

KL- Abgabe 01

Aufgabe 1:

a)

i) $z = -1 + j\sqrt{3}$

$$|z| = 2$$

$$\arg(z) = \frac{2\pi}{3}$$

ii) $z = -2 - j2$

$$|z| = 2\sqrt{2}$$

$$\arg(z) = \frac{5\pi}{4}$$

iii) $F(\Omega) = |F(\Omega)| = \frac{\Omega}{\sqrt{1+\Omega^2}}$

$$\varphi(\Omega) = \frac{\pi}{2} - \arctan(\Omega)$$

$$F(0) = 0$$

$$F(1) = \frac{1}{\sqrt{2}}$$

$$\lim_{\Omega \rightarrow \infty} F(\Omega) = 1$$

$$\varphi(0) = \frac{\pi}{2}$$

$$\varphi(1) = \frac{\pi}{4}$$

$$\lim_{\Omega \rightarrow \infty} \varphi(\Omega) = 0$$

iv) $F(\Omega) = |F(\Omega)| = \frac{1}{\sqrt{1+(a^2-2)\Omega^2+\Omega^4}}$

$$\varphi(\Omega) = \arg F(\Omega) = \begin{cases} -\arctan\left(\frac{a\Omega}{1-\Omega^2}\right), & \Omega < 1 \\ -\frac{\pi}{2}, & \Omega = 1 \\ -\pi - \arctan\left(\frac{a\Omega}{1-\Omega^2}\right), & \Omega > 1 \end{cases}$$

$$F(0) = 1$$

$$F(1) = \frac{1}{a}$$

$$\lim_{\Omega \rightarrow \infty} F(\Omega) = 0$$

$$\varphi(0) = 0$$

$$\varphi(1) = -\frac{\pi}{2}$$

$$\lim_{\Omega \rightarrow \infty} \varphi(\Omega) = -\pi$$

Aufgabe 2:

a)

$$i) \underline{F}(j\omega) = \frac{j\omega \frac{L_1}{R_2}}{1 + j\omega \frac{L_1}{R_1}}$$

$$iv) \underline{F}(j\omega) = \frac{j\omega C_1 R_1}{1 + j\omega C_1 R_1}$$

$$ii) \underline{F}(j\omega) = \frac{1}{1 + j\omega C_1 R_1}$$

$$v) \underline{F}(j\omega) = \frac{j\omega \frac{L_2}{R_1}}{1 + j\omega [C_2 R_1 + \frac{L_2}{R_1}] + (j\omega)^2 \cdot 2C_2 L_2}$$

$$iii) \underline{F}(j\omega) = \frac{1}{1 + j\omega \frac{L_1}{R_1}}$$

b) • Abb. b) und c) (Tiefpassfilter)

• Abb. a) und d) (Hochpassfilter)

Bedingung für beide gleich: $R_1 C_1 = \frac{L_1}{R_1}$