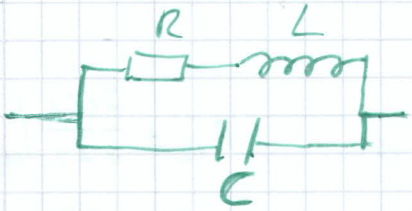
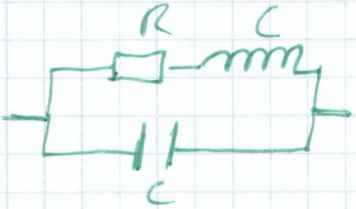
Elektronik-Übung

Aufgabe 7

Reeller Widerstand



Reele Spule



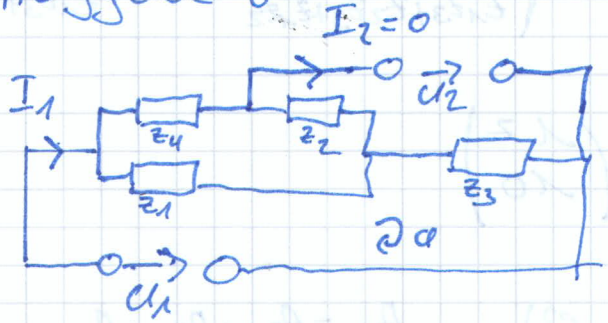
Reeller Kondensator

d)

U wird für eine Frequenz max.
(wenn man bestimmt ausrechnen)

Elektronik Übung

Aufgabe 8

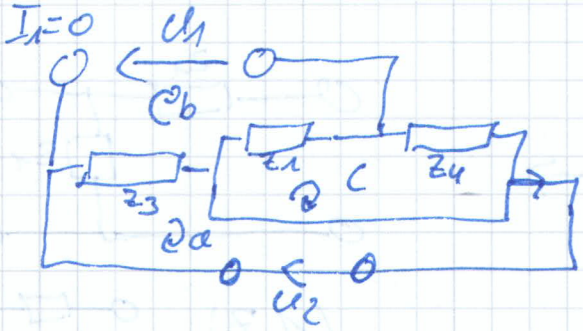


$$z_{11} = \left.\frac{\partial u_1}{\partial I_1}\right|_{I_2=0} \qquad z_{12} = \left.\frac{\partial u_1}{\partial I_2}\right|_{I_1=0}$$

$$z_{21} = \left.\frac{\partial u_2}{\partial I_1}\right|_{I_2=0} \qquad z_{22} = \left.\frac{\partial u_2}{\partial I_2}\right|_{I_1=0}$$

$$u_1 = I_1 \left(z_3 + \left(\frac{1}{z_1} + \frac{1}{z_2+z_4}\right)^{-1}\right) = I_1 \left(z_3 + \frac{z_1(z_4+z_2)}{z_1+z_2+z_4}\right)$$

$$I_1 = I_{z1}\left(1 + \frac{z_2+z_4}{z_1}\right) \iff I_{z1} = I_1 \frac{z_1}{z_1+z_2+z_4}$$



$$a = u_2 = -I_2 \left(z_3 + \left(\frac{1}{z_2} + \frac{1}{z_1+z_4}\right)^{-1}\right)$$

$$= -I_2 \left(z_3 + \frac{z_2(z_1+z_4)}{z_1+z_2+z_3}\right)$$

$$b = I_2 = I_{z2}\left(1 + \frac{z_1+z_4}{z_2}\right)$$

$$\iff I_{z2} = I_2 \frac{z_2}{z_1+z_2+z_4}$$

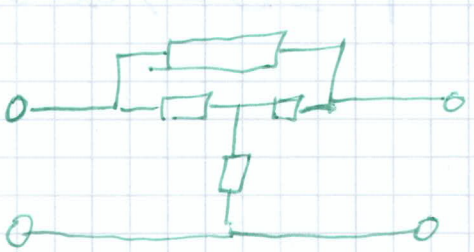
$$I_2 = 0: \quad u_1 = -I_1 \cdot z_3 - I_1 \frac{z_1 z_3}{z_1+z_2+z_4}$$

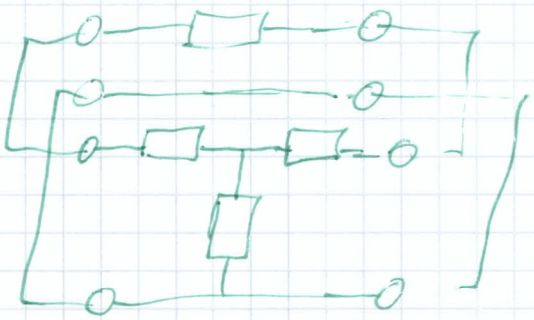
$$\Rightarrow z_{11} = z_3 + \frac{z_1(z_4+z_2)}{z_1+z_2+z_4} \qquad z_{12} = -z_3 - \frac{z_1 z_2}{z_1+z_2+z_4}$$

$$z_{21} = z_3 + \frac{z_1 z_2}{z_1+z_2+z_4} \qquad z_{22} = -\left(z_3 + \frac{z_2(z_1+z_4)}{z_1+z_2+z_4}\right)$$

$$\underline{\underline{Y}} = \frac{1}{\det \underline{\underline{z}}} \begin{pmatrix} z_{22} & -z_{12} \\ -z_{21} & z_{11} \end{pmatrix}$$

b)



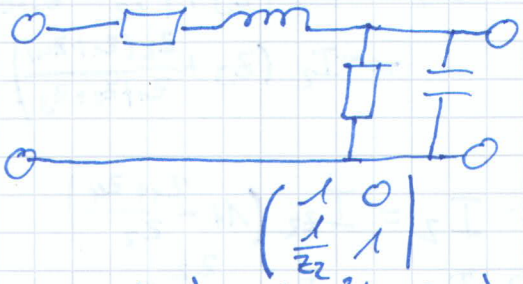


$$Y_1 = \begin{pmatrix} \frac{1}{Z_4} & -\frac{1}{Z_4} \\ \frac{1}{Z_4} & -\frac{1}{Z_4} \end{pmatrix} \qquad Y_2 = \begin{pmatrix} \frac{Z_2+Z_3}{Z_1Z_3+Z_1Z_2+Z_2Z_3} & \frac{-Z_3}{Z_1Z_3+Z_1Z_2+Z_2Z_3} \\ \frac{Z_3}{Z_1Z_3+Z_2Z_3+Z_1Z_2} & -\frac{Z_2+Z_3}{Z_1Z_3+Z_2Z_3+Z_1Z_2} \end{pmatrix}$$

$$\rightarrow A = \begin{pmatrix} 1 & Z \\ 1 & 0 \end{pmatrix}$$

$$A = \begin{pmatrix} 1 & 0 \\ \frac{1}{Z} & 0 \end{pmatrix} \qquad A_T = A_{Z1} \cdot A_{Z3} \cdot A_{Z2}$$

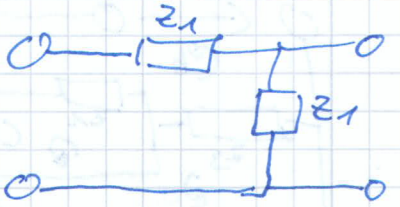
Aufgabe 9



$$\begin{pmatrix} 1 & 0 \\ \frac{1}{Z_2} & 1 \end{pmatrix}$$

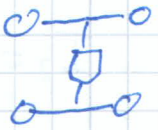
$$\begin{pmatrix} 1 & Z_1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1+\frac{Z_1}{Z_2} & Z_1 \\ \frac{1}{Z_2} & 1 \end{pmatrix} = A_1$$

$\rightarrow$

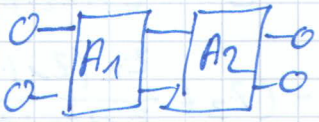


$$A_1 = \begin{pmatrix} 1 & Z \\ 1 & 0 \end{pmatrix}$$

$$A_2 = \begin{pmatrix} 1 & 0 \\ \frac{1}{Z} & 0 \end{pmatrix}$$



b)



$\Rightarrow A_1^2$

$U_{max} \rightarrow$

$I_{max} \rightarrow$

c)

$$\Gamma = \frac{Z_1 - Z_2}{Z_1 + Z_2}$$

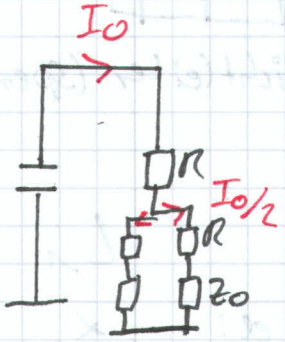
$\Gamma = 1 \Rightarrow Z_1 = 0$

$\Gamma = -1 \Rightarrow Z_2 = 0$

$\Gamma = 0 \Rightarrow Z_1 = Z_2$

Elektronik

Aufgabe 10



$$R_{ges} = R + \frac{R+Z_0}{2} \quad ; \quad Z_0 = R + \frac{R+Z_0}{2}$$

$$\Leftrightarrow R = \frac{Z_0}{3} = 16,\bar{6}$$

(b) $\frac{U_e}{U_\omega} = 2$

$$U_e = I_0 R + \tfrac{1}{2} I_0 R + \tfrac{1}{2} I_0 3R$$
$$U_\omega = \tfrac{1}{2} I_0 3R$$

(c)

RG58: Dämpfung: $71m\,(-0{,}55\ \frac{dB}{m}) + (-6dB) = -45dB$

RG213: $71m\,(-0{,}2\ \frac{dB}{m}) + (-6dB) = -20{,}2dB$

Felder: $-6dB$
Leistung: $3dB$

$$D = 20 \log_{10} \frac{U_2}{U_1} = 10 \log_{10} \frac{P_2}{P_1}$$

$$V_{ges} = \frac{U_{Verstärker}}{U_0}$$

Aufgabe 11

$$VSWR = \frac{1+\Gamma}{1-\Gamma} \Rightarrow \Gamma = 1/5 \qquad VSWR = 1{,}5$$

b) $P = \frac{U_+^2}{Z_0} \Rightarrow U_+ = \sqrt{P Z_0}$

$\Gamma = \frac{U_-}{U_+} \Rightarrow U_- = \Gamma \, U_+$

$P_R = \frac{U_-^2}{Z_0}$ → reflektiert

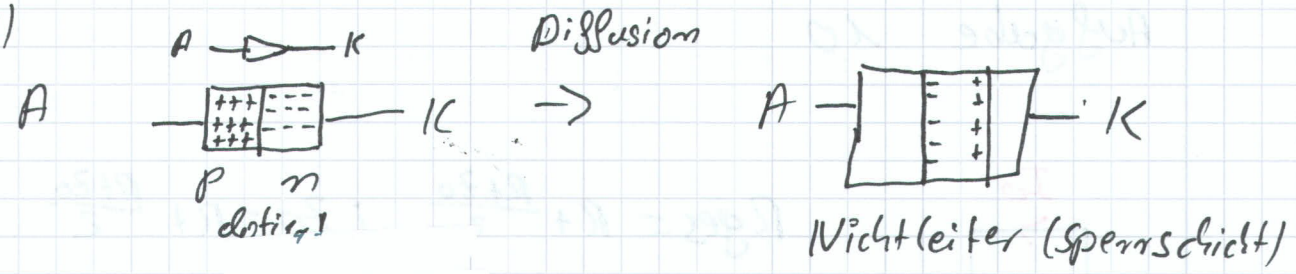
$\Rightarrow \frac{P_r}{P} = \Gamma^2 \Rightarrow P_R = \Gamma^2 \cdot P = 4W$

c) $\Gamma = \frac{Z/Z_0 - 1}{Z/Z_0 + 1}$

$\Rightarrow Z = \frac{3}{2} Z_0$ für $\Gamma = 1/5$

Aufgabe 12

a)



Nichtleiter (Sperrschicht)

b)

I)

	L_1	L_2
a:	x	x
b:	x	✓
c:	x	✓

II)

	L_1	L_2
a:	x	x
b:	✓	✓
c:	✓	✓