

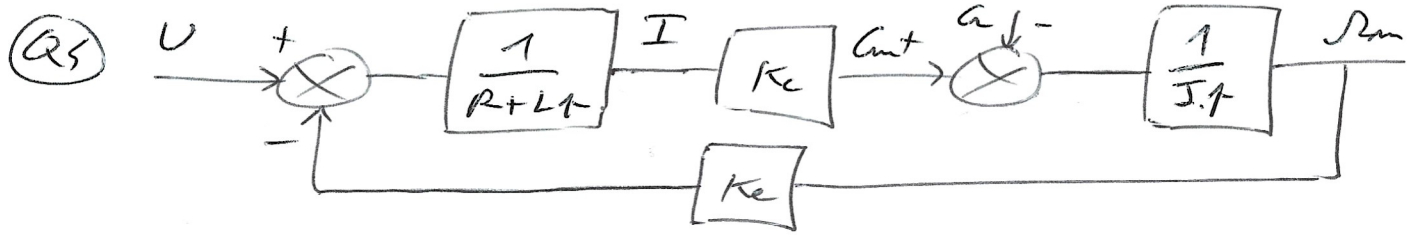
① Correction DS de SI, AP, janvier 22, Discovery, CCP AP17

Q1 $\vec{v}(A \in \text{cube}/R_0) = \omega \dot{\theta} \vec{e}_\theta$

Q2 $\vec{I}_C A \cdot \vec{v}(A \in \text{cube}/R_0) = \vec{0} \Rightarrow \dots \Rightarrow \tan \beta = -\frac{e}{2a}$

⚠ $\beta < 0$ sur la figure donnée ; $\Rightarrow \beta = -15,52^\circ$

Q3 $a = -\frac{e}{2 \tan \beta}$; $\Delta \beta = \pm 10^{-3}$ \Rightarrow $\begin{cases} a_{\max} = 1540,1 \text{ mm} \\ a_{\min} = 1539,9 \text{ mm} \\ \text{erreur} = \pm 0,1 \text{ mm} < 5 \end{cases}$



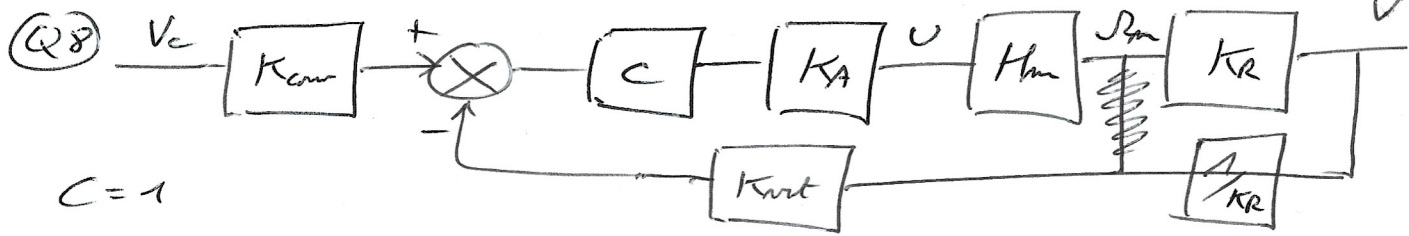
Q5 $\rho_m = H_1 U + H_2 i$

$H_1 = \frac{1/K_e}{\frac{LJ}{K_e K_e} s^2 + \frac{RJ}{K_e K_e} s + 1}$; $H_2 = \frac{\frac{R}{K_e K_e} (1 + \frac{L}{R} s)}{\frac{LJ}{K_e K_e} s^2 + \frac{RJ}{K_e K_e} s + 1}$

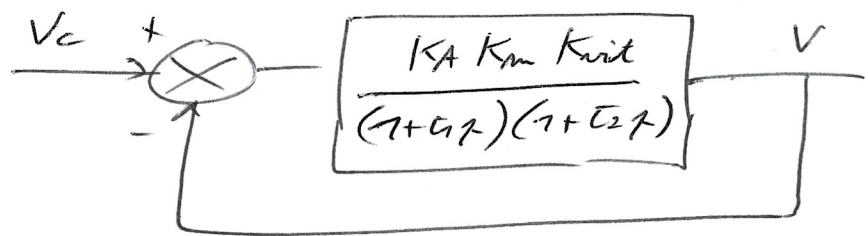
Q6 $H_1 = \frac{8,65}{0,00535 s^2 + 0,29 s + 1} = \frac{8,65}{(1 + 0,023 s)(1 + 0,0023 s)}$

Q7 $K_R = \frac{0,145}{5 \times 28,5} = 9,55 \cdot 10^{-5} \text{ m rad}^{-1}$

$K_{conv} = \frac{K_{vit}}{K_R} = \frac{1,5 \cdot 10^{-3}}{9,55 \cdot 10^{-5}} = 1,5 \text{ V.m}^{-1}.s^{-1}$



C=1



Personas
 $K_1 = K_m K_A K_{vit}$

(2)

$$Q25) H(\tau) = \frac{K_1}{(1+\tau_1\tau)(1+\tau_2\tau) + K_1} = \frac{\frac{K_1}{1+K_1}}{\frac{\tau_1\tau_2}{1+K_1}\tau^2 + \frac{\tau_1+\tau_2}{1+K_1}\tau + 1}$$

$$H(\tau) = \frac{K}{\frac{\tau^2}{\omega_0^2} + \frac{2\zeta}{\omega_0}\tau + 1} \Rightarrow K = \frac{K_1}{1+K_1} = 0,085$$

$$\omega_0 = \sqrt{\frac{1+K_1}{\tau_1\tau_2}} = 133 \text{ rad s}^{-1}$$

$$\frac{2\zeta}{\omega_0} = \frac{\tau_1+\tau_2}{1+K_1} \Rightarrow \zeta = \frac{\tau_1+\tau_2}{2\sqrt{\tau_1\tau_2}\sqrt{1+K_1}} = 1,77$$

Q10) ? $a_{max} = \frac{V_{max}}{t_{sx}}$???

Q11) Abaque $\Rightarrow t_{sx} \omega_0 = 10 \Rightarrow t_{sx} = \frac{10}{\omega_0} = 0,075 \text{ s}$

$$a_{max} = \frac{0,3}{0,075} = 4,17 \text{ ms}^{-2} > 0,8 \text{ Pas OK}$$

Q12) $K = 0,085 \neq 1 \Rightarrow$ Asservissement pas précis.

Il faut un correcteur PI qui apportera une intégration

Q13) $C(\tau) = K_p \left(1 + \frac{1}{T_i \tau}\right) = \frac{K_p (1 + T_i \tau)}{T_i \tau}$

$$H_{Bc}(\tau) = \frac{K_A K_m K_{rt} K_p (1 + T_i \tau)}{T_i (1 + \tau_1 \tau)(1 + \tau_2 \tau) \tau} \quad K_{Bc} = \frac{K_A K_m K_{rt} K_p}{T_i}$$

Q14) $T_i = T_1 = 0,027 \text{ s} \Rightarrow H_{Bc} = \frac{K_{Bc}}{\tau (1 + T_2 \tau)}$

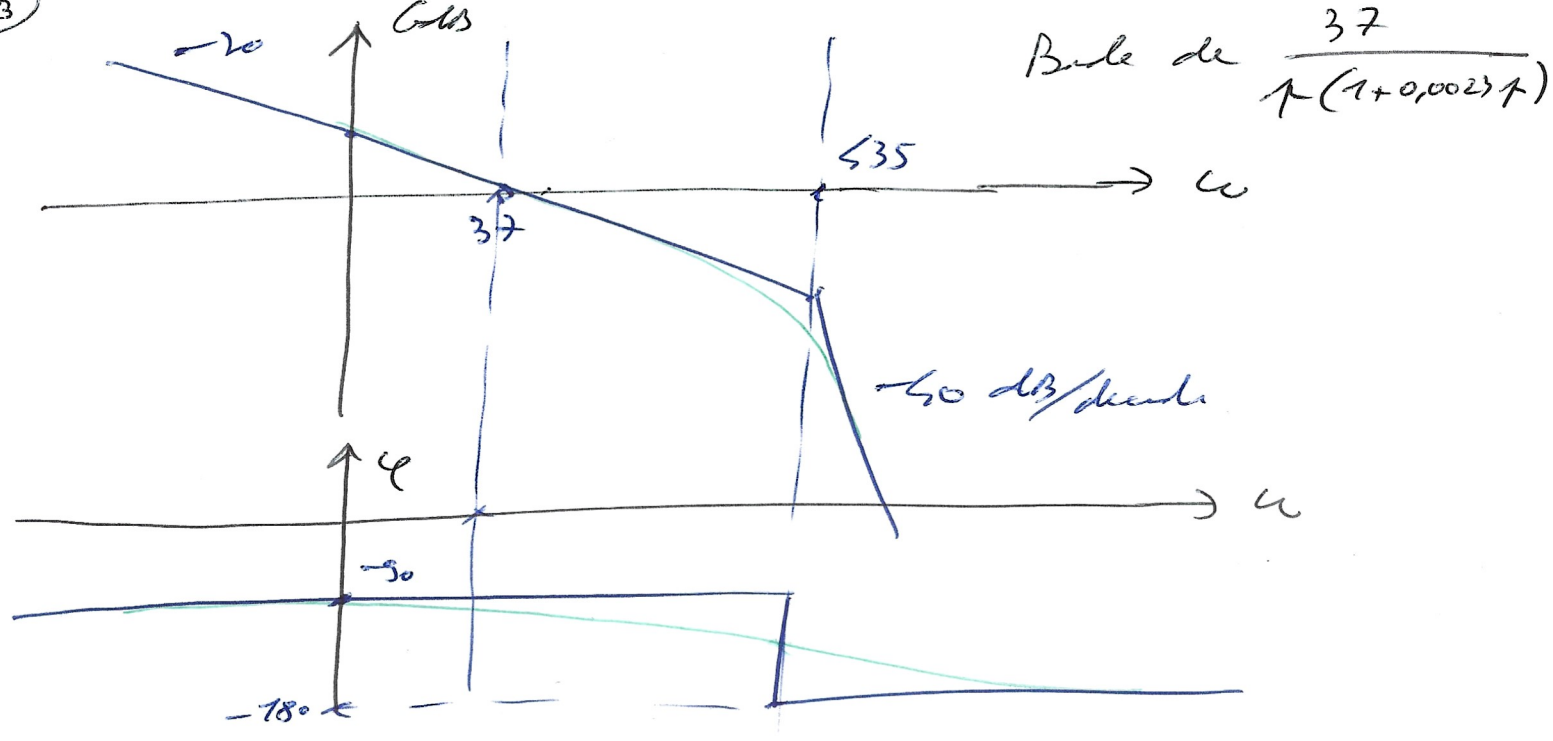
Q15) $H_{Bc}(\tau) = \frac{37 \cdot K_p}{\tau (1 + 0,0023 \tau)}$

On a une intégration en avant de la FTBO...

Boole : comme pour $\omega = \frac{1}{0,0023} = 435$

$$\omega \rightarrow 0 \Rightarrow |H_{Bc}| = \frac{37}{\omega}, \quad \omega \rightarrow \infty \Rightarrow |H_{Bc}| = 0 \text{ pour } \omega = 37$$

3



On veut $\sigma_{te} = 45^\circ$, pour $\omega = 535$ et fait $G_{dB} = 3$ dB

$$20 \log\left(\frac{37 \cdot 14}{535}\right) = 3 \Rightarrow K_p = \frac{535}{37} 70^{3/20} = 16,6$$

Q16) On veut $a < 0,8 \text{ m/s}^2$, $a = \frac{V_{max}}{t_{sx}}$, on trouve $a = 0,9; 2; 1$
Pas OK

Q17) Précis dans les 2 cas, Réel $t_{sx} = 0,38 \text{ s}$ $a = 1,2 \text{ m/s}^2$ Simple $t_{sx} = 0,5 \text{ s}$ $a = 1,5 \text{ m/s}^2$

Q25) On isole Σ , TRD sur $x \Rightarrow \Pi \delta = X_{01}$

Q26) On isole la roue, TRD en A $\Rightarrow J \ddot{\theta} = 2 X_{01} - \ell \theta$

$$\ddot{\theta} = -\frac{\delta}{2} \Rightarrow \theta = \left(\frac{J}{2} + 2\Pi\right) \delta$$

Q27) J négligeable $\Rightarrow \theta = 2\Pi \delta$

$$\begin{aligned} \vec{s}(I_2, \Sigma_0) &= \vec{s}(G, \Sigma_0) + \vec{I}_2 G \wedge \Pi \vec{\Pi} (\theta \vec{e}_{\Sigma_0}) \\ &= \vec{0} + (x_G \vec{x} + y_G \vec{y})_1 - \Pi \delta \vec{x} = -y_G \Pi \delta \vec{y} \end{aligned}$$

Q29) On isole Σ , TRD en $I_2 \Rightarrow -y_G \Pi \delta = \ell Z_{01} - (\ell - y_G) \Pi g$
limite basculement $Z_{01} = 0 \Rightarrow \delta = \frac{(\ell - y_G) g}{y_G} = 5,68 \text{ m/s}^2$

Q30) limite glissement $\Rightarrow X_{01} = -\nu \cdot Z_{01}$
 $\Rightarrow \Pi \delta = -\nu \left(\frac{(\ell - y_G) \Pi g - y_G \Pi \delta}{\ell} \right) \Rightarrow \delta = \frac{\nu (\ell - y_G)}{\ell - y_G \nu} = 5,13 \text{ m/s}^2$

Q31) Il faut $\delta = 4,5 \text{ m/s}^2$

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