



Exercice 3 :

	J	K	Q	Q'
	0	0	Q <sub>3</sub>	Q <sub>1</sub>
	0	1	0	1
	1	0	1	0
	1	1	Q <sub>2</sub>	Q <sub>2</sub>

Etat initial				Etat suivant				Bascule 1		Bascule 2		Bascule 3		Bascule 4	
Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>4</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>	Q <sub>4</sub>	J <sub>1</sub>	K <sub>1</sub>	J <sub>2</sub>	K <sub>2</sub>	J <sub>3</sub>	K <sub>3</sub>	J <sub>4</sub>	K <sub>4</sub>
0	0	0	0	1	0	0	0	1	φ	0	φ	0	φ	0	φ
1	0	0	0	0	1	0	0	φ	1	1	φ	0	φ	0	φ
0	1	0	0	1	1	0	0	1	φ	φ	0	0	φ	0	φ
1	1	0	0	0	0	1	0	φ	1	φ	1	1	φ	0	φ
0	0	1	1	1	0	1	0	1	φ	0	φ	φ	0	0	φ
1	0	1	1	0	1	1	0	φ	1	1	φ	φ	0	0	φ
0	1	1	1	1	1	1	0	1	φ	φ	0	φ	0	0	φ
1	1	1	1	0	0	0	1	φ	1	φ	1	φ	1	1	φ
0	0	0	0	1	0	0	1	1	φ	0	φ	0	φ	φ	0
1	0	0	0	0	1	0	1	φ	1	1	φ	0	φ	φ	0
0	1	0	0	1	1	0	1	1	φ	φ	0	0	φ	φ	0
1	1	0	0	0	0	1	1	φ	1	φ	1	1	φ	φ	0
0	0	1	1	1	0	1	1	1	φ	0	φ	φ	0	φ	0
1	0	1	1	0	1	1	1	φ	1	1	φ	φ	0	φ	0
0	1	1	1	1	1	1	1	1	φ	φ	0	φ	0	φ	0
1	1	1	1	0	0	0	0	φ	1	φ	1	φ	1	φ	1

Bascule 1 : J = 1  
K = 1

Bascule 2 :  $J_2$  :

$\begin{matrix} \phi_3 \phi_4 \\ \phi_1 \phi_2 \end{matrix}$	00	01	11	10
00	0	0	0	0
01	$\phi$	$\phi$	$\phi$	$\phi$
11	$\phi$	$\phi$	$\phi$	$\phi$
10	1	1	1	1

$$J_2 = \phi_1$$

 $K_2$  :

$\begin{matrix} \phi_3 \phi_4 \\ \phi_1 \phi_2 \end{matrix}$	00	01	11	10
00	$\phi$	$\phi$	$\phi$	$\phi$
01	0	0	0	0
11	1	1	1	1
10	$\phi$	$\phi$	$\phi$	$\phi$

$$K_2 = \phi_1$$

Bascule 3 :  $J_3$  :

$\begin{matrix} \phi_3 \phi_4 \\ \phi_1 \phi_2 \end{matrix}$	00	01	11	10
00	0	0	$\phi$	$\phi$
01	0	0	$\phi$	$\phi$
11	1	1	$\phi$	$\phi$
10	0	0	$\phi$	$\phi$

$$J_3 = \phi_1 \phi_2$$

Bascule 4

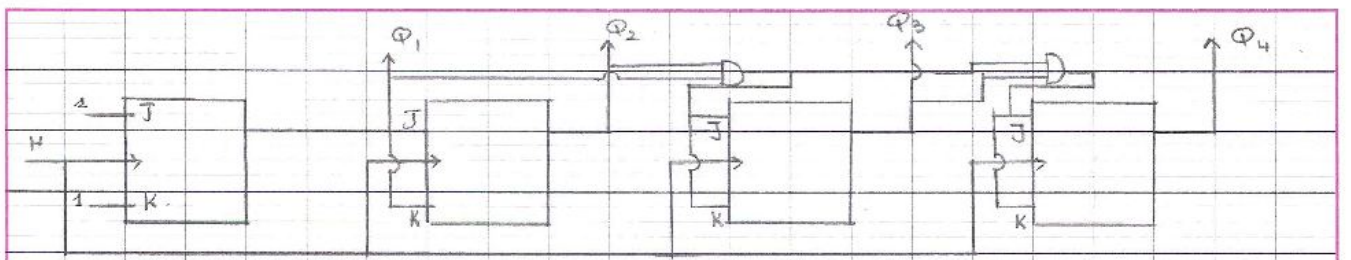
 $J_4$  :

$\begin{matrix} \phi_3 \phi_4 \\ \phi_1 \phi_2 \end{matrix}$	00	01	11	10
00	0	$\phi$	$\phi$	0
01	0	$\phi$	$\phi$	0
11	0	$\phi$	$\phi$	1
10	0	$\phi$	$\phi$	0

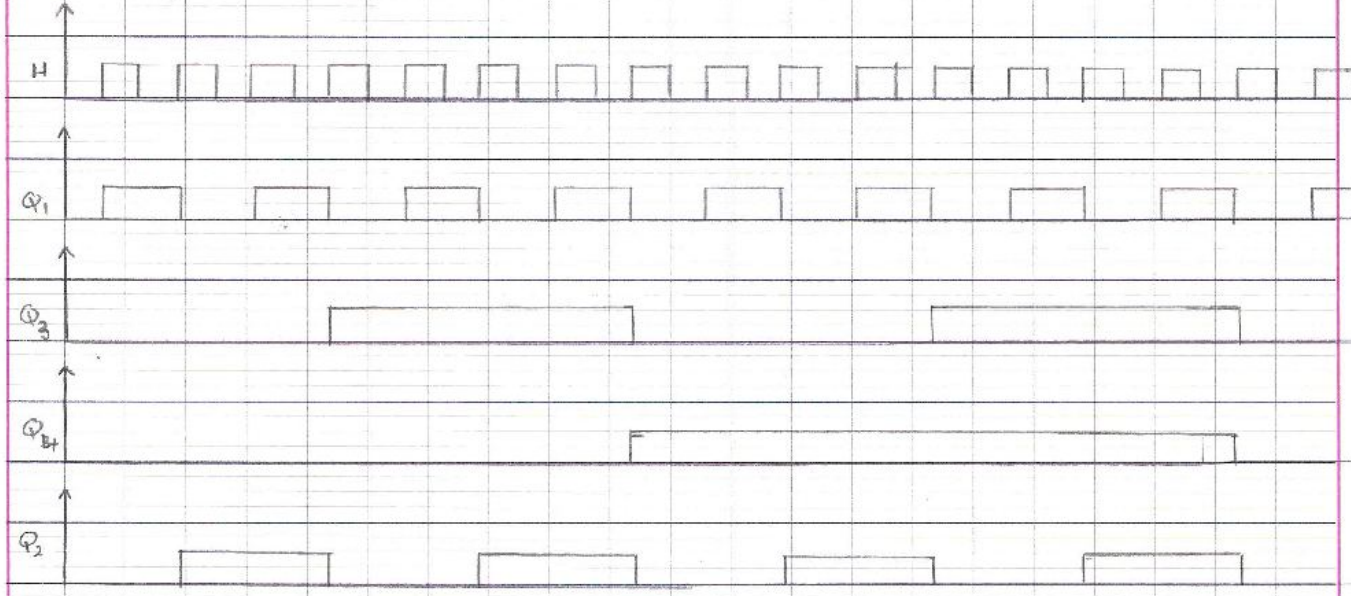
$$J_4 = \phi_1 \phi_2 \phi_3$$

$$K_3 = J_3$$

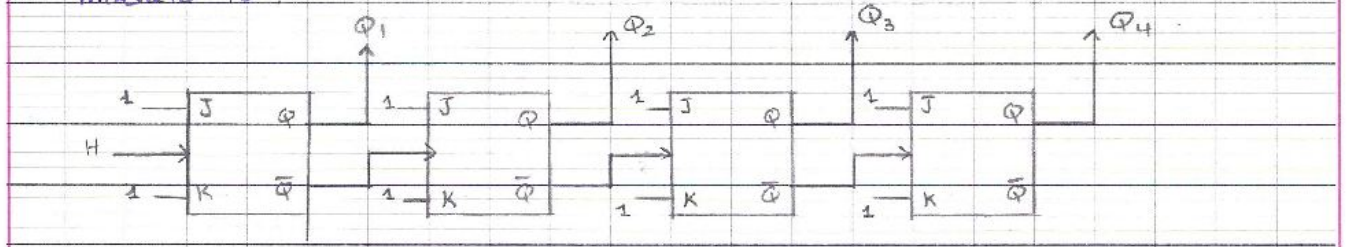
$$K_4 = J_4$$



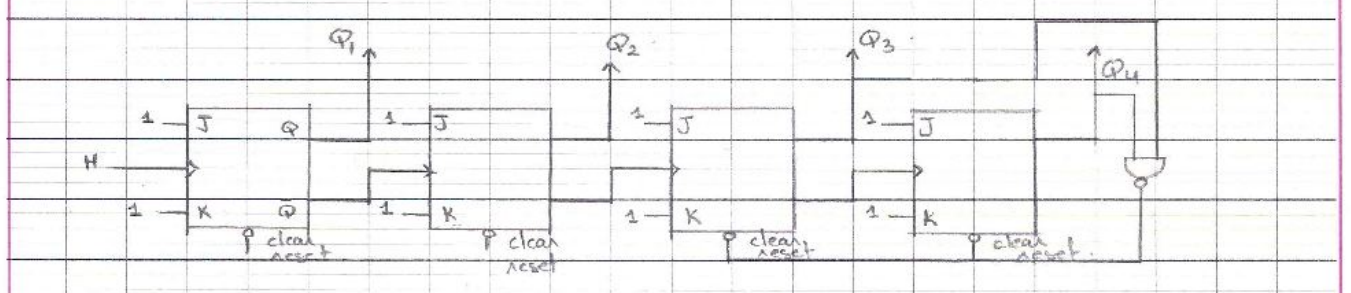
Exercice 4 a



modulo 16 :



modulo 12 :



## Exercice 5 a (TD n° 1)

$D_3$	$D_2$	$D_1$	$D_0$	a	b	c	d	e	f	g
0	0	0	0	0	0	0	0	0	0	1
0	0	0	1	1	0	0	1	1	1	1
0	0	1	0	0	0	1	0	0	1	0
0	0	1	1	0	0	0	0	1	1	0
0	1	0	0	1	0	0	1	1	0	0
0	1	0	1	0	1	0	0	1	0	0
0	1	1	0	0	1	0	0	0	0	0
0	1	1	1	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	1	0	0
1	0	1	0	0	0	0	1	0	0	0
1	0	1	1	1	1	0	0	0	0	0
1	1	0	0	0	1	1	0	0	0	1
1	1	0	1	1	0	0	0	0	1	0
1	1	1	0	0	1	1	0	0	0	0
1	1	1	1	0	1	1	1	0	0	0

a :

$D_3 D_2$ \ $D_1 D_0$	00	01	11	10
00	0	1	0	0
01	1	0	0	0
11	0	1	0	0
10	0	0	1	0

$$a = \bar{D}_3 \bar{D}_2 \bar{D}_1 D_0 + \bar{D}_3 D_2 \bar{D}_1 \bar{D}_0 + D_3 D_2 \bar{D}_1 D_0 + D_3 \bar{D}_2 D_1 D_0$$

b :

$D_3 D_2$ \ $D_1 D_0$	00	01	11	10
00	0	0	0	0
01	0	1	0	1
11	1	0	1	1
10	1	0	1	0

$$b = \bar{D}_3 D_2 \bar{D}_1 D_0 + D_3 D_1 \bar{D}_0 + D_3 D_1 D_0 + D_3 D_2 \bar{D}_0$$