5.

$$G(s) = \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$$

a) $M_p = 30\%$

$t_s = 0{,}05$ (s)

$M_p \to \xi \approx 0{,}35786$ $\qquad M_p = e^{\frac{-\xi\pi}{\sqrt{1-\xi^2}}}$

$t_s \wedge \xi_p \to \omega_n$ $\qquad t_s = 4\tau = \frac{4}{\xi\omega_n}$

$$\omega_n = \frac{4}{t_s \cdot \xi} \approx 223{,}55$$

$2\xi\omega_n \approx 160$

$\omega_n^2 \approx 49975{,}9$ polinomio $\to \begin{cases} -80 + 208{,}74i \\ -80 - 208{,}74i \end{cases}$

b) $M_p = 17\%$, $t_p = 0{,}5$ (s)

$M_p \to \xi = 0{,}491274152$ $\qquad M_p = e^{\frac{-\xi\pi}{\sqrt{1-\xi^2}}}$

$t_p \wedge \xi \to \omega_n = 7{,}2137$ $\qquad t_p = \frac{\pi}{\omega_n\sqrt{1-\xi^2}} = 0{,}494 \approx 0{,}5$

$\omega_n^2 = 52{,}037$ $\qquad \omega_n = \frac{\pi}{t_p\sqrt{1-\xi^2}}$

polinomeo $\to \begin{cases} -3{,}55 + 6{,}2767i \\ -3{,}55 - 6{,}2767i \end{cases}$

$$G(s) = \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2} = \frac{52}{s^2 + 7s + \sqrt{52}}$$