

RTA - ASSISTENZ - Übung 3 - 13.11.15

Gegaben: P(s) \rightarrow Bode

$$\text{Lösung: } P(s) = \frac{(s+1)^2}{(s+1)(0,01s+1)(0,1s+1)} e^{-0,0001 \cdot s}$$

$$\text{Check: } |P(j\omega)| = \frac{111}{(61) \cdot 11 \cdot 11} = 1 = 0 \text{ dB } \checkmark$$

$$\omega = 1 \rightarrow \begin{array}{l} \text{Betrag} + 20 \rightarrow \text{Pole} + 2 \cdot \text{Null.} \\ \text{Phase} + 270 \rightarrow \text{Inst. Pole} + 2 \cdot \text{Null.} \end{array} \left. \begin{array}{l} \{\pi_1 = +1 \quad \xi_{1,2} = 1 \\ \pi_2 = 10 \end{array} \right.$$

$$\omega = 10 \rightarrow \begin{array}{l} \text{Betrag} - 20 \rightarrow \text{Pole} \\ \text{Phase} - 90 \rightarrow \text{Stab. Pole} \end{array} \left. \begin{array}{l} \{\pi_2 = 10 \\ \pi_3 = 100 \end{array} \right.$$

$$\omega = 100 \rightarrow \begin{array}{l} \text{Betrag} - 20 \rightarrow \text{Pole} \\ \text{Phase} - 90 \rightarrow \text{Stab. Pole} \end{array} \left. \begin{array}{l} \{\pi_3 = 100 \end{array} \right.$$

Was fehlt? \rightarrow Phase \rightarrow Tabelle

$$e^{-Ts} \rightarrow \frac{1}{T} \text{ Frequenz vom } -57,3^\circ = 1 \text{ rad/s}$$

$$\text{Phase } ? + 90 \rightarrow \frac{1}{T} \rightarrow 90 - 57,3^\circ \approx 33$$

$$\rightarrow \frac{1}{T} = 10000 \rightarrow T = 0,0001$$

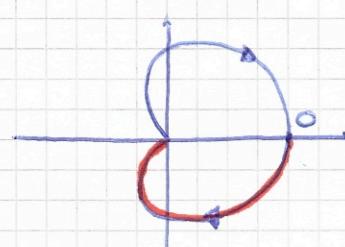
$$\rightarrow P(s) = \frac{(s+1)^2}{(-s+1)(0,01s+1)(0,1s+1)} e^{-0,0001 \cdot s}$$

Gegaben Bode $\rightarrow \Sigma(s)$, Nyquist

$$P(s) = 10 \frac{0,1s+1}{(s+1)^2}$$

$$\text{Aus Bode } \omega = 0 \quad |P| = 1 \quad \angle(P) = 0 \rightarrow 1$$

$$\omega = \infty \quad |P| = 0 \quad \angle(P) = -90^\circ$$



Gegaben

$$1) P(s) = \frac{1}{s(s+1)(s+2)} \rightsquigarrow \text{Integration}$$

$$2) P(s) = \frac{1}{(s+1)(s+2)} \rightsquigarrow ?$$

$$3) P(s) = \frac{1}{s+2} e^{-s} \rightsquigarrow \text{Tatzeit}$$

$$4) P(s) = \frac{1}{(-s+n)(s+2)} \rightarrow ?$$

$$\angle\left(\frac{1}{(s+n)(s+2)}\right) = ?$$

$$\begin{aligned}\lim_{\omega \rightarrow \infty} \angle\left(\frac{1}{(\omega+n)(\omega+2)}\right) &= \lim_{\omega \rightarrow \infty} (\angle(1) - \angle(j\omega+1) - \angle(j\omega+2)) \\ &= \lim_{\omega \rightarrow \infty} (\text{arctan}(0) - \text{arctan}\left(\frac{\omega}{\pi}\right) - \text{arctan}\left(\frac{\omega}{2}\right)) \\ &= 0 - \frac{\pi}{2} - \frac{\pi}{2} = -\pi\end{aligned}$$

$$\begin{aligned}\lim_{\omega \rightarrow 0} \angle\left(\frac{1}{(-s+n)(s+2)}\right) &= \lim_{\omega \rightarrow 0} (\angle(1) - \angle(-j\omega+n) - \angle(j\omega+2)) \\ &= \lim_{\omega \rightarrow 0} (\text{arctan}(0) - \text{arctan}\left(-\frac{n\pi}{2}\right) - \text{arctan}\left(\frac{n\pi}{2}\right)) \\ &= 0 + \frac{\pi}{2} - \frac{\pi}{2} = 0\end{aligned}$$

