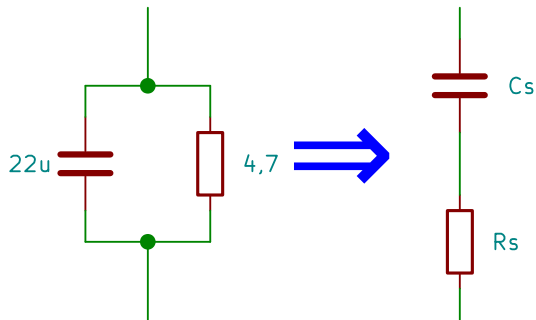


Aufgabe i.7 a) und b)

Frequenz:

$$f = 1,8 \text{ kHz}$$

Scheinwiderstand Kondensator (Parallelschaltung):

$$X_{C,p} = \frac{1}{2 \cdot \pi \cdot f \cdot C} \rightarrow X_{C,p} = \frac{1}{3600 \cdot \pi \text{ s}^{-1} \cdot 22 \cdot 10^{-6} \text{ F}}$$

$$X_{C,p} = 4,019 \Omega$$

Spitzenwerte der Teilströme:

$$\hat{i}_C = \hat{u} \cdot \frac{1}{4,019 \Omega}$$

$$\hat{i}_R = \hat{u} \cdot \frac{1}{4,7 \Omega}$$

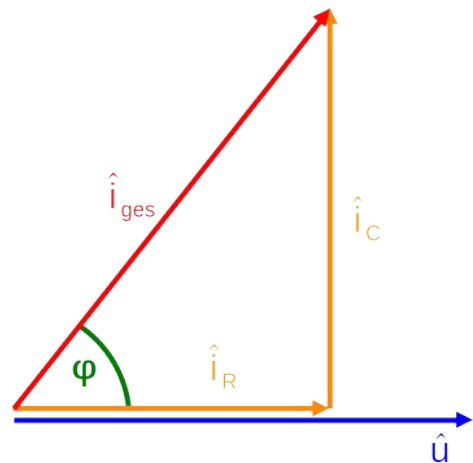
Aus dem Zeigerdiagramm ergibt sich:

$$\hat{i}_{\text{ges}} = \sqrt{\hat{i}_R^2 + \hat{i}_C^2} \rightarrow \hat{i}_{\text{ges}} = \hat{u} \cdot \sqrt{\left(\frac{1}{4,7 \Omega}\right)^2 + \left(\frac{1}{4,019 \Omega}\right)^2}$$

$$\hat{i}_{\text{ges}} = \hat{u} \cdot 0,3274 \Omega^{-1}$$

$$\varphi = \arctan\left(\frac{\hat{i}_C}{\hat{i}_R}\right) \rightarrow \varphi = \arctan\left(\frac{4,019 \Omega}{4,7 \Omega}\right)$$

$$\varphi = 40,53^\circ$$



Arbeitsblatt Nr.

Datum:

Name:

Klasse:

Fach:

Berechnung der Werte der Ersatz-Serienschaltung:

$$\hat{u}_{R,s} = \hat{u} \cdot \cos(\varphi) \quad ; \quad \hat{u}_{R,s} = R_S \cdot \hat{i}_{ges} \quad \rightarrow \quad R_S = \frac{\hat{u}}{\hat{i}_{ges}} \cdot \cos(\varphi)$$

$$R_S = \frac{\hat{u}}{\hat{u} \cdot 0,3274 \Omega^{-1}} \cdot \cos(40,53^\circ)$$

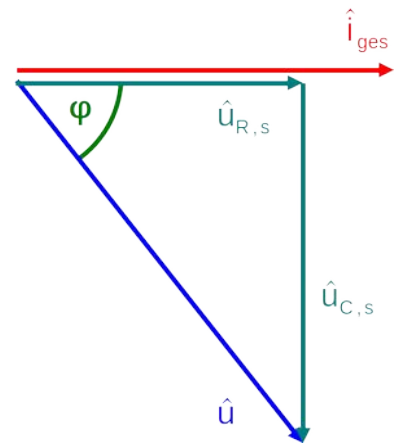
$$R_S = 2,322 \Omega$$

$$\hat{u}_{C,s} = \hat{u} \cdot \sin(\varphi) \quad ; \quad \hat{u}_{C,s} = X_{C,s} \cdot \hat{i}_{ges} \quad \rightarrow \quad X_{C,s} = \frac{\hat{u}}{\hat{i}_{ges}} \cdot \sin(\varphi)$$

$$X_{C,s} = 1,985 \Omega$$

$$C_s = \frac{1}{2 \cdot \pi \cdot f \cdot X_{C,s}} \quad \rightarrow \quad C_s = \frac{1}{2 \cdot \pi \cdot 1,8 \text{ kHz} \cdot 1,985 \Omega}$$

$$C_s = 44,54 \mu F$$



Berechnung der Gesamtimpedanz:

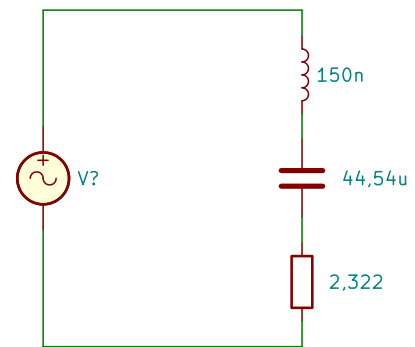
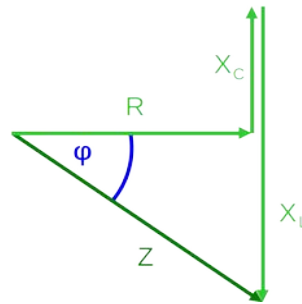
$$X_L = 2 \cdot \pi \cdot f \cdot L$$

$$X_L = 1,696 \Omega$$

$$Z = \sqrt{R^2 + (X_C - X_L)^2} \quad 6$$

$$Z = \sqrt{(2,322 \Omega)^2 + (1,985 \Omega - 1,696 \Omega)^2}$$

$$Z = 2,339 \Omega$$



Phasenwinkel:

$$\varphi = \arctan\left(\frac{X_C - X_L}{R}\right)$$

$$\varphi = 7,1^\circ$$

Blindwiderstand:

$$X = X_C - X_L$$

$$X = 0,289 \Omega$$

Gesamtstrom:

$$\hat{i} = \frac{\hat{u}}{Z} \quad \rightarrow \quad \hat{i} = \frac{10 \text{ V}}{2,339 \Omega}$$

$$\hat{i} = 4,275 \text{ A}$$