

a-f)

a) Skript S. 163: $A(\omega) = \frac{U_A}{U_E} = \frac{-Z_2 V(\omega)}{Z_2 + Z_1(1 + V(\omega))}$

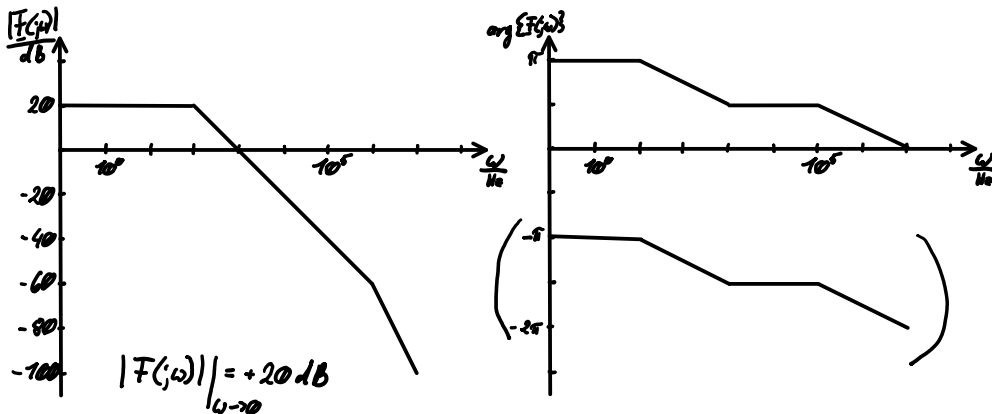
b) $F(j\omega) = \frac{U_a}{U_e} = -\frac{R_2 V_0 \omega_j}{R_1 V_0 \omega_j (1 + j\omega C R_2) + (R_1(1 + j\omega C R_2) + R_2)(\omega_j + j\omega V_0)}$

$F(j\omega) \Big|_{V_0 \rightarrow \infty} = \frac{-R_2 \omega_j}{R_1 \omega_j (1 + j\omega C R_2) + j\omega R_1(1 + j\omega C R_2) + j\omega R_2}$

c) $F(j\omega) = \frac{-\frac{R_2}{R_1}}{1 + j\omega \left(\frac{1}{\omega_j} + C R_2 + \frac{R_2}{R_1 \omega_j} \right) + (j\omega)^2 \frac{C R_2}{\omega_j}} = -\frac{R_2}{R_1} \frac{1}{(1 + j\frac{\omega}{\omega_1})(1 + j\frac{\omega}{\omega_2})}$

$b \approx 10^{-2} \text{ s} \quad \alpha = 10^{-8} \text{ s}^2$

$20 \log(|K|) = 20 \text{ dB} \quad p_{1,2} = \frac{-b \pm \sqrt{b^2 - 4a}}{2a} \quad p_1 = -100 \text{ Hz} \Rightarrow \omega_1 = 10^2 \text{ Hz} \quad \omega_2 = 10^6 \text{ Hz}$
 $p_2 = -10^6 \text{ Hz}$



d)

$u_e(t) = U_0 \left(\frac{t}{T_A} s(t) - \frac{t-T_A}{T_A} s(t-T_A) - \frac{t-T_A}{2T_A} s(t-T_A) + \frac{t-3T_A}{2T_A} s(t-3T_A) \right)$

$V_e(p) = \frac{U_0}{T_A} \left(\frac{1}{p^2} - \frac{3}{2} \frac{1}{p^2} \exp(-pT_A) + \frac{1}{2} \frac{1}{p^2} \exp(-p3T_A) \right)$

$u_e(t)$ ist beschränkt $\Rightarrow$ Konvergenzbereich $\mathbb{C} \in \mathbb{R} \Rightarrow V_e(f) = V_e(p) \Big|_{p=j2\pi f}$

$V_e(f) = \frac{U_0}{T_A} \frac{1}{(j2\pi f)^2} \left(1 - \frac{3}{2} \exp(-j2\pi f T_A) + \frac{1}{2} \exp(-j2\pi f 3T_A) \right)$

e)

$V_A(f) = F_s(j\omega) \Big|_{\omega=2\pi f} \cdot V_e(f) = \frac{U_1}{T_0} \frac{1}{(j2\pi f)^2} \frac{1}{1 + j\frac{\omega}{\omega_0}} (1 - \exp(-j2\pi f T_0))^2$

f)

Dreiecksignal ist beschränkt, siehe d)

$V_A(f) \Rightarrow V_A(p) = \frac{U_1 \omega_0}{T_0} \frac{1}{p^2} \frac{1}{\omega_0 + p} (1 - 2 \exp(-pT_0) + \exp(-2pT_0))$ S. 328

$u_A(t) = \frac{U_1 \omega_0}{T_0} \left(s(t) \frac{1}{\omega_0^2} (\omega_0 t + e^{-\omega_0 t} - 1) - 2 \frac{s(t-T_0)}{\omega_0^2} (\omega_0(t-T_0) + e^{-\omega_0(t-T_0)} - 1) + \frac{s(t-2T_0)}{\omega_0^2} (\omega_0(t-2T_0) + e^{-\omega_0(t-2T_0)} - 1) \right)$

(

>