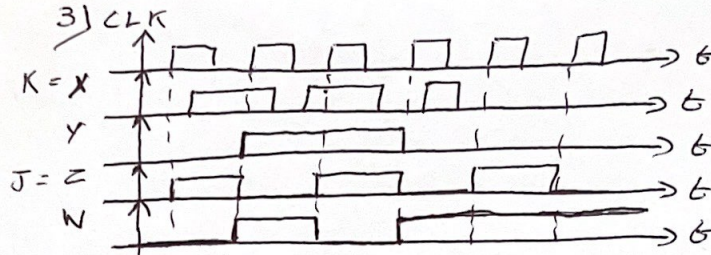
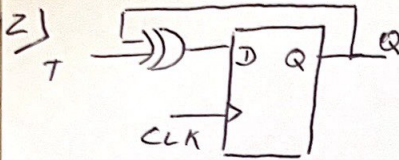


Exercice 3 :

1)

CLK	D	Q^m
X	X	Q^{m-1}
0	0	0
1	1	1

CLK	J	K	Q^m
X	X	X	Q^{m-1}
0	0	0	Q^{m-1}
0	1	1	0
1	0	0	1
1	1	1	Q^{m-1}



Exercice 2 :

Chiffre max $(7)_{10} \Rightarrow 3$ bascules

Etat m	Q_C^m	Q_D^m	Q_A^m	Q_C^{m+1}	Q_D^{m+1}	Q_A^{m+1}	Etat $m+1$
7	1	1	1	0	0	1	5
5	1	0	1	0	1	1	3
3	0	1	1	0	0	1	1
1	0	0	1	1	1	1	7

Etats "parasites"

Q_C^m	Q_D^m	Q_A^m	Q_C^{m+1}	Q_D^{m+1}	Q_A^{m+1}	Etat $m+1$
0	0	0	1	0	1	7
0	1	0	0	1	1	3
1	0	0	0	1	1	5
1	1	0	1	0	1	7

$Q_A^{m+1} = 1$

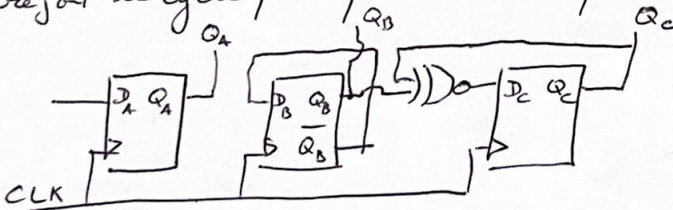
Q_D^{m+1}	Q_C^{m+1}	Q_D^m	Q_C^m
0	0	0	0
0	1	0	1
1	0	1	0
1	1	1	1

$Q_B^{m+1} = \overline{Q_B^m}$

Q_D^{m+1}	Q_C^{m+1}	Q_D^m	Q_C^m
0	0	0	0
0	1	0	1
1	0	1	0
1	1	1	1

$Q_C^{m+1} = Q_D^m \oplus Q_C^m$

On rejoint le cycle principal en 1 coup d'horloge



Exercice 4 :

1) $S = \overline{A_0} \overline{A_1} (C+D) + A_0 \overline{A_1} C + \overline{A_0} A_1 D + A_0 A_1 (C+D) = (C+D) (\overline{A_0} \oplus A_1) + A_0 \overline{A_1} C + \overline{A_0} A_1 D$

2) L'ordinateur affiche des T_0 alors qu'il devrait afficher des T_{10}
En effet, $8 T_0 = \frac{8 \cdot 10^{12}}{2^{40}} T_{10} \approx 7,828 T_{10}$

3) 3AF
0B2

(4611)₁₆

$(F)_{16} + (2)_{16} = (15)_{10} + (2)_{10} = (17)_{10} = (11)_{16}$ car $17 \div 16 = 1$
 $(A)_{16} + (1)_{16} = (10)_{10} + (1)_{10} = (11)_{10} = (B)_{16}$ et $(B)_{16} + (B)_{16} = (22)_{10} = (16)_{16}$

$$4) (51)_{10} = (00110011)_{C2}$$

$$(127)_{10} = (01111111)_{C2}$$

$$(10110010)_{C2} =$$

Déplacement (Nb négatif)

$$(-63)_{10} = (11000001)_{C2}$$

$$(-63)_{10} = (11000001)_{C2}$$

$$110000010$$

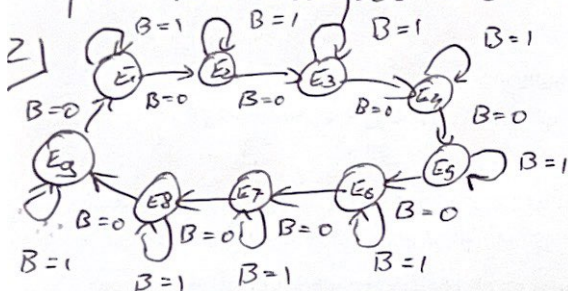
on oublie la retenue

$$(10000010)_{C2} = (-128 + 2)_{10} = (-126)_{10}$$

pas de déplacement

Exercice 1 :

1) Les lampes 1 et 5 sont toujours allumées en même temps. Même chose pour les lampes 2 et 4.



3) 9 états donc 4 bits au minimum

S'il s'agissait d'un codage one hot on utiliserait 9 bits

4)

Etat n	B	Q_3^n	Q_2^n	Q_1^n	Q_0^n	Q_3^{n+1}	Q_2^{n+1}	Q_1^{n+1}	Q_0^{n+1}	Etat n+1
1	0	0	0	0	0	0	0	0	1	2
2	0	0	0	0	1	0	0	1	0	3
3	0	0	0	1	0	0	0	1	1	4
4	0	0	0	1	1	0	1	0	0	5
5	0	0	1	0	0	0	1	0	1	6
6	0	0	1	0	1	0	1	1	0	7
7	0	0	1	1	0	0	1	1	1	8
8	0	0	1	1	1	1	0	0	0	9
9	0	1	0	0	0	0	0	0	0	1
1	1	0	0	0	0	0	0	0	0	1
2	1	0	0	0	0	0	0	0	1	2
3	1	0	0	0	0	0	0	1	0	3
4	1	0	0	0	0	0	0	1	1	4
5	1	0	1	0	0	0	1	0	0	5
6	1	0	1	0	0	0	1	0	1	6
7	1	0	1	1	0	0	1	1	0	7
8	1	0	1	1	0	0	1	1	1	8
9	1	1	0	0	0	1	0	0	0	9

+ 7 états
"parasites"

Q_0^{n+1}

Q_3^n	Q_2^n	Q_1^n	Q_0^n
00	1	0	0
01	1	0	0
11	X	X	X
10	0	X	X

B=0

Q_0^{n+1}

Q_3^n	Q_2^n	Q_1^n	Q_0^n
00	0	1	1
01	0	1	1
11	X	X	X
10	0	X	X

B=1

$$C_0 \Leftrightarrow Q_0^{n+1} = B Q_0^n + \bar{B} Q_0^n Q_3^n$$

5) Table des sorties (a, seule)

Q_3^n	Q_2^n	Q_1^n	Q_0^n	A_1
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0

Q_1^n

Q_3^n	Q_2^n	Q_1^n	Q_0^n
00	0	0	1
01	0	0	1
11	X	X	X
10	1	X	X

$$A_1 = Q_3^n + \bar{Q}_2^n Q_1^n + \bar{Q}_0^n Q_1^n$$

$$= Q_3^n + Q_0^n (Q_1^n + Q_2^n)$$