


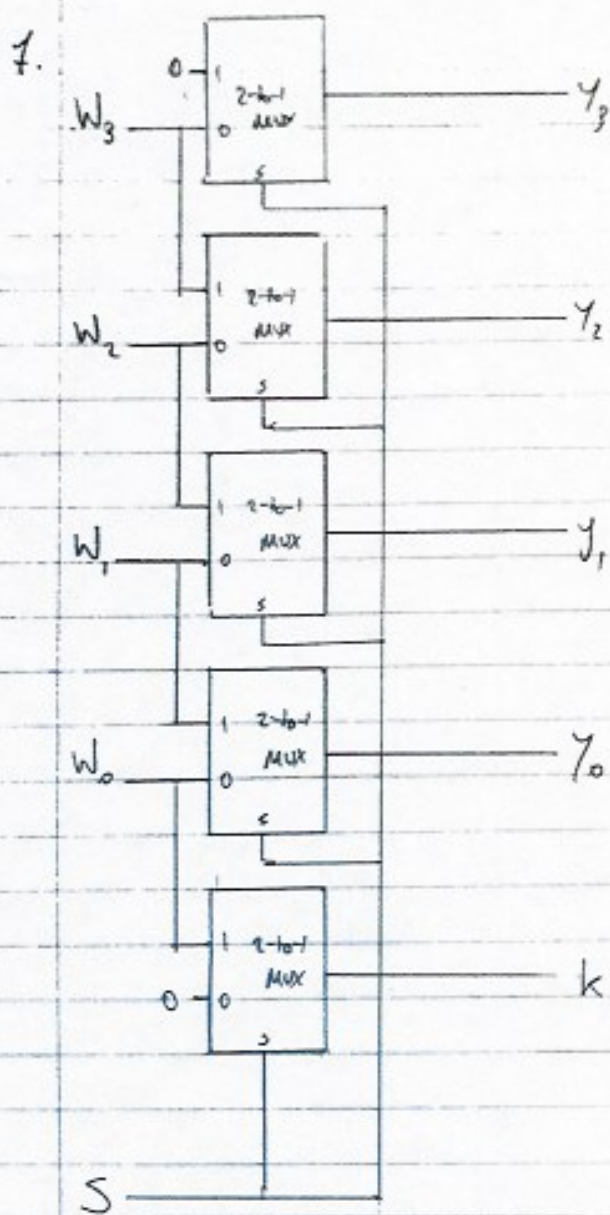
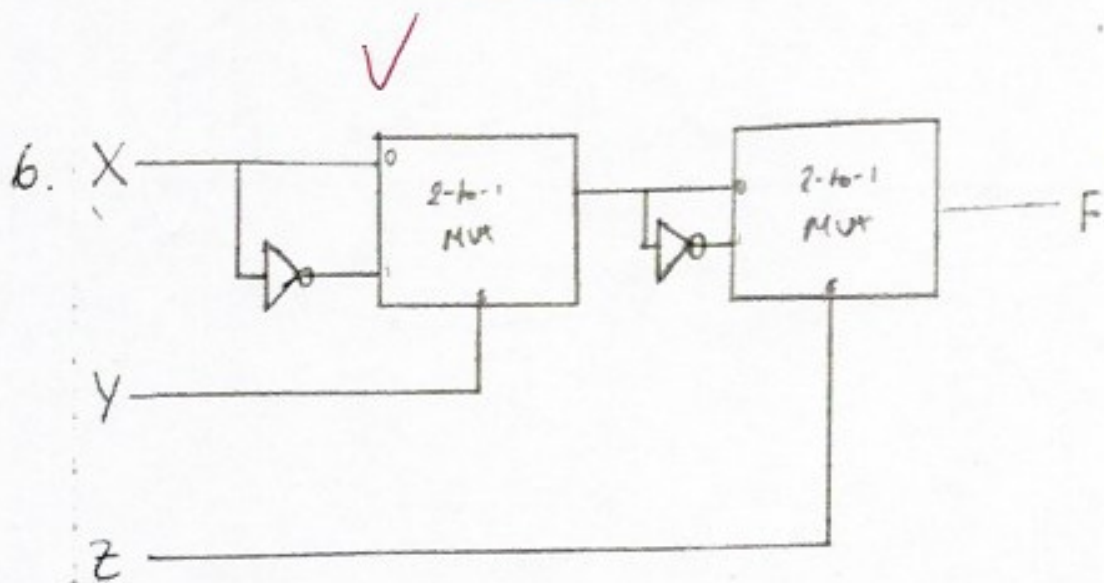
5

w_1	w_2	w_3	$\bar{w}_1 \bar{w}_2$	$w_2 \bar{w}_3$	$\bar{w}_1 w_2$	F
0	0	0	1	0	0	1
0	0	1	0	0	0	0
0	1	0	1	1	1	1
0	1	1	0	0	1	1
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	0	1	0	1
1	1	1	0	0	0	0

$w_2=0$
 $w_2=1$
 $w_3=0$
 $w_3=1$

K-map i.e. or by looking
 f_1
 $f_2 = ?$
 $f_2 = ?$





8.

