Correction DS de SI, MPSI 1, oct 24

Exo 1 $H(p) = \frac{3}{p+5}$ $\quad E(p) = \frac{1}{p}$ $\quad S(p) = \frac{3}{p(p+5)}$

$S(p) = \frac{a}{p} + \frac{b}{p+5}$ $\quad 3 = a(p+5) + bp = (a+b)p + 5a$

$a = \frac{3}{5}$ $\quad b = -\frac{3}{5}$ $\quad S(p) = \frac{3}{5}\left(\frac{1}{p} - \frac{1}{p+5}\right)$

$s(t) = \frac{3}{5}\left(1 - e^{-5t}\right).u(t)$

Exo 2 $H(p) = \frac{5}{p^2+4p+11}$ $\quad E(p) = 1$

$S(p) = \frac{5}{p^2+4p+11} = \frac{5 \times \frac{1}{3} \times 3}{(p+2)^2+7}$

$s(t) = \frac{5}{\sqrt{7}} e^{-2t} \sin(\sqrt{7}t).u(t)$

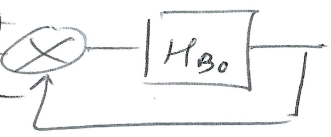
Exo 3 $s(\infty) = 8$ $\quad \left.\begin{array}{l} 1{,}05\, s(\infty) = 8{,}4 \\ 0{,}95\, s(\infty) = 7{,}6 \end{array}\right)$ $t_{5\%} = 53\ s$

Exo 4 (Q3) $H_1(p) = \frac{1}{R+Lp}$ $\quad K_2 = K_m$ $\quad H_3(p) = \frac{1}{Jp}$ $\quad K_4 = K_m$

(Q4) $\Omega_\ell(p) = \frac{1}{Jp}\left(C_\ell(p) + C_e(p)\right) \Longrightarrow G_3(p) = \frac{1}{Jp}$

$G_1(p) = \ell$ $\quad C_e(p) = \frac{k}{p}\left[\Omega_m(p) - \Omega_\ell(p)\right] \Longrightarrow G_2(p) = \frac{k}{p}$

(Q5)



$H_{BO}(p) = \left(\ell + \frac{k}{p}\right)\frac{1}{Jp} = \frac{\ell p + k}{Jp^2}$

$H_{BF}(p) = \frac{\ell p + k}{Jp^2 + \ell p + k}$

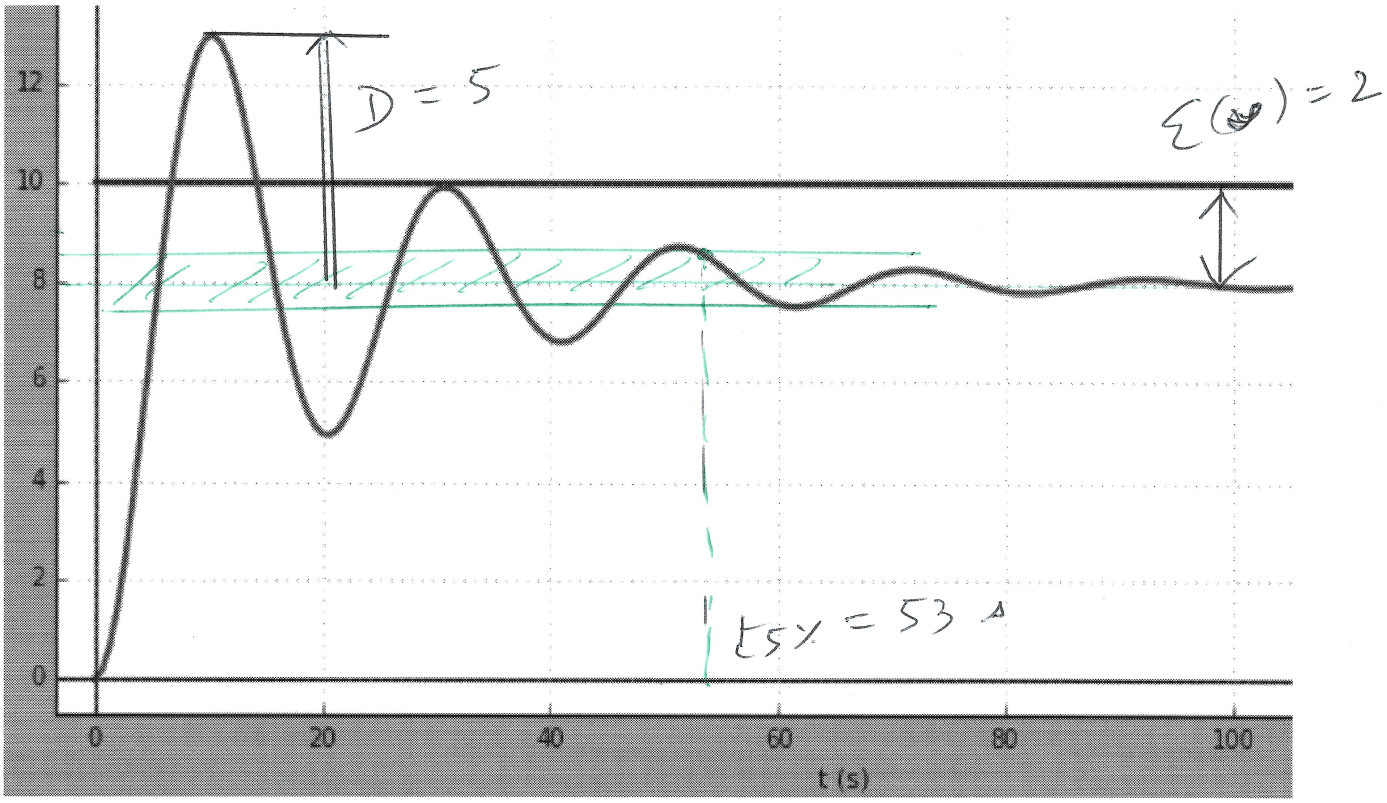
(Q3) Suite

$H_{mot} = \frac{K_m}{(R+Lp)Jp + K_m^2}$

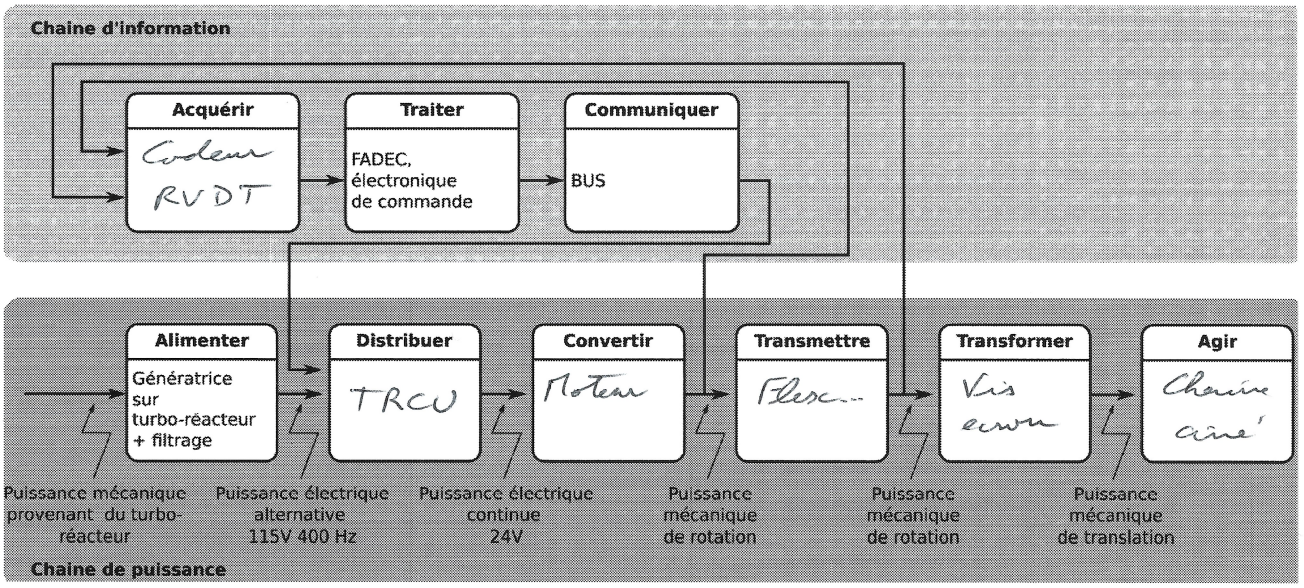
$H_{mot} = \frac{1/K_m}{\frac{LJ}{K_m^2}p^2 + \frac{RJ}{K_m^2}p + 1}$.

Document réponses, DS MPSI1, octobre 2024

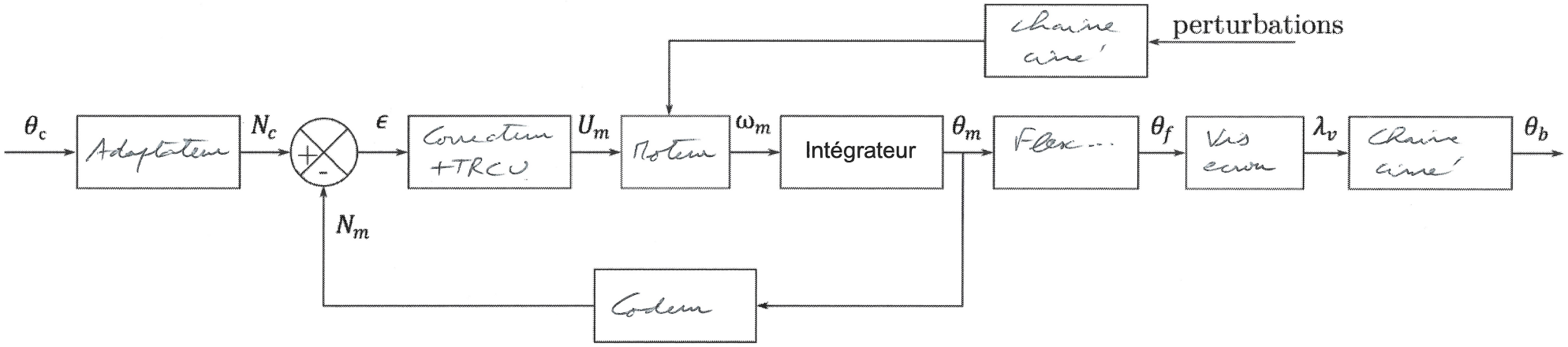
Exercice 3.



Exercice 4, question 1.



Exercice 4, question 2.



Exercice 4, question 4.