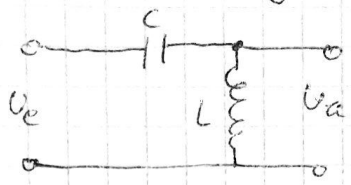
Bearbeitung des 3. Übungsblatts zur Elektronik

05.05.20

A2: CL-Sprungantwort



(a) $g(\omega) := \frac{U_a(\omega)}{U_e(\omega)} = \frac{i\omega L}{i\omega L + \frac{1}{i\omega C}}$

$G(s)$ durch $\omega = is$: $G(s) = \frac{sL}{sL + \frac{1}{sC}} = \frac{s^2LC}{s^2LC+1}$ //

(b) $U_a(t) = \mathcal{L}^{-1}\{G(s) \cdot \mathcal{L}\{U_e(t)\}(s)\}(t)$

Laplace-Trafo des Einheitssprungs:

$U_e(t) = \Theta(t) \cdot 1V$

$\rightarrow \mathcal{L}\{U_e(t)\}(s) = 1V \int_0^\infty \Theta(t) e^{-st}\, dt = -\frac{e^{-st}}{s}\Big|_0^{\rightarrow\infty} 1V = \frac{1}{s} \cdot 1V$

$\Rightarrow U_a(t) = \mathcal{L}^{-1}\{\frac{G(s)}{s}\}(t) \cdot 1V$

$= \mathcal{L}^{-1}\{\frac{sLC}{s^2LC+1}\}(t) \cdot 1V$

$\overset{\text{Tabellen}}{=} LC \cdot \frac{\cos(\sqrt{\frac{1}{LC}}\, t)}{LC}\, V$

$= 1V \cdot \cos\left(\sqrt{\frac{1}{LC}} \cdot t\right)$ //