Exercise 1

$t_{gate\ delay} = 1 + 0.1 \cdot 2$

$2(t_{gate\ delay}) =$

$D_1 + t_{comb}$
2.04

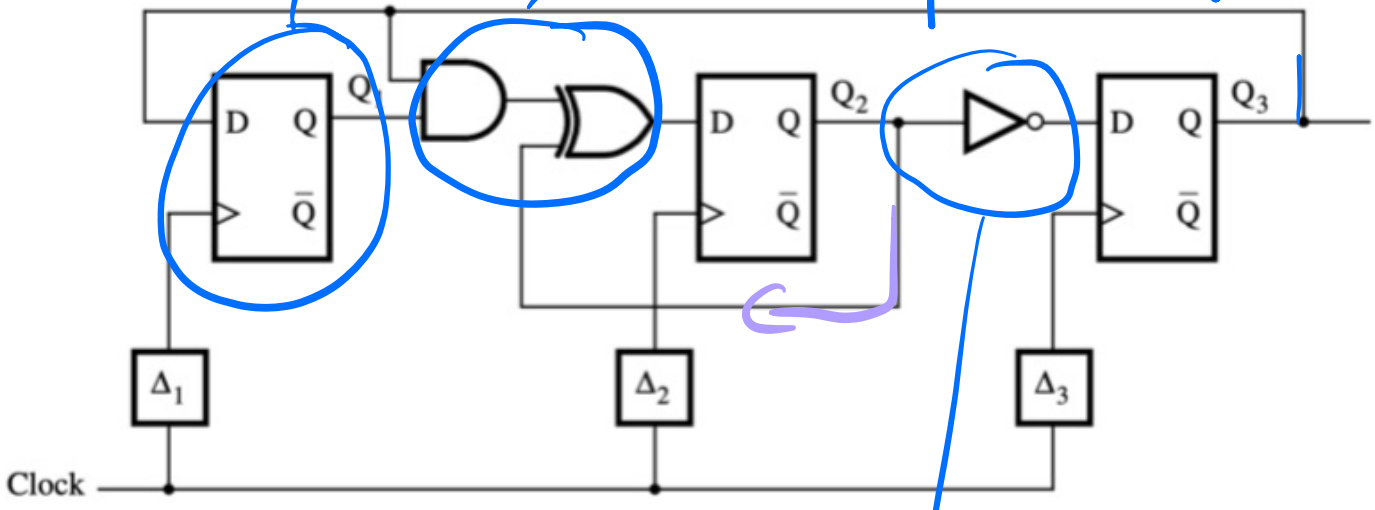
(a) $t_{comb_1} = 2.04\ ns > 0.6ns$

$t_{comb_2} = 1.01\ ns$

$t_{CQ}\ (1ns) + t_{comb}\ (2.04ns)$

+ thold (0.4ns)

+ tsetup (0.6ns)



1ns + 1.01ns + 0.6ns
tcQ tcomb +0.4ns

1 + 2.4 + 0.6 = 4
1 + 1.1 + 0.6 = 2.7
1 + 0 + 0.6 = 1.6

1 + 1.2 + 0.6

on prend le ⊕ grand $\frac{1}{4} = \frac{1}{T} = f_{max}$

comb + $t_{cQ_{min}} \geq t_{hold}$?
oui car $t_{cQ_{min}} \geq 0.8$

(b)

$$t_{comb} + t_{cq} < (t_{clk} - t_{setup} + t_{skew})$$

t_{clk} ↓ 0.6

$$\Rightarrow t_{comb} + t_{cq} - t_{skew}$$

$$1 + 2.4 + 0.6 - 0.7 = 3.3$$

$$1 + 1.1 + 0.6 + 0.7 = 3.4$$

$$\frac{1}{3.4} = f_{max}$$

$$t_{cq} + t_{comb} - t_{skew} \geq t_{hold}$$

$$\Leftrightarrow \quad 3.4 - 0.7 \geq 0.4$$

(c)

1→2

$1 + 2.4 + 0.6 + 0.7 = 4.7$

2→3

$1 + 1.1 + 0.6 - 0.5$

$1 + 0 + 0.6 - 1 + 0.5 = 1.1$

$-t_{Skreu1} + t_{Skreu3}$

↓

$0.8\,(min) - 1 + 0.5 = 0.3!$ ⚠

Exercise 2

(1)

	IN		
	0	1	OUT
IDLE	IDLE	A0	
A0	IDLE	A1	
A1	IDLE	A2	
A2	IDLE	A3	
A3	IDLE	A4	
A4	IDLE	A5	
A5	IDLE	A6	
A6	IDLE	A7	
A7	IDLE	A8	
A8	IDLE	A9	
A9	IDLE	B	
B	IDLE	B	