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a) $G(s) = \dfrac{120}{s^2 + 12s + 120}$

$2\xi\omega_n = 12 \qquad \omega_n^2 = 120 \rightarrow \omega_n = 10,95$

$\xi = \dfrac{12}{2 \times 19,95}$

$= 0,5477$

$t_s = 4 \cdot \tau = 4 \cdot \dfrac{1}{\xi\omega_n} = 0,666(s)$

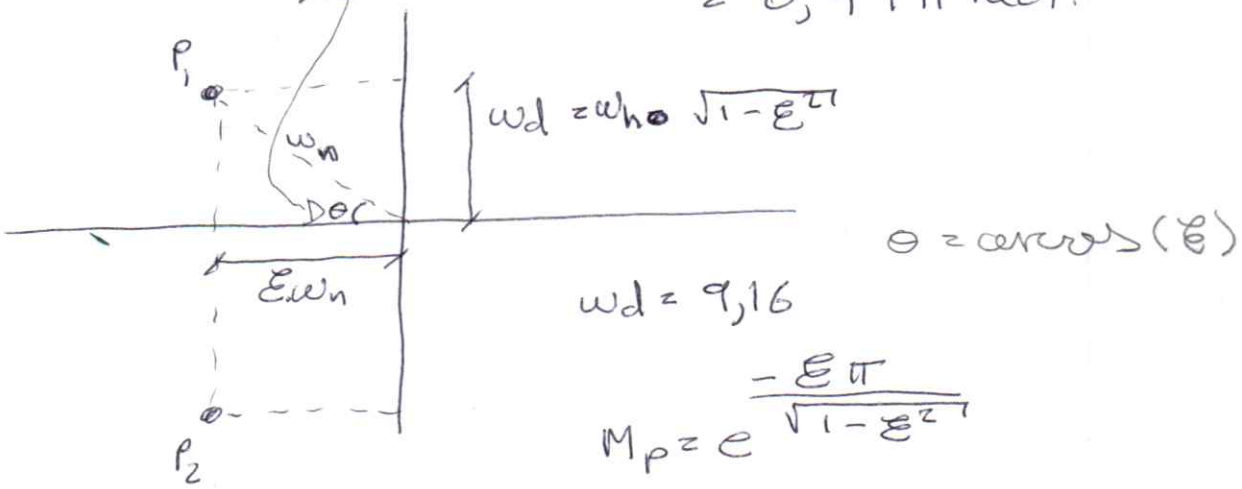
$t_p = \dfrac{\pi}{\omega_n \sqrt{1-\xi^2}} = 0,343(s)$

$t_r \Big|_{10\%}^{90\%} \dfrac{1}{\omega_d}\left[\pi - \operatorname{artg}\left(\dfrac{\omega_d}{\xi\omega_n}\right)\right] = 0,2346$

$\theta = \arccos\left(\dfrac{\xi\omega_n}{\omega_n}\right)$

$\omega_d = \omega_n \cdot \sqrt{1-\xi^2} \qquad = 56,79°$

$\approx 9,16 \qquad = 0,9911 \text{ rad}$



$\theta = \arccos(\xi)$

$\omega_d = 9,16$

$M_p = e^{\dfrac{-\xi\pi}{\sqrt{1-\xi^2}}}$