• Tarea Semana 3

Se pide: $\alpha_{MAX} = 1dB$; $\alpha_{MIN} = 12dB$; $f_p = 1500Hz$; $f_s = 3kHz$

Máxima Planicidad.

$$|T(j\omega)|^2 = T(j\omega)\cdot T(-j\omega) = T(s)\cdot T(-s)\Big|_{s=j\omega} = \frac{1}{1+\xi^2\omega^{2\cdot n}}$$

$$|\alpha|^2 = 1+\xi^2\cdot\omega^{2n} \longrightarrow \alpha_{dB} = 10\cdot\log\left(1+\xi^2\omega^{2n}\right)$$

Para $\alpha_{MAX} \longrightarrow \omega = 1$

$$\longrightarrow 1dB = 10\log(1+\xi^2)$$

$$10^{\frac{1}{10}} - 1 = \xi^2 \longrightarrow \boxed{\xi = 0,509}$$

$$\Omega_w = 1500Hz\cdot 2\pi \longrightarrow \begin{cases} \omega_{pn} = 1 \\ \omega_{sn} = 2 \end{cases}$$

Buscamos hallar el orden: • $\alpha_1 = 10\log(1+0,509^2\cdot 2^{2\cdot 1}) = 3dB$

Orden 3 $\longrightarrow$ • $\alpha_3 = 10\log(1+0,509^2\cdot 2^{2\cdot 3}) = 12,45dB$ ✓

$\alpha_3 > \alpha_{MIN}$

$$|T(j\omega)|^2 = \frac{1}{1+\xi^2\omega^{2n}} \xrightarrow[\omega = s/j]{s=j\omega} T(s)\cdot T(-s) = \frac{1}{1+\xi^2\left(\frac{s}{j}\right)^{2\cdot 3}}$$

$$= \frac{1}{1-\xi^2 s^6} = \frac{\frac{1}{\xi^2}}{s^6 - \frac{1}{\xi^2}} = \frac{c}{s^3+as^2+bs+c}\cdot\frac{c}{s^3-as^2+bs-c}$$

$$= \frac{c^2}{s^6+2bs^4-a^2s^4+b^2s^2-2acs^2-c^2}$$

$$c = \frac{1}{\xi} = 1,965 \quad ; \quad b^2 = 2ac \longrightarrow a = \frac{b^2}{2c}$$

$$2b = a^2 \longrightarrow 2b = \frac{b^4}{4c^2} \longrightarrow b^4 - 8c^2b = 0 \longrightarrow b^3 = 8c^2$$

$b = 3,14$

$a = \frac{3,14^2}{2\cdot 1,965} = 2,509$

$$\Rightarrow \boxed{T(s) = \frac{1,965}{s^3+2,509s^2+3,14s+1,965}}$$