UNIVERSIDADE DE SÃO PAULO

ESCOLA POLITÉCNICA – DEPARTAMENTO DE ENGENHARIA MECÂNICA

PME3380 – Modelagem de Sistemas Dinâmicos

Exercícios 12/11

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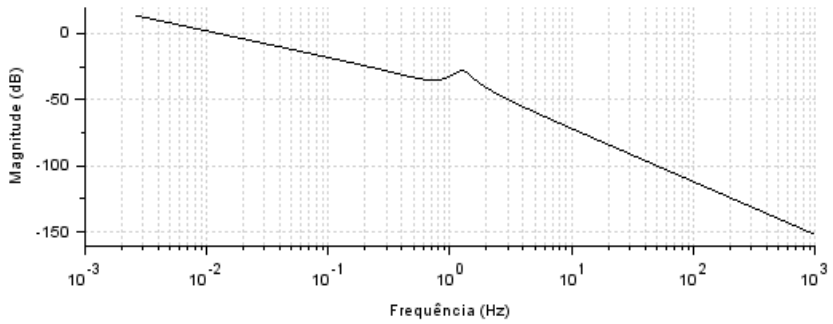
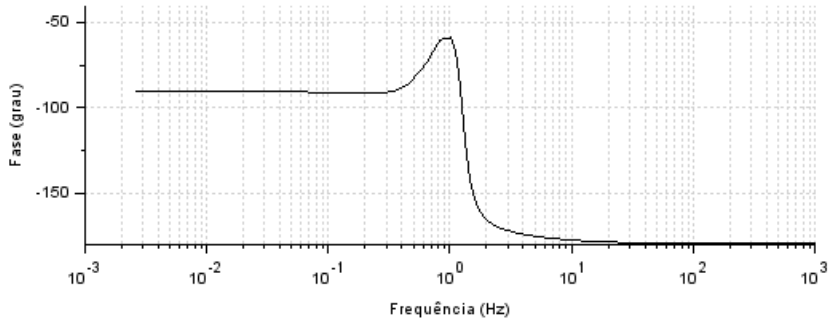
São Paulo

2020

Exercício 1





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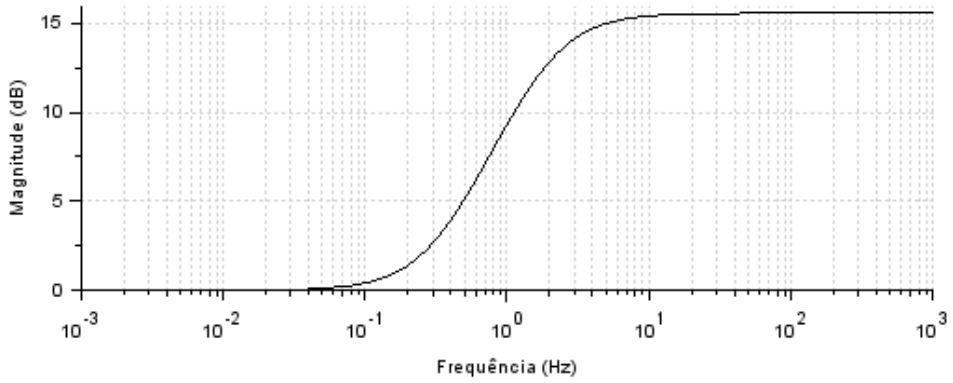
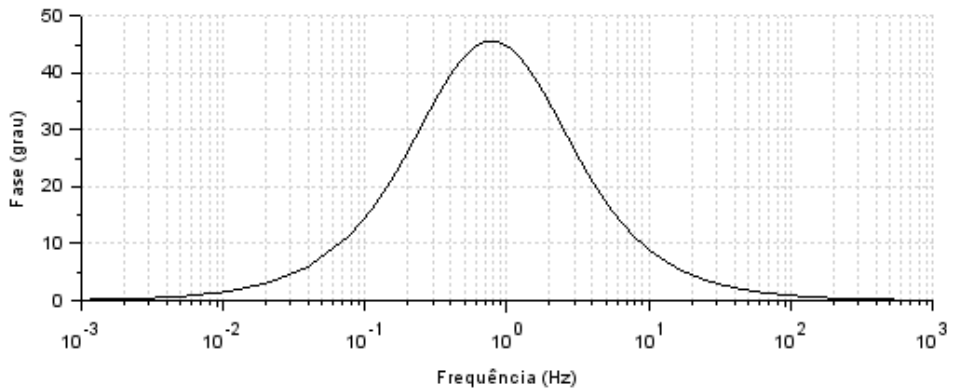
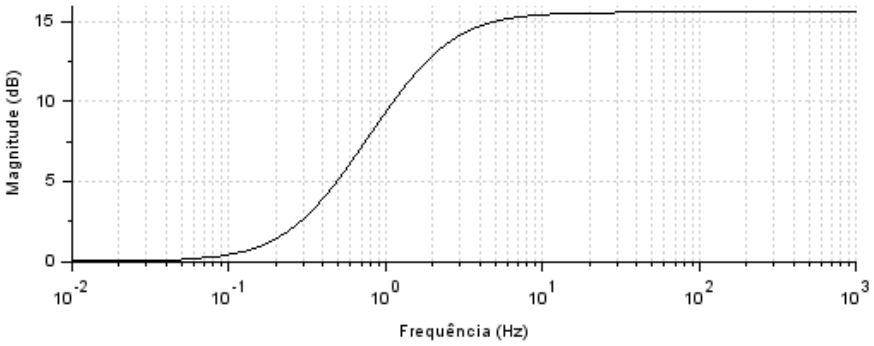
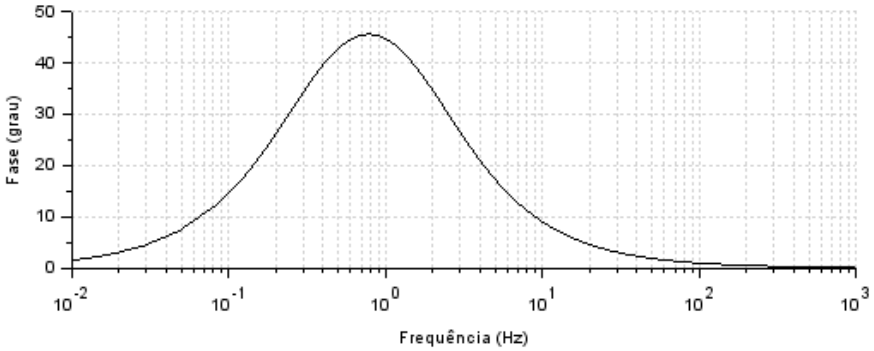


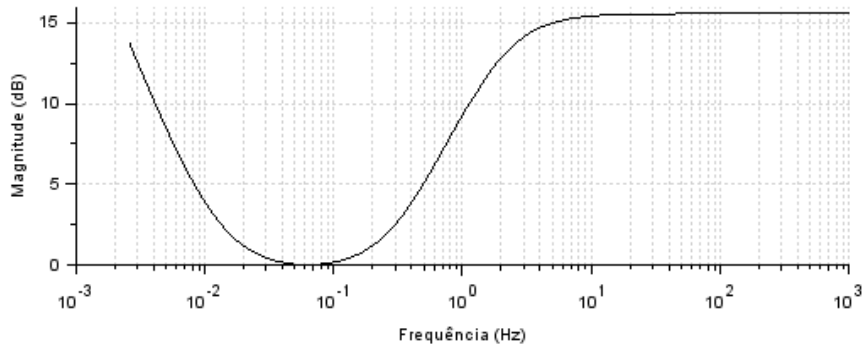


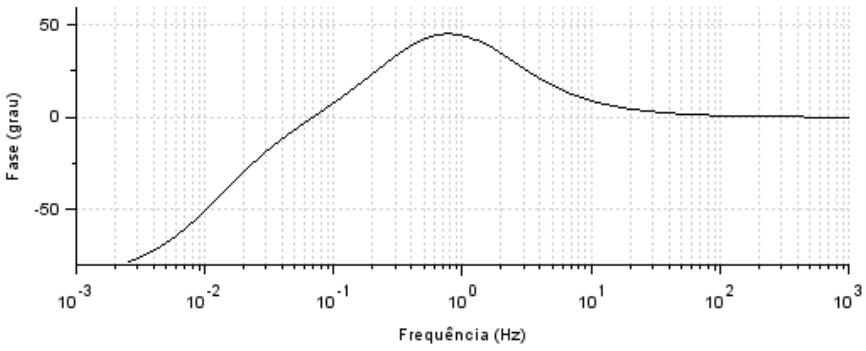
Exercício 3





Exercício 6





Modelagem — Pedro Leonel Giannoni de Oliveira — #USP: ~~10335569~~ 10335569

Exercícios 12/11 — Feito em scilab

1) $G_1(s) = \dfrac{s^2 + 5s + 25}{s^4 + 7{,}4s^3 + 76s^2 + 320s}$

2) $G_2(s) = 6 \cdot \dfrac{(s+2)}{(s+12)}$

3) A fase em 5 rad/s é de $\approx 45°$

4) Diagrama na última página

- Polos: $\begin{cases} P_1 = -5 \\ P_2 = 0 \\ P_3 = -1{,}2 + 7{,}9j \\ P_4 = -1{,}2 - 7{,}9j \end{cases}$ Dominantes

- $\omega_n = \sqrt{1{,}2^2 + 7{,}9^2} = 7{,}99$ rad/s
- $\zeta = \dfrac{1{,}2}{7{,}99} = 0{,}15$
- $\omega_r = \omega_n\sqrt{1-2\zeta^2}$

$\Rightarrow \omega_r = 7{,}8$ rad/s

- Pico de ressonância em 7,8 rad/s (esperado)
- Fase em 5 rad/s é de $-62{,}3°$

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

6) - Fase em 5 rad/s de $-16{,}8°$ (soma das fases dos FTs)
- G_2 e G_1 em série: magnitude aumenta em $\approx$ 15 dB após 5 rad/s