Corrigé DS PCSI 1 — Nov 26

Exo 1

Q1 $H(p) = \dfrac{7}{p+5}$ $\quad S(p) = \dfrac{7}{p(p+5)} = \dfrac{a}{p} + \dfrac{b}{p+5}$

$a = S(p) = \dfrac{7}{5}\left[\dfrac{1}{p} - \dfrac{1}{p+5}\right]$ $\quad s(t) = \dfrac{7}{5}\left(1 - e^{-5t}\right) u(t)$

~~Exo 2~~

Q2 $H(p) = \dfrac{6}{p^2 + 6p + 3<}$ $\quad E(p) = 1$

$S(p) = \dfrac{\frac{6}{5} \times 5}{(p+3)^2 + 25}$ $\quad s(t) = \dfrac{6}{5} e^{-3t} \sin(5t) \cdot u(t)$

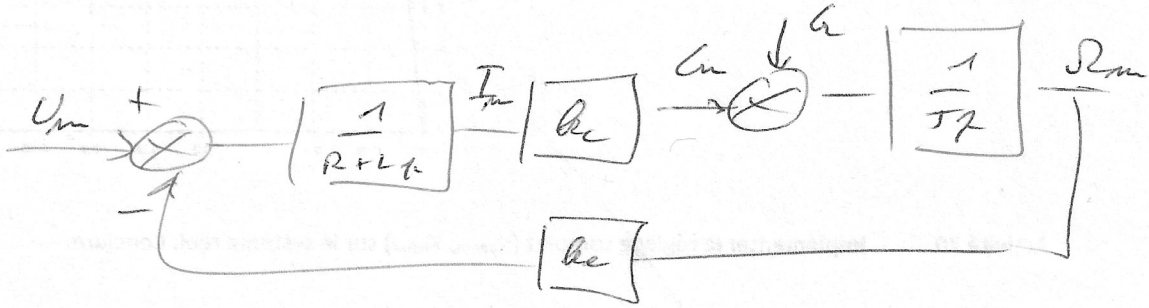
Exo 2

Q1 $H_1 = \dfrac{1}{Jp}$ $\quad H_2 = \dfrac{1}{p}$ $\quad H_3 = K_\Theta$

Q2 $H_4 = \dfrac{K_\Theta}{Jp^2 + K_\Theta}$ $\quad H_5 = \dfrac{K_c K_\Theta}{Jp^2 + K_\Theta + K_c K_\Theta}$

Exo 3

Q1



Q2 $H_1 = \dfrac{k_c}{(R+Lp)Jp + k_c k_e}$

$H_2 = \dfrac{R+Lp}{(R+Lp)Jp + k_c k_e}$ $\quad \Omega_m = H_1 U_m + H_2 C_r$

Q3 $\Omega_m = H_m \left[U_m + H_{part} C_r\right]$ $\quad H_m H_{part} = H_2$

$\Rightarrow H_m = H_1$ $\quad H_{part} = \dfrac{H_2}{H_1} = \dfrac{R+Lp}{k_c}$

(2)

(Q4) $H_3 = \frac{1}{\rho} \times 2 \times R_t \times \frac{K_m}{1 + \tau_m p} = \frac{2 R_t K_m}{\rho (1 + \tau_m p)}$

(Q5) Non corrigé

$\varepsilon(\infty) = 0$; $DY = 0$; $t_{5\%} = 0,5\ s > 0,01\ s$

Corrigé

$\varepsilon(\infty) = 0$; $DY = 22\% > 10\%$; $t_{5\%} = 0,03\ s > 0,01\ s$

(Q6) $H_{Bo} = \frac{5 K_c}{p(1 + 0,005 p)}$

$H_{BF} = \frac{5 K_c}{0,005 p^2 + p + 5 K_c} = \frac{1}{\frac{p^2}{1000 K_c} + \frac{1}{5 K_c} + 1}$

$K_{BF} = 1$ ($\Rightarrow$ Réas) ; $\omega_0 = \sqrt{1000 K_c} = 10\sqrt{10 K_c}$

$\frac{2\zeta}{\omega_0} = \frac{1}{5 K_c} \Rightarrow \zeta = \sqrt{\frac{10}{K_c}}$

(Q7) $\zeta = 0,7 \Rightarrow K_c = \frac{10}{(0,7)^2} = 20,4$

$\omega_0 = 14,2$ rad/s et $t_{5\%} = \frac{3}{\omega_0} = 0,021\ s$

Performances :

Réas, $\varepsilon(\infty) = 0$ car $K_{BF} = 1$ OK

Rapidité : $t_{5\%} = 0,021 > 0,01\ s$ Pas OK

Dépassement : $DY = 0,05 < 0,1$

$5\% < 10\%$ OK