

Correction DS de SE, PCSI-1, nov-23

**Exo 1**

$$H(\lambda) = \frac{\lambda}{\lambda+2} ; E(\lambda) = \frac{1}{\lambda} ; S(\lambda) = \frac{\lambda}{\lambda(\lambda+2)}$$

$$S(\lambda) = \frac{a}{\lambda} + \frac{b}{\lambda+2} \quad a=2 \text{ et } b=-2$$

$$S(\lambda) = 2 \left( \frac{1}{\lambda} - \frac{1}{\lambda+2} \right) \Rightarrow s(t) = 2 \left( 1 - e^{-2t} \right) \cdot u(t)$$

**Exo 2**

$$H(\lambda) = \frac{5}{\lambda^2 + 6\lambda + 25} \quad ; \quad E(\lambda) = 1$$

$$S(\lambda) = \frac{5}{\lambda^2 + 6\lambda + 25} = \frac{5 \times \frac{1}{5} \times \lambda}{(\lambda+3)^2 + 16} \Rightarrow s(t) = \frac{5}{5} e^{-3t} \sin(4t) u(t)$$

**Exo 3**

$$\begin{cases} 1,05 \times s(\infty) = 6,3 \\ 0,55 \times s(0) = 5,7 \end{cases}$$

$$\begin{cases} E(\infty) = 8 - 6 = 2 \\ t_{5\%} = 8 \text{ s} \\ D = 8,1 - 6 = 2,1 \end{cases}$$

**Exo 4**

$$a\lambda \phi(\lambda) = b G(\lambda) + c \cdot \phi(\lambda) \Rightarrow \phi(\lambda) = \frac{b}{a\lambda - c} G(\lambda)$$

**Exo 5**

$$2) H_1(\lambda) = \frac{b_c}{(R+L\lambda)T\lambda + b_c b_e}$$

$$H_2(\lambda) = K_{12} \frac{\frac{1}{5\lambda}}{1 + \frac{1}{5\lambda} \times \frac{b_c b_e}{R+L\lambda}} = \frac{K_{12} (R+L\lambda)}{(R+L\lambda)T\lambda + b_c b_e}$$

4)  $K_1 = K_3 K_{10} K_{11}$

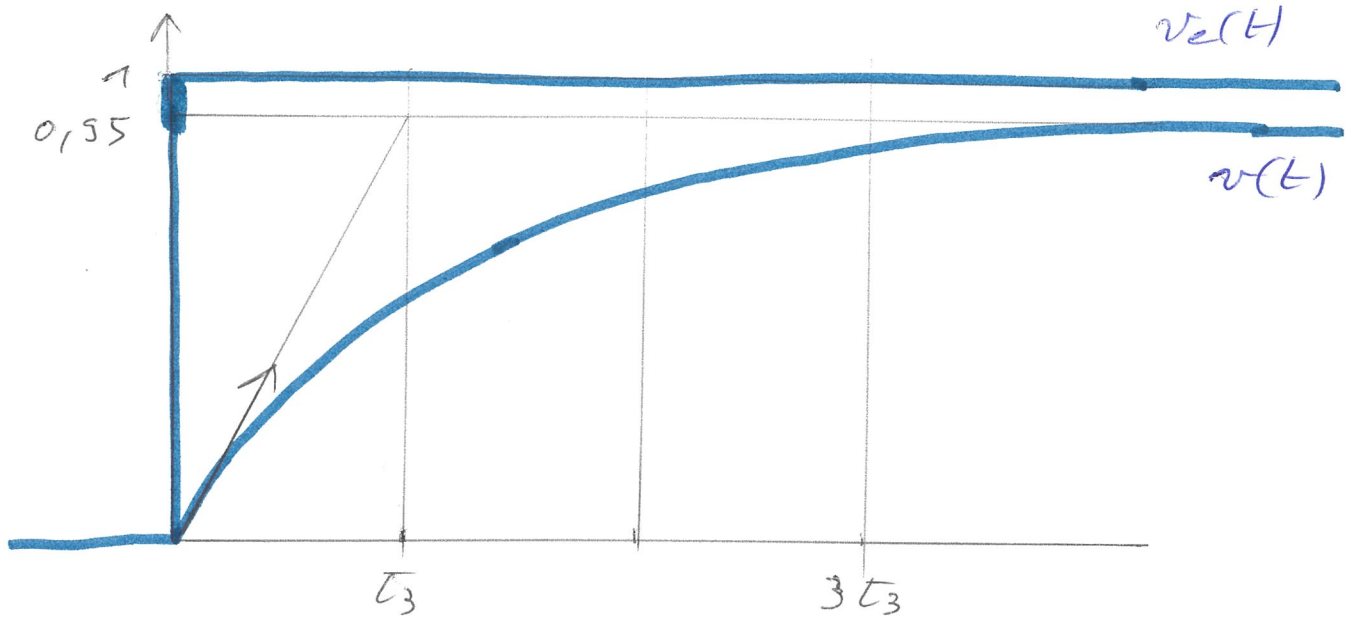
$$5) H_3(\lambda) = \frac{20C}{1 + 0,5\lambda + 20C} = \frac{\frac{20C}{1+20C}}{1 + \frac{0,5}{1+20C} \lambda} = \frac{K_3}{1 + T_3 \lambda}$$

$$K_3 = \frac{20C}{1+20C} \quad ; \quad T_3 = \frac{0,5}{1+20C}$$

6)  $C = 1 \Rightarrow K_3 = \frac{20}{21}$  et  $T_3 = \frac{1}{42} = 0,024 \text{ s}$

$$K_3 = 0,955$$

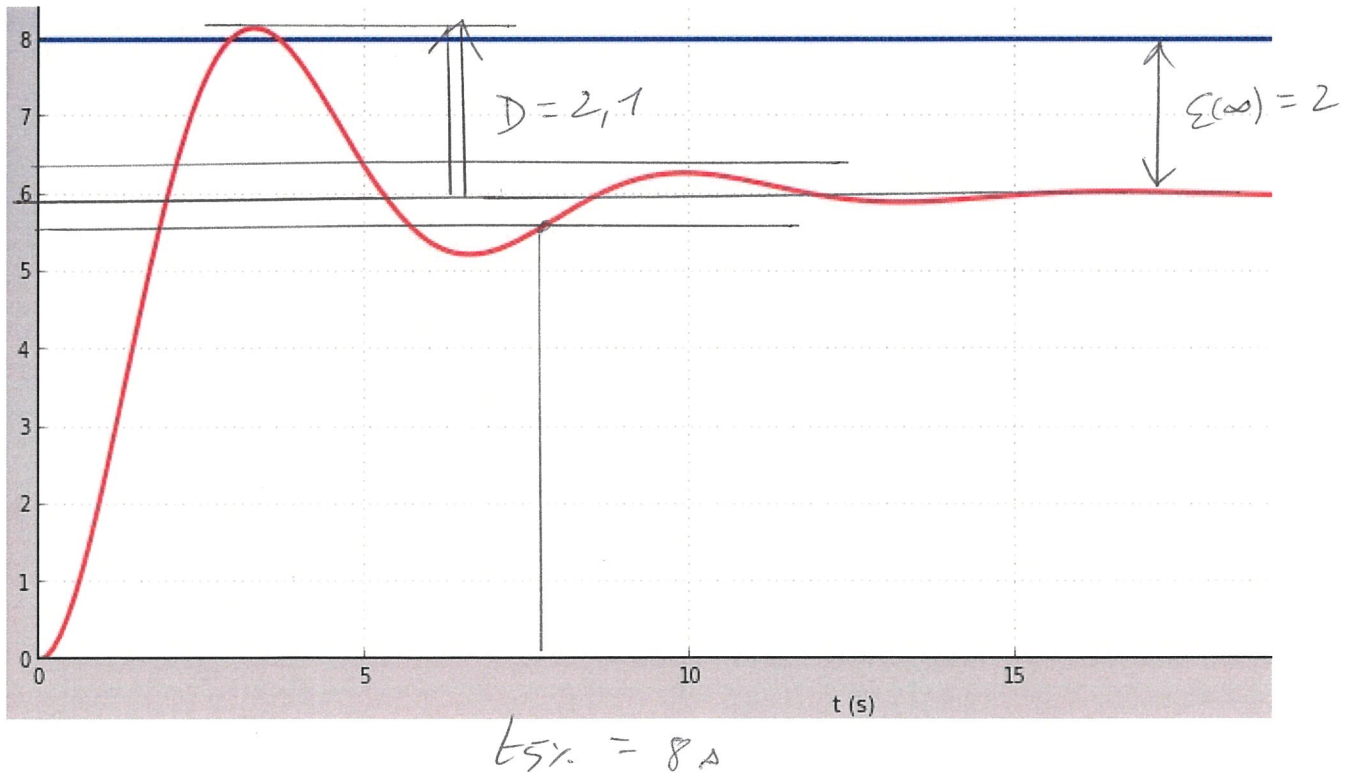
6] Suite



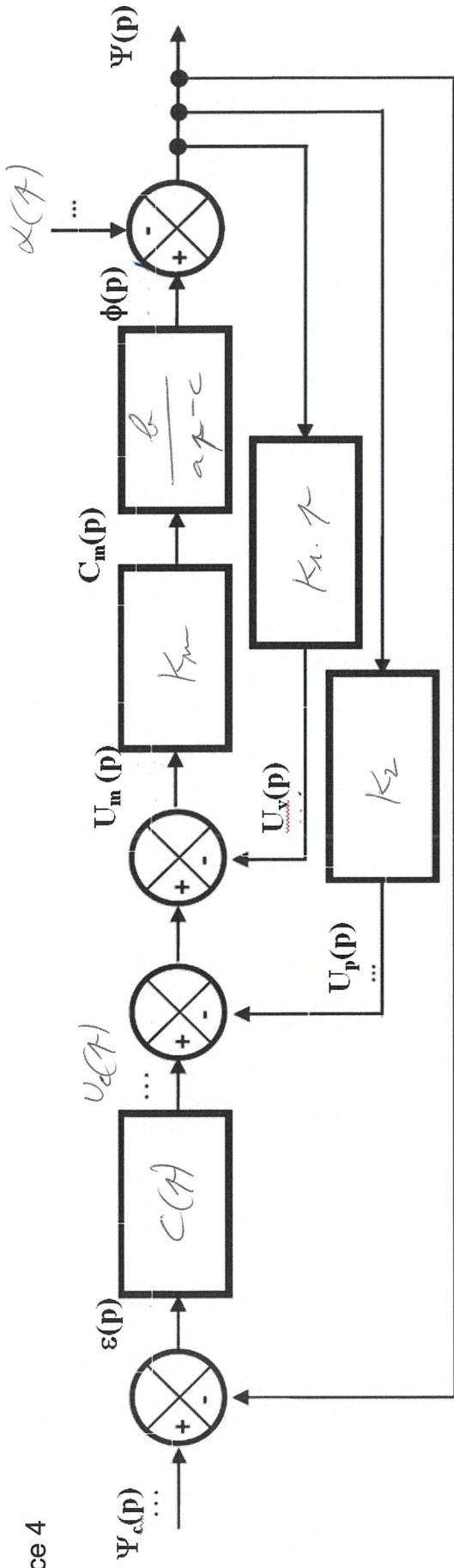
Performances :  $\left\{ \begin{array}{l} \text{Stable, pas de dépassement} \\ \Sigma(\infty) = 0,05 ; t_{5\%} = 3t_3 = 0,072 \text{ s} \end{array} \right.$

7] Lorsque  $C \uparrow$ ,  $\Sigma(\infty) \downarrow$  et  $t_{5\%} \downarrow$

Exercice 3.



Exercice 4



Exercice 5

