Samuel Alves 2076963-9

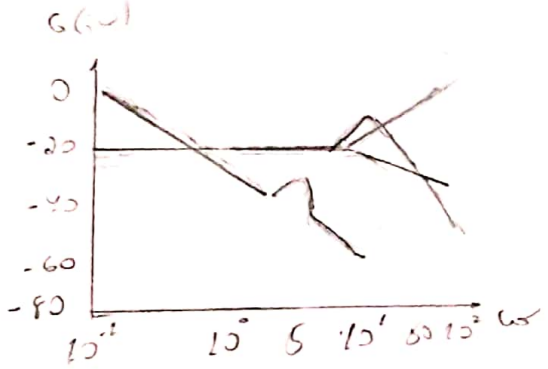
1- $G_1(s) = \frac{5^2 + 5s + 25}{s(s^3 + 7{,}5s^2 + 75s + 320)}$ $\quad G_1(j\omega) = \frac{25\left(1 - \left(\frac{\omega}{5}\right)^2 + \frac{\omega}{5}j\right)}{s\left(\frac{\omega}{5}j + 1\right)\left(\frac{1}{4} - \left(\frac{\omega}{8}\right)^2 + 0{,}375\frac{\omega}{8}j\right)}$

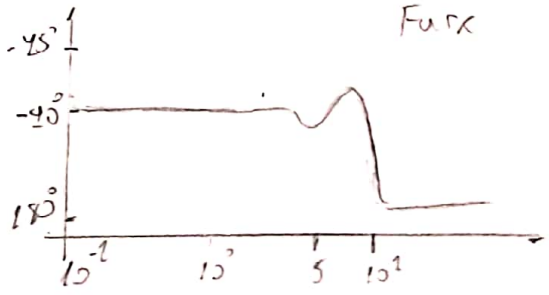
$K_b = \frac{5}{20}$ $\quad 20\log\left(\frac{5}{6{,}4}\right) = -2{,}14\,dB$ $\quad \omega_n = 5\,rad/s$

$\omega_r = \omega_n\sqrt{1-2\zeta^2} = 3{,}5\,rad/s$ — pico

$M_r = \frac{1}{2\zeta\sqrt{1-\zeta^2}} = 1{,}25\,dB$ — pico

p/ $\omega >> \omega_n$, cai 40 dB por década

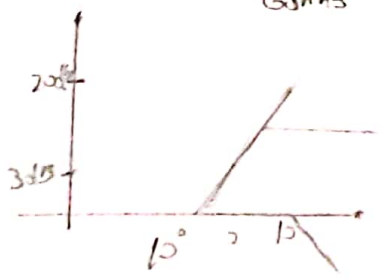


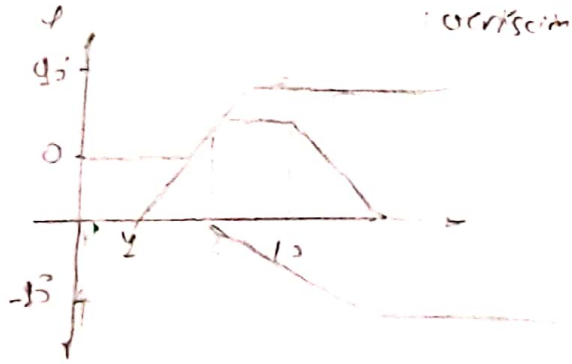


2- $G_2(s) = \frac{6(s+2)}{s+12}$ $\quad G_2(j\omega) = 1\,\frac{\left(\frac{\omega}{2}j + 1\right)}{\left(\frac{\omega}{12}j + 1\right)}$

Polo em $\omega = 12\,rad/s$ com diminuição de fase

Zero em $\omega = 2\,rad/s$ com aumento de fase





4- Polos $\quad p_1 = -5$ $\quad p_2 = 0$ $\quad p_3 = -1{,}2 + 7{,}4j$ $\quad p_4 = -1{,}2 - 7{,}4j$ } dominantes

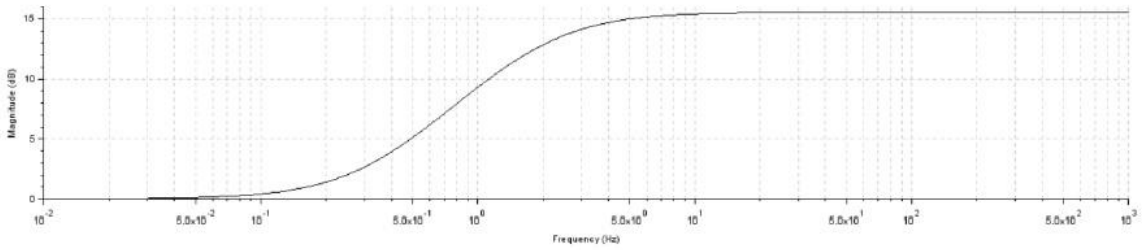
5- Overshoot

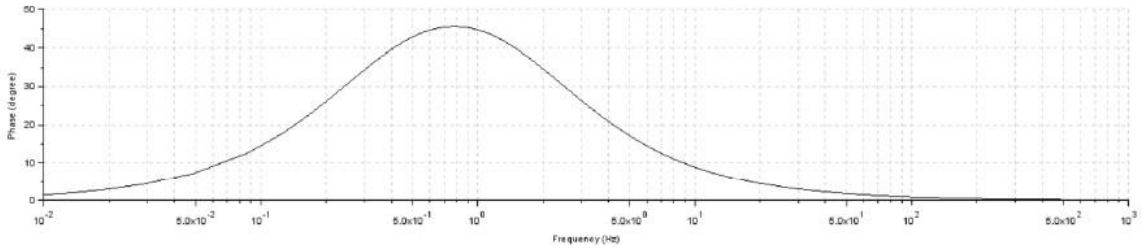
$$M_p = e^{\left(\frac{-\zeta\pi}{\sqrt{1-\zeta^2}}\right)} = 0,62 \rightarrow 62\%$$

Pelo teorema do valor final:

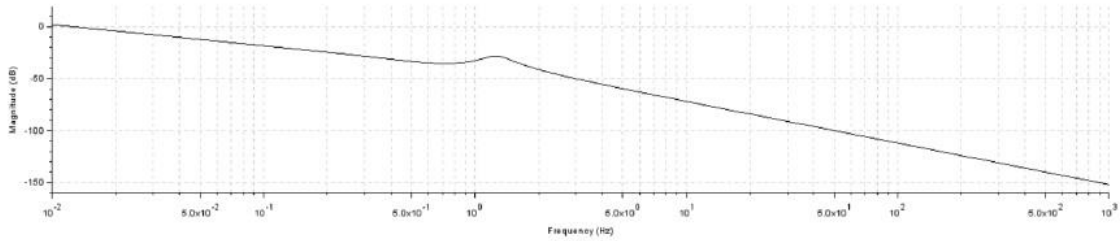
$$\lim_{t \to \infty} f(t) = \lim_{s \to 0} sF(s) = \frac{25}{320} = 0,078125$$

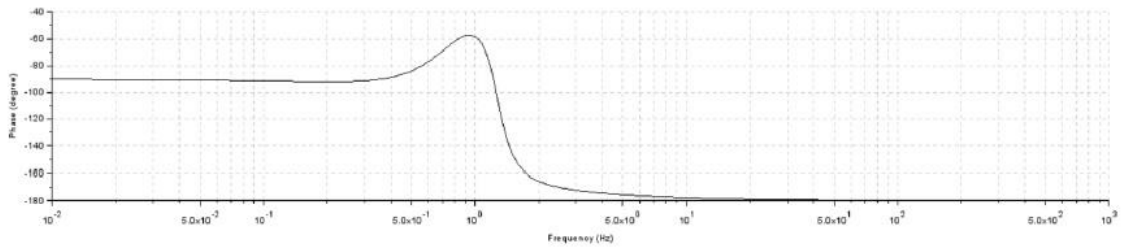
Exercício 3





Exercício 4





Exercicio 6