DS de SI, TP, mars 22

Exo 1

Q1 $FTBF(\tau) = \dfrac{2K}{0{,}02\tau^2 + \tau + 2K} = \dfrac{1}{\frac{\tau^2}{100K} + \frac{\tau}{2K} + 1}$

$\omega_0 = 10\sqrt{K}$ $\quad \dfrac{2z}{\omega_0} = \dfrac{1}{2K} \Rightarrow z = \dfrac{5}{2}\sqrt{K}$; $K = 1$

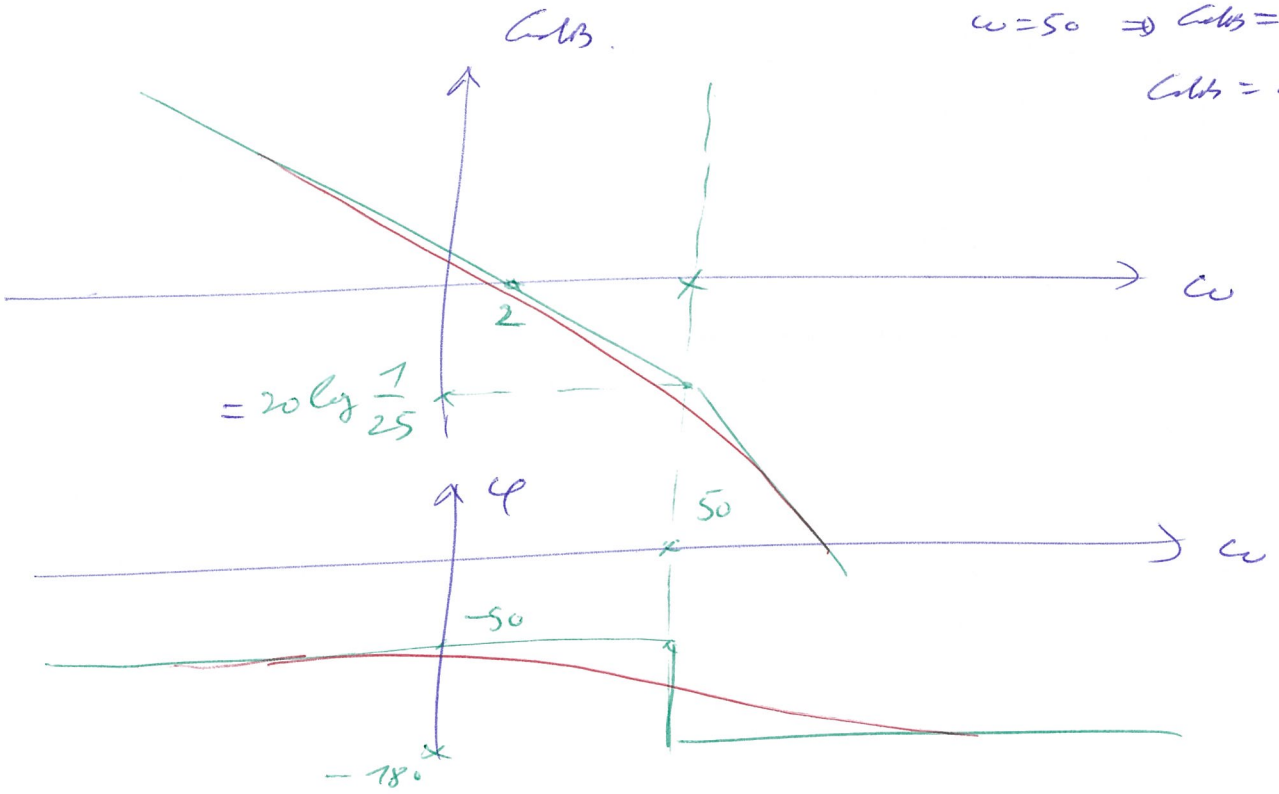
Q2 $H(\tau) = \dfrac{2}{\tau(1 + 0{,}02\tau)}$ $\quad$ Cassure $\omega = \dfrac{1}{0{,}02} = 50$

1re asymptote : $\omega \to 0$

$|H| = \dfrac{2}{\omega}$

$\omega = 50 \Rightarrow G_{dB} = 20\log\dfrac{1}{25}$

$G_{dB} = -28$



On veut $M_\varphi = 45°$ $\Rightarrow$ Il faut $20\log K = 20\log 25 + 3$

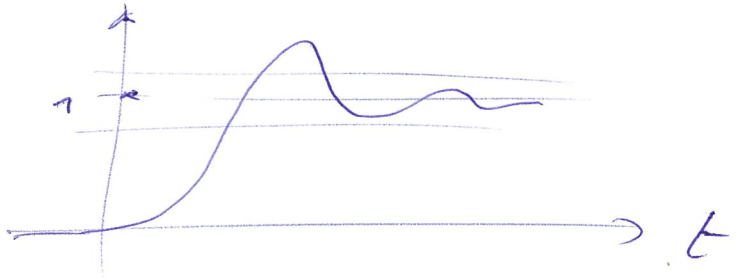
$\Rightarrow 20\log K = 31$

$K = 10^{31/20} = 35{,}5$

Q3 Avec $K = 35{,}5$

$\omega_0 = 59{,}6$

$z = 0{,}42$



(2)

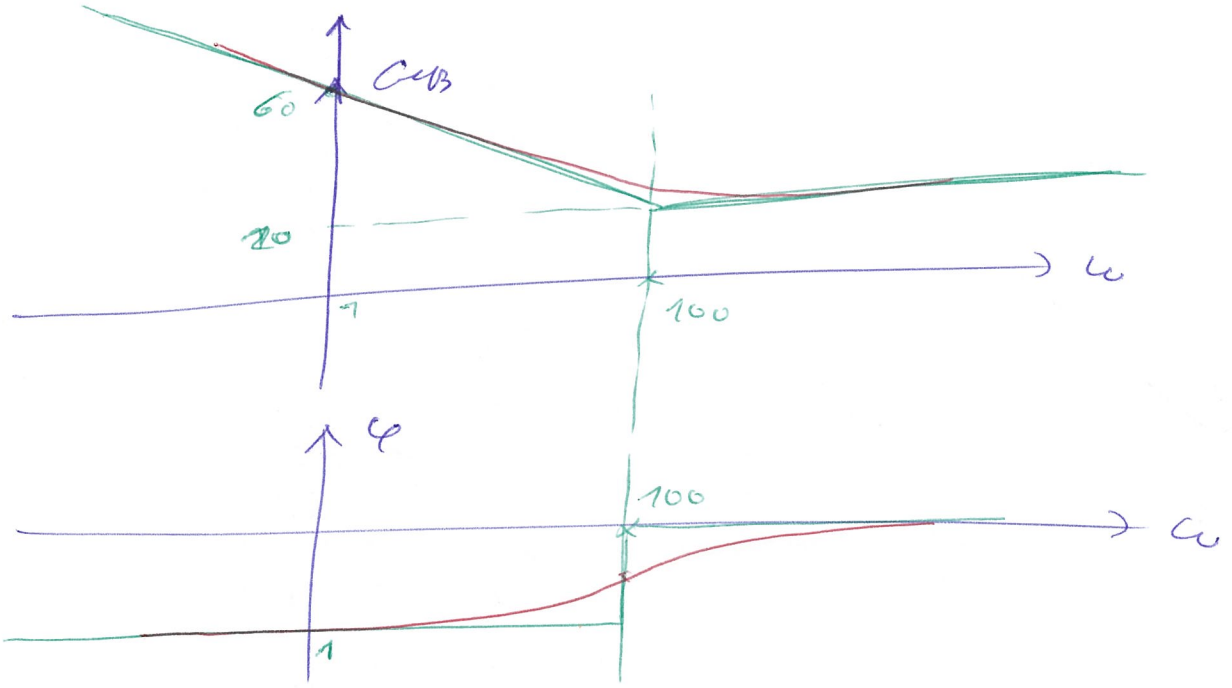
Exo 2

(Q1) FTBO donné avec $K_p = 10$ | $\omega_{0dB} = 18$; $M_\varphi = 100°$

(Q2) $C(p) = 10 + \frac{1000}{p} = \frac{10p + 1000}{p} = \frac{1000(1 + 0{,}01p)}{p}$

Cassure $\omega = 100$

1re asymptote : $|H| = \frac{1000}{\omega}$; 2e asymptote $|H| = 10$



(Q3) On veut $\omega_{0dB} = 100$ et $M_\varphi = 70°$

Avec $K_p = 10$, on a ... ~~il faut donc 20 log K_p =~~

pour $\omega = 100$ ~~G dB~~ $= -16$

Il faut donc $20 \log K_p = 36$ $\Rightarrow K_p = 10^{36/20} = 63{,}1$

$$C(p) = \frac{K_p \cdot p + K_I}{p} = \frac{K_I\left(1 + \frac{K_p}{K_I} p\right)}{p}$$

$$\frac{K_p}{K_i} = \frac{1}{10} \Rightarrow K_I = 631\ s$$

$$\varphi = -90 - \text{~~arctan~~} 90 + \arctan\left(\frac{\omega}{10}\right) = 84{,}3 - 180$$

$\Rightarrow M_\varphi = 84°$.