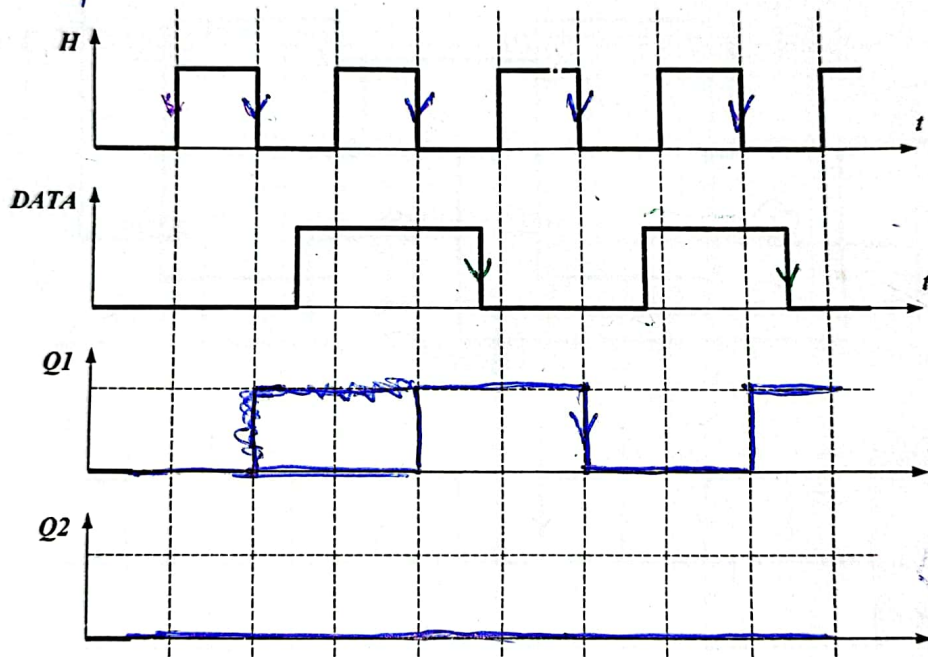
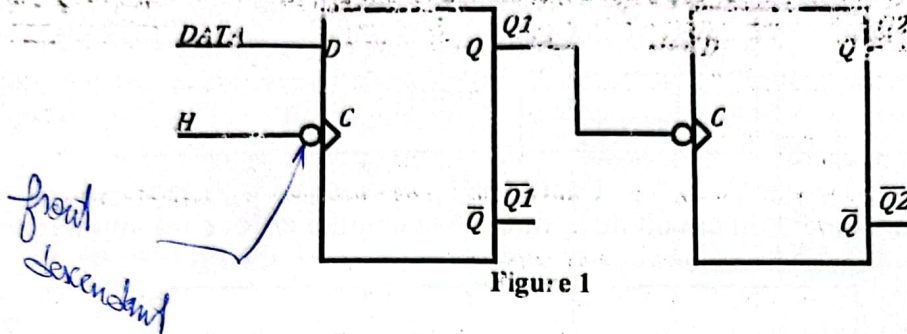


# Electronique Numérique

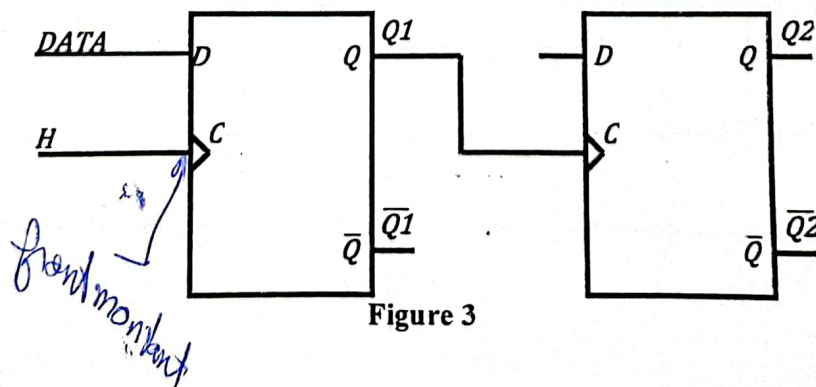
## Série de TD N°4

### Exercice 1

1. Analyser le fonctionnement du circuit de la figure 1 et compléter les chronogrammes de la figure 2.



2. Analyser le fonctionnement du circuit de la figure 3 et compléter les chronogrammes de la figure 4.



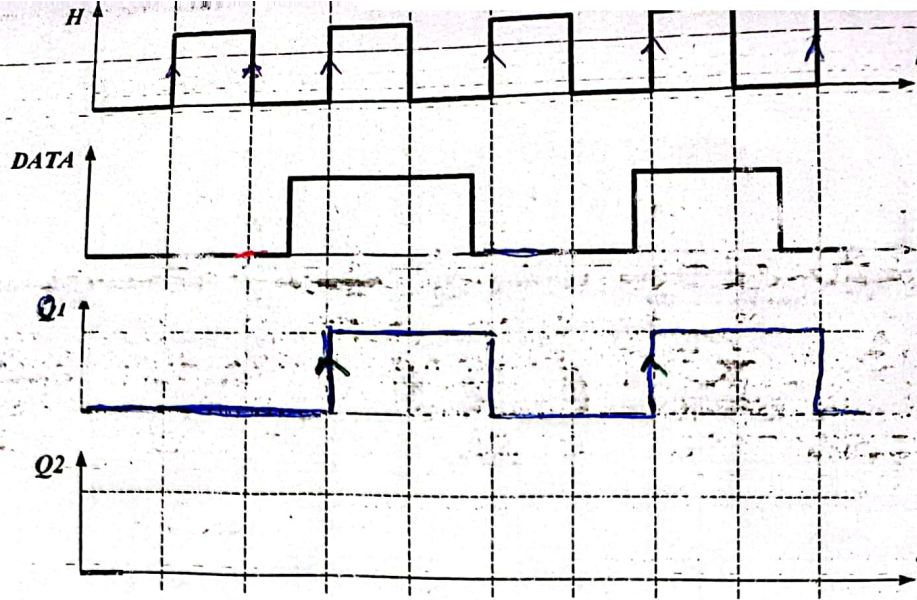


Figure 4

3. Analyser le fonctionnement du circuit de la figure 5 et compléter les chronogrammes de la figure 6.

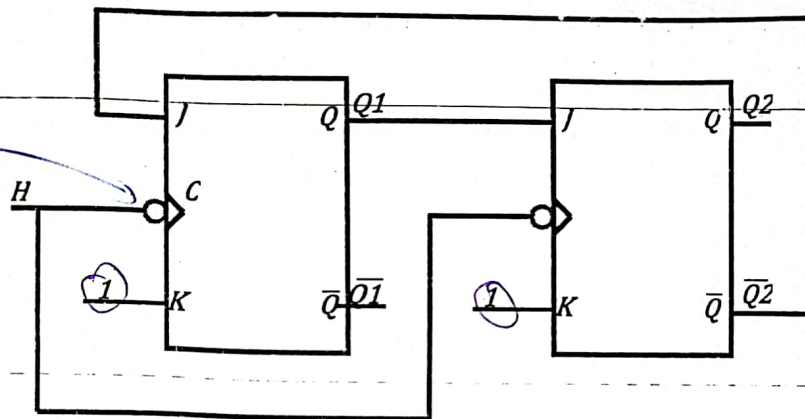


Figure 5

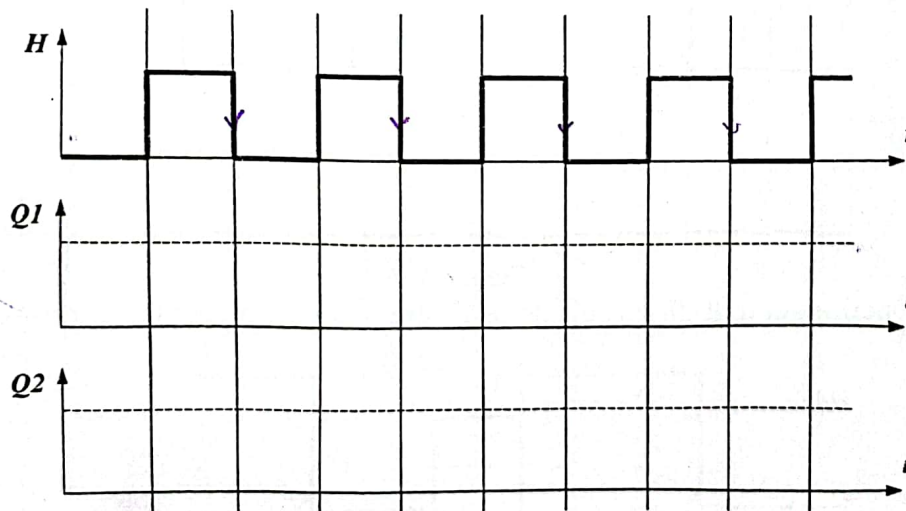


Figure 6



## Exercice 2 (Montage Maître-Esclave)

Soit le montage de la figure 7. Compléter les chronogrammes de la figure 8.

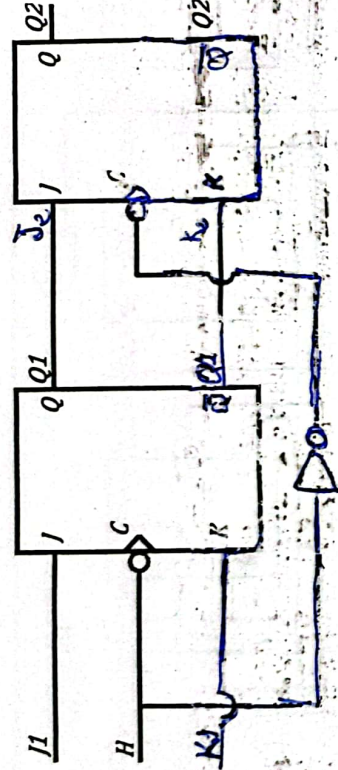


Figure 7

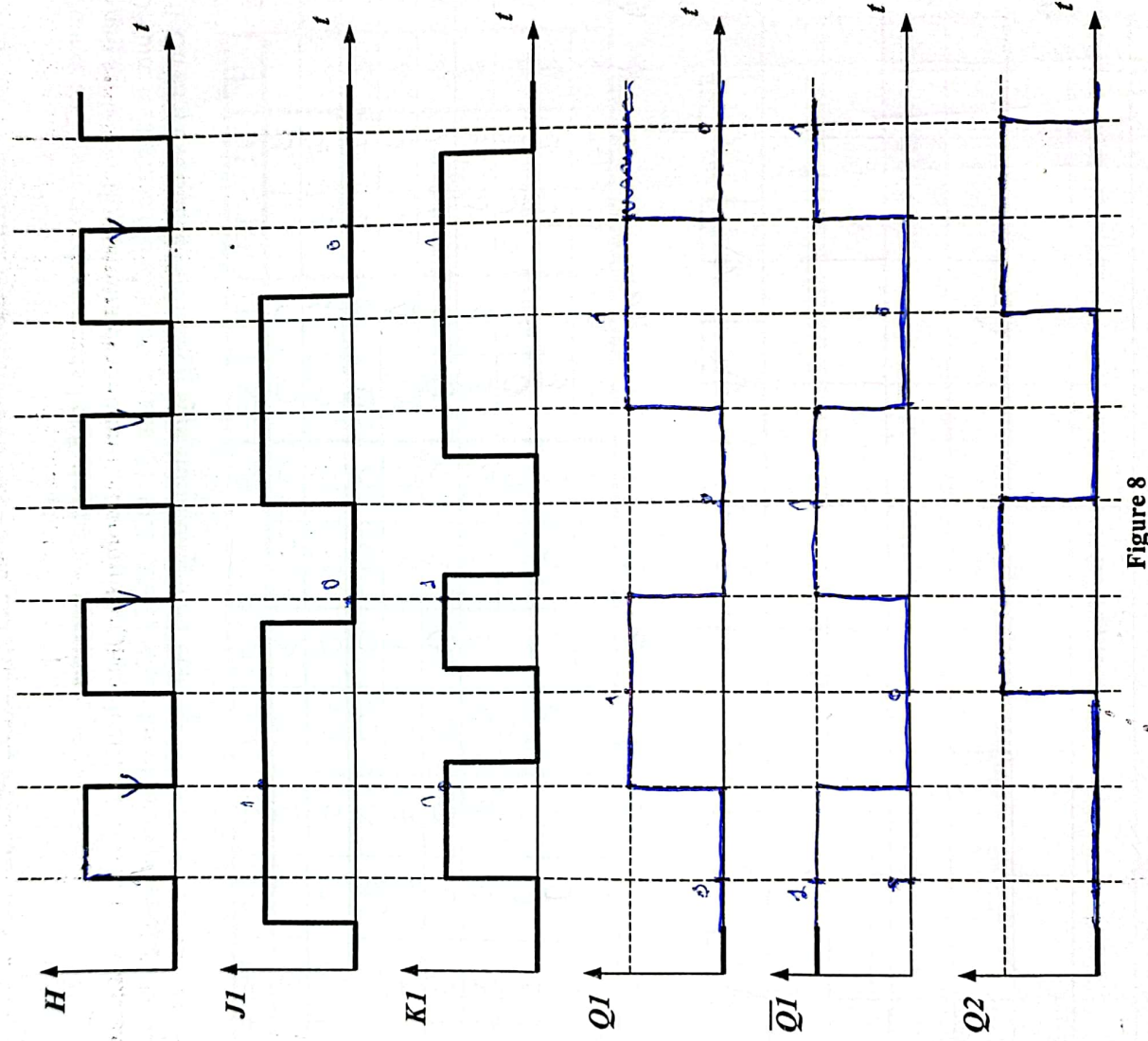


Figure 8

### Exercice 3

Soit le montage de la figure 9.

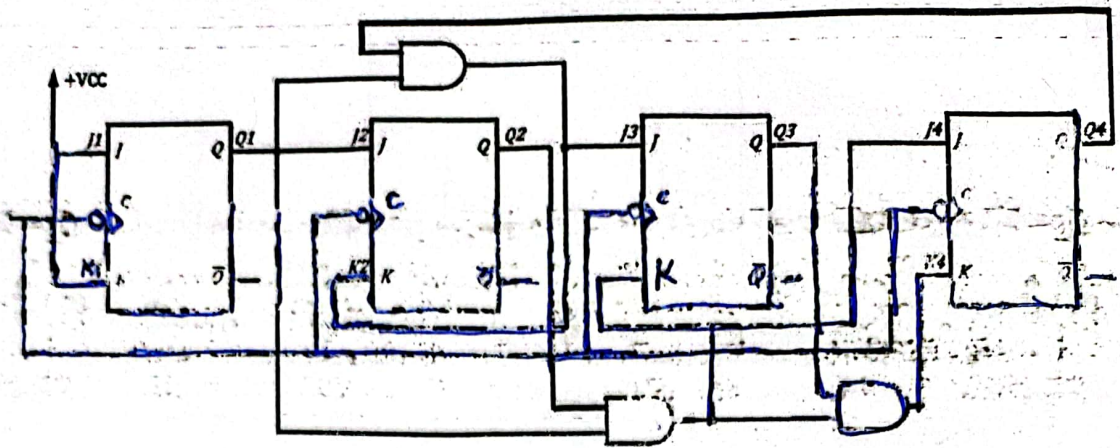
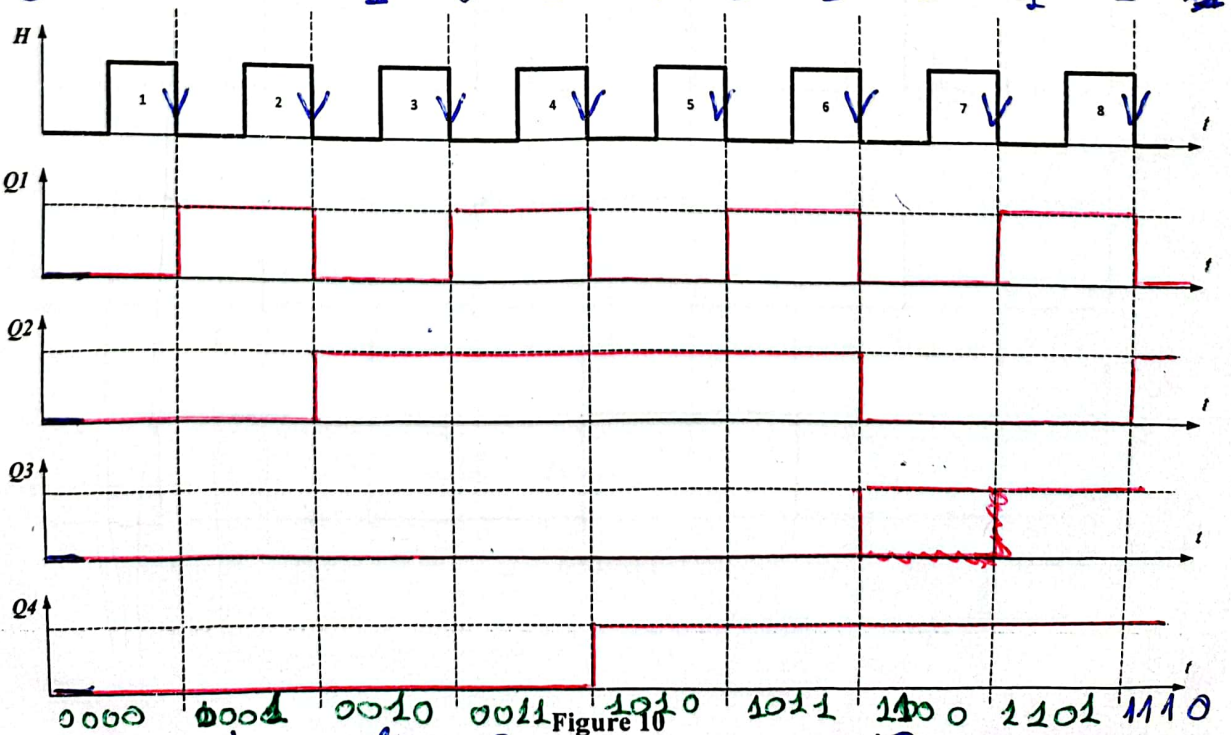


Figure 9

- Donner les équations des entrées J et K de chaque bascule.
- Analyser le fonctionnement de ce circuit et compléter le tableau 1.
- Déduire les formes d'ondes des sorties Q1, Q2, Q3 et Q4 sur les chronogrammes de la figure 10. On suppose que les sorties Qi sont initialement à l'état bas.

Tableau 1

	H	J1	K1	J2	K2	J3	K3	J4	K4	Q1	Q2	Q3	Q4
		1	1	0	0	0	0	0	0	0	0	0	0
1	↓	1	1	1	0	0	0	0	0	1	0	0	0
2	↓	1	1	0	0	0	0	0	0	0	1	0	0
3	↓	1	1	1	0	0	1	1	0	1	1	0	0
4	↓	1	1	0	0	0	0	0	0	0	1	0	1
5	↓	1	1	1	1	1	1	1	0	1	1	0	1
6	↓	1	1	0	0	0	0	0	0	0	0	0	1
7	↓	1	1	1	1	1	0	0	0	1	0	0	1
8	↓	1	1	0	0	0	0	0	0	0	1	1	1



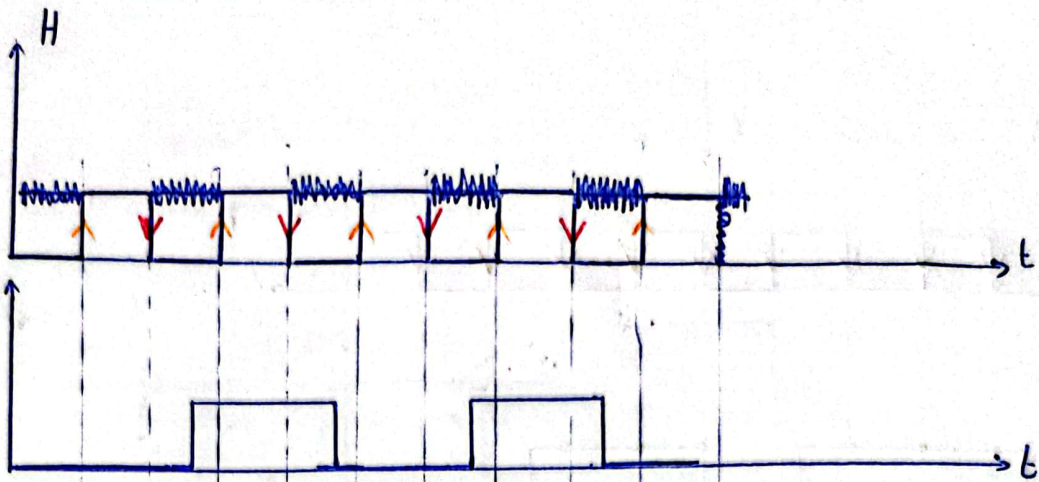
TD4



# TD4

- 1 -

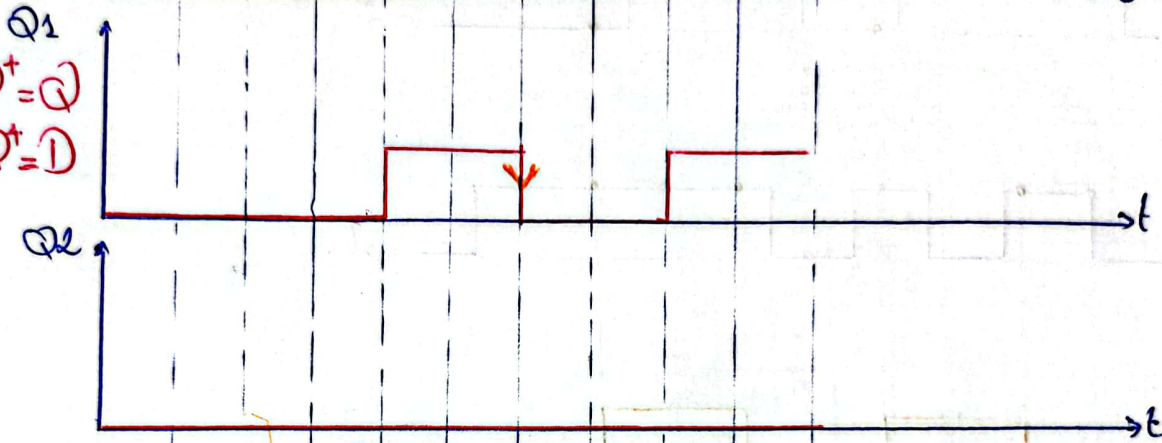
pair (1)



pair (1) → DATA

$H=0 \Rightarrow Q^+ = Q$

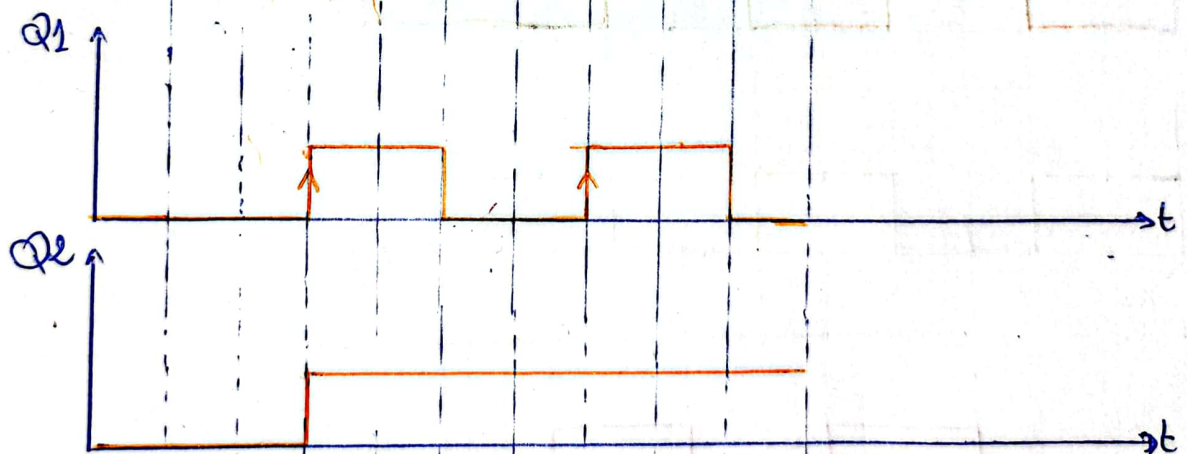
$H=1 \Rightarrow Q^+ = \overline{Q}$



pair (2):  
 $H = Q_1$

- 2 -

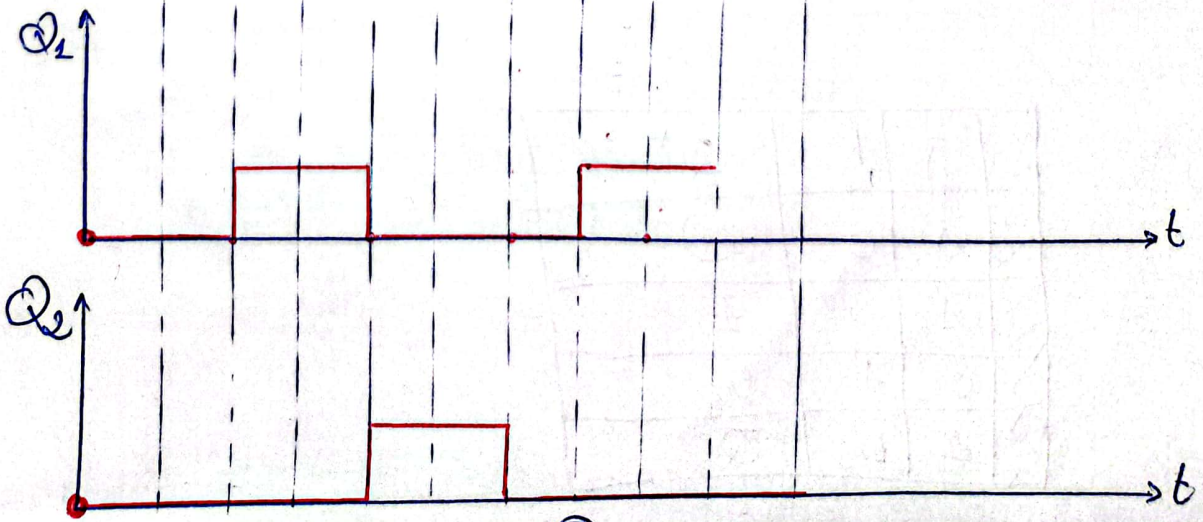
pair (2)



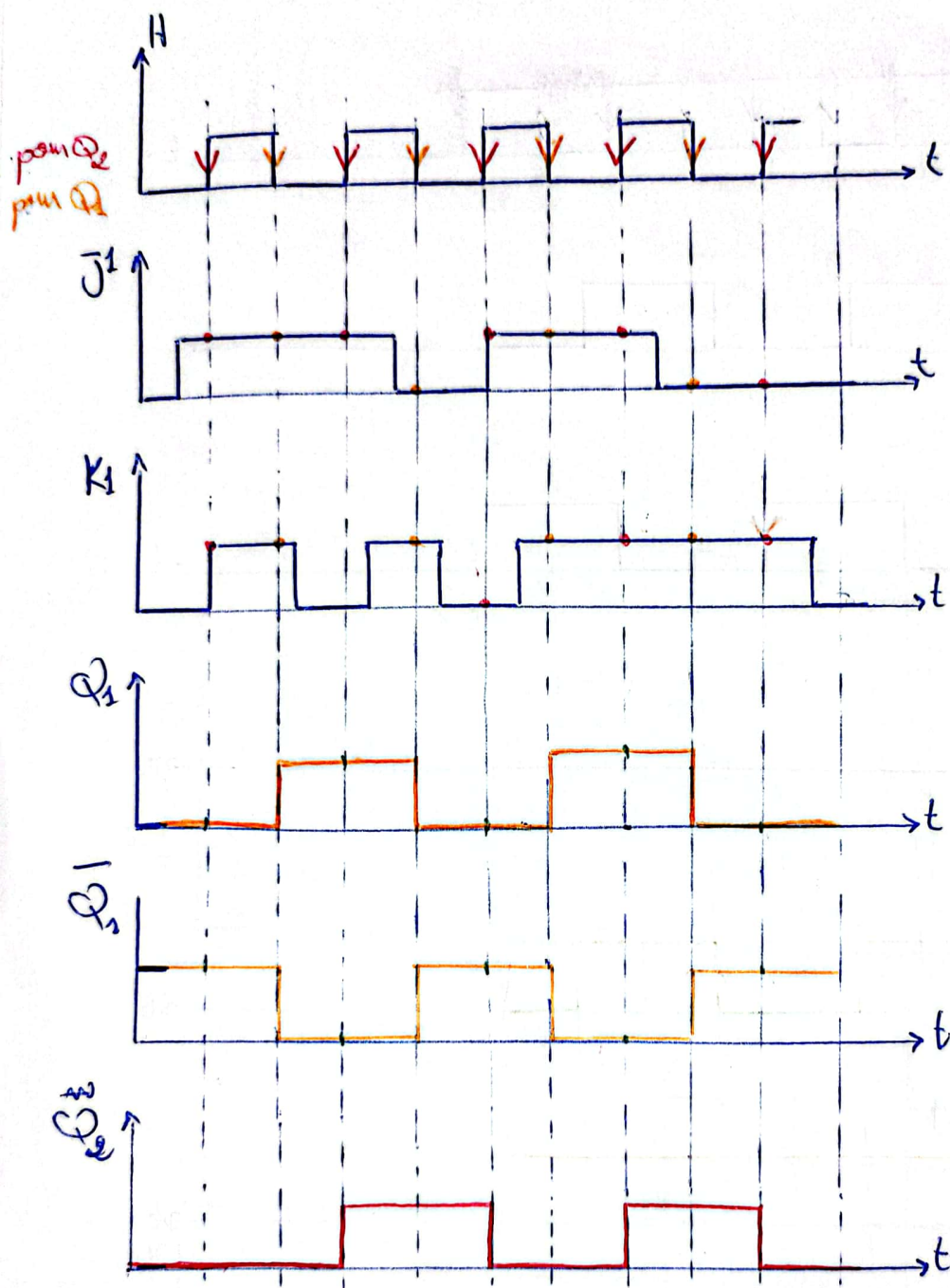
pair (3):  
 $H = Q_2$

- 3 -

pair (3)



# EX2:



	$J$	$K$	$Q^+$
0	0	0	$Q$
1	0	0	1
0	1	0	0
1	1	1	$\bar{Q}$

(2)



### Exercice 3:

1°)  $J_1 = 1$   
 $K_1 = 1$

$J_2 = Q_1$   
 $K_2 = Q_1 Q_4$

$J_3 = Q_1 Q_4 = K_3$   
 $K_3 = Q_1 Q_2$

$J_4 = Q_1 Q_2 = K_4$   
 $K_4 = Q_1 Q_2 Q_3$

	H	$J_1$	$K_1$	$J_2$	$K_2$	$J_3$	$K_3$	$J_4$	$K_4$	$Q_1$	$Q_2$	$Q_3$	$Q_4$
		1	1	0	0	0	0	0	0	0	0	0	0
1	↓	1	1	1	0	0	0	0	0	1	0	0	0
2	↓	1	1	0	0	0	0	0	0	0	1	0	0
3	↓	1	1	1	0	0	1	1	0	1	1	0	0
4	↓	1	1	0	0	0	0	0	0	0	0	0	1
5	↓	1	1	1	1	1	1	1	0	1	1	0	1
6	↓	1	1	0	0	0	0	0	0	0	0	1	1
7	↓	1	1	1	1	1	0	0	0	1	0	1	1
8	↓	1	1	0	0	0	0	0	0	0	1	1	1
9	↑	1	1	1	1	1	1	1	1	1	1	1	1

J	K	
0	0	mémoire
0	1	mise à 0
1	0	mise à 1
1	1	$Q^+ = \bar{Q}$

