(1)

Corrigé DS de SI, MP, déc 25, Verle

(Q1) $\Omega_{max} = 0{,}08$ °/s $\varphi_{max} = \Omega \times \Delta t = 0{,}08 \times 15 \times 60 = 7°$

(Q2) $\varphi_{max} = \Omega_{max}\,(3 + d_{cte}) \Rightarrow d_{cte} = \dfrac{\varphi_{max}}{\Omega_{max}} - 3 = \dfrac{7}{0{,}18} - 3 = 36$ s

(Q3) $d_{total} = 36 + 6 = 42$ s

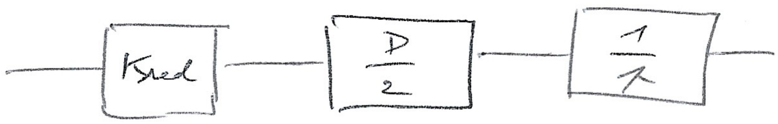
(Q4) $V = \dfrac{3{,}651}{49} = 0{,}075$ m/s $\omega = \dfrac{V}{R} = \dfrac{0{,}075}{22{,}75} = 3{,}3 \cdot 10^{-3}$ rad s^{-1}

49 s < 60 s OK $\omega = 0{,}19\ d°s^{-1} > 18$ Pas OK

(Q5) Acausal

(Q6) $\varepsilon = 3{,}651 - 3{,}633 = 0{,}018 > 0{,}015$ m Pas OK

(Q7) $V = K_{red}\,\omega_m \dfrac{D}{2}$



(Q8)

(Q13) TRS $\Rightarrow F_I + F_J = \left(\dfrac{m_v}{2} + m_{cc}\right) g$

(Q14) $\vec{M_C} = -\delta F_I \vec{y}$

(Q15) $\vec{M_D} = -\delta F_J \vec{y}$ $\vec{M_{cc}} = -\delta g \left(\dfrac{m_v}{2} + m_{cc}\right) \vec{y}$

(Q16) $\vec{M_{cl}} = -\delta g \left(\dfrac{m_v}{2} + m_{cl}\right) \vec{y}$ $\vec{M_{glob}} = -\delta g \,(m_v + m_{cc} + m_{cl})\, \vec{y}$

AN : $M_{glob} = 7014$ Nm

(Q17) $J_{eq} = (m_v + m_{cc} + m_{cl}) \dfrac{D^2}{4} K_{red}^2 + 2 J_g K_{red}^2 + 2 J_m$

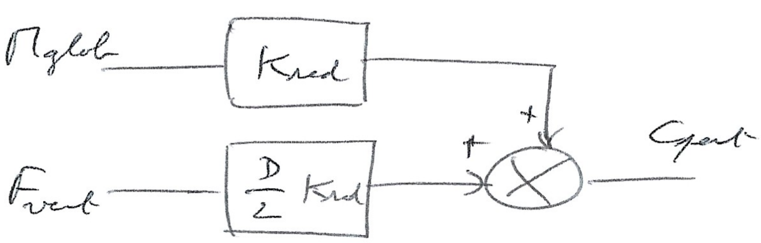
(Q18) $P_{ext} = F_{vent} \cdot V_{ch} + M_{glob}\,\omega_m$

(Q19) $P_{int} = C_m\,\omega_m$

(Q20) $J_{eq}\,\dot{\omega}_m\,\omega_m = C_m\,\omega_m + F_{vent}\dfrac{D}{2} K_{red}\,\omega_m + M_{glob} K_{red}\,\omega_m$

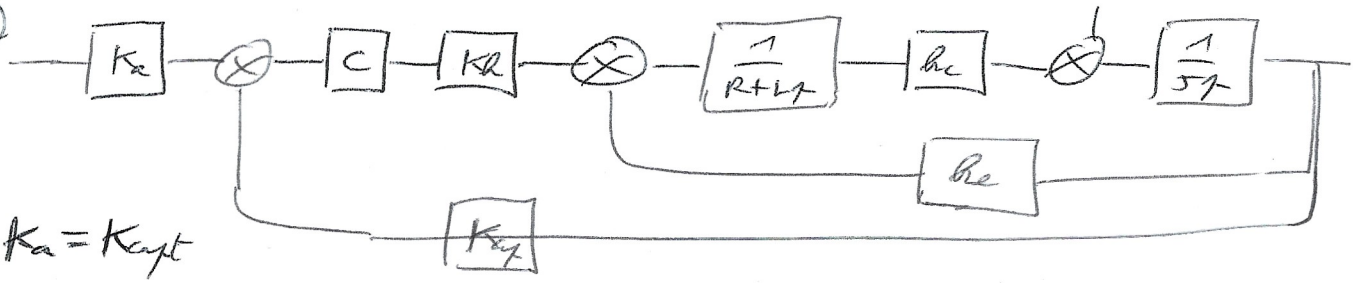
$J_{eq}\,\dot{\omega}_m = C_m + A.F_{vent} + B.M_{glob}$

(Q21)



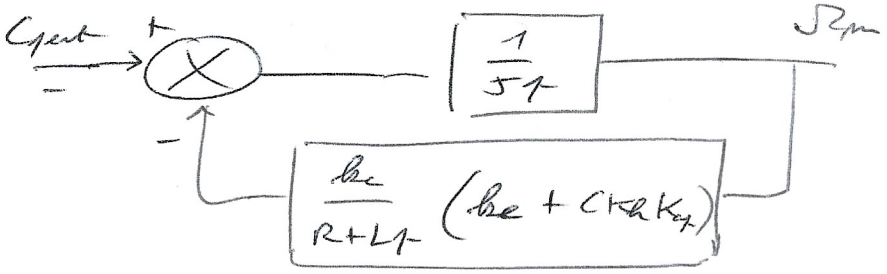
(2)

(Q22)



(Q23) $K_a = K_{capt}$

(Q24)



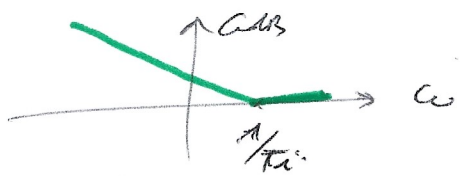
$$H(p) = \frac{R + Lp}{Jp(R+Lp) + k_c(k_c + C K_R K_{capt})}$$

$$H(p) = \frac{1 + \frac{L}{R}p}{\frac{JL}{R}p^2 + Jp + \frac{k_c}{R}(k_c + C K_R K_{capt})}$$

$$\Rightarrow \alpha = \frac{-R}{k_c(\ )} \quad ; \quad \delta = \frac{JR}{k_c(\ )} \quad ; \quad \varepsilon = \frac{JL}{k_c(\ )}$$

(Q25) Ecart $\varepsilon = \alpha . C_0$ (pas d'intégration dans la FTBO)

(Q26) Bode de $\frac{1 + T_i p}{T_i p}$



(Q27) PI ⇒ erreur nulle

(Q28) $20 \log C = -1,8 \Rightarrow C = 10^{\frac{-1,8}{20}} = 0,81$

(Q29) $\Pi_e = \leq 5$, stabilité OK ; une intégration dans la FTBO précision OK

(Q30) Ecart $\varepsilon < 1$ mm, conforme au cahier des charges

Pb : accumulation des erreurs ⇒ synchronisation mutile

(Q31) $M_{c2} = F_{con}(m_1 - 2m_2 + \omega_c K_{adapt})$