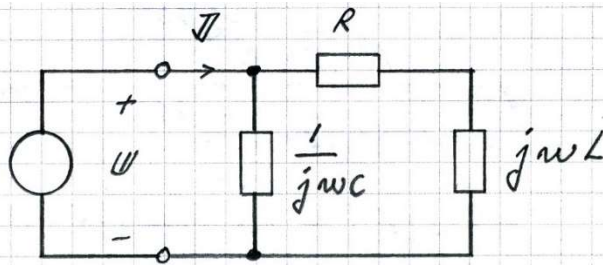


2019-01-11

2a)



$$I = \frac{U}{Z} \dots (1)$$

$$u(t) = 10\sqrt{2} \cdot \sin(1000t + 90^\circ) \text{ V}$$

$$\rightarrow U = 10\sqrt{2} e^{+j90^\circ} \text{ V}$$

$$Z = \frac{\frac{1}{j\omega C} \cdot (R + j\omega L)}{\frac{1}{j\omega C} + (R + j\omega L)} =$$

$$= \frac{R + j\omega L}{1 + j\omega CR - \omega^2 CL} \rightarrow$$

$$Z = \frac{1000 + j1000}{1 + j - 1} =$$

$$= 1000 - j1000 = 1000\sqrt{2} \cdot e^{-j45^\circ} \Omega$$

INSÄTTNING (1)  $\Rightarrow$

$$\underline{I} = \frac{10\sqrt{2} \cdot e^{+j90^\circ}}{1000\sqrt{2} \cdot e^{-j45^\circ}} = 0,010 e^{+j135^\circ} \text{ A}$$

$$\rightarrow \underline{i(t)} = \underline{10 \sin(1000t + 135^\circ) \text{ mA}}$$

$$b) \quad S = U \cdot I \quad \dots (2)$$

$$P = S \cdot \cos \varphi \quad \dots (3)$$

$$Q = S \cdot \sin \varphi \quad \dots (4)$$

$$\hat{U} = 10\sqrt{2} \text{ V} \Rightarrow U = 10 \text{ V}$$

$$\hat{I} = 10 \text{ mA} \Rightarrow I = \frac{10}{\sqrt{2}} \text{ mA}$$

$$\varphi = \arg U - \arg I \rightarrow$$

$$\varphi = 90^\circ - 135^\circ = -45^\circ$$

#### EFFEKTFAKTOR

$$\cos \varphi = \cos(-45^\circ) \approx \underline{\underline{0,71}}$$

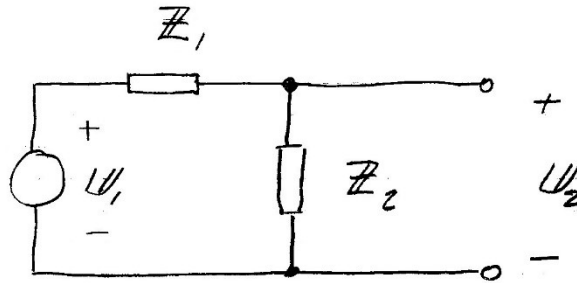
$$(2) \rightarrow S = 10 \cdot \frac{10}{\sqrt{2}} \text{ mVA} \approx \underline{\underline{71 \text{ mVA}}}$$

$$(3) \rightarrow P = 71 \cdot 0,71 \text{ mW} = \underline{\underline{50 \text{ mW}}}$$

$$(4) \rightarrow Q = 71 \cdot (-0,71) \text{ mVAR} = \underline{\underline{-50 \text{ mVAR}}}$$

2018-01-08

2.



$$u_1(t) = 10\sqrt{2} \sin(1000t + 0^\circ) \text{ V} \rightarrow$$

$$U_1 = 10\sqrt{2} e^{j0^\circ} \text{ V}$$

$$Z_1 = j\omega L \quad \omega = 1000 \frac{\text{RAD}}{\text{S}} \rightarrow Z_1 = j500 \Omega$$

$$Z_2 = \frac{\frac{1}{j\omega C} \cdot R}{\frac{1}{j\omega C} + R} = \frac{R}{1 + j\omega CR} \Rightarrow$$

$$Z_2 = \frac{1000}{1 + j} = 500 - j500 = 500\sqrt{2} \cdot e^{-j45^\circ} \Omega$$

SPÄNNUNGSTEILNUNGSLAGEN ...

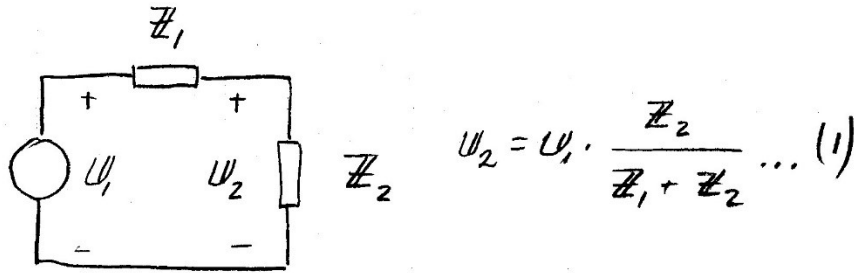
$$U_2 = U_1 \cdot \frac{Z_2}{Z_1 + Z_2} \Rightarrow$$

$$U_2 = 10\sqrt{2} \cdot e^{j0^\circ} \cdot \frac{500\sqrt{2} \cdot e^{-j45^\circ}}{500} = 20 e^{-j45^\circ} \text{ V}$$

$$\Rightarrow u_2(t) = 20 \sin(1000t - 45^\circ) \text{ V}$$

2017-01-13

2a)



$$u_1(t) = 115\sqrt{2} \sin(120\pi t + 0^\circ) \text{ V} \rightarrow$$

$$U_1 = 115\sqrt{2} \cdot e^{j0^\circ} \text{ V}$$

$$Z_1 = \frac{1}{j\omega C} = -j \frac{1}{\omega C} \rightarrow$$

$$Z_1 = -j \frac{1}{120\pi \cdot 84,5 \cdot 10^{-6}} = -j 31,4 \Omega$$

$$Z_2 = R + j\omega L \rightarrow$$

$$Z_2 = 20,0 + j 120\pi \cdot 0,127 = (20,0 + j 47,9) \Omega$$

ins. (1)  $\Rightarrow$

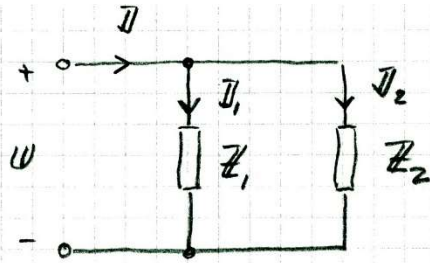
$$U_2 = 115\sqrt{2} \cdot e^{j0^\circ} \cdot \frac{20,0 + j 47,9}{-j 31,4 + 20,0 + j 47,9} =$$

$$= 115\sqrt{2} \cdot e^{j0^\circ} \cdot \frac{\sqrt{20,0^2 + 47,9^2} \cdot e^{j \arctan \frac{47,9}{20,0}}}{\sqrt{20,0^2 + 16,5^2} \cdot e^{j \arctan \frac{16,5}{20,0}}} =$$

$$= 115\sqrt{2} \cdot e^{j0^\circ} \cdot \frac{51,9 \cdot e^{j 67,3^\circ}}{25,9 \cdot e^{j 37,5^\circ}} \approx 230\sqrt{2} \cdot e^{j 27,8^\circ} \text{ V}$$

$$\Rightarrow \underline{u_2(t) = 230\sqrt{2} \sin(120\pi t + 27,8^\circ) \text{ V}}$$

26)



Vid  $f = 50 \text{ Hz}$  FÄR  $Z_1$ , OCH  $Z_2$   
ANDRA VÄRDEN

$$Z_1 = -j \frac{1}{100\pi \cdot 84,5 \cdot 10^{-6}} = -j37,7 \Omega$$

$$Z_2 = 20,0 + j100\pi \cdot 0,127 = (20,0 + j39,9) \Omega$$

$$I_1 = \frac{U}{|Z_1|} \rightarrow I_1 = \frac{230}{37,7} \approx 6,10 \text{ A}$$

$$I_2 = \frac{U}{|Z_2|} \rightarrow I_2 = \frac{230}{\sqrt{20,0^2 + 39,9^2}} \approx 5,15 \text{ A}$$

$$P = R \cdot I_2^2 \rightarrow P = 20,0 \cdot 5,15^2 = 530 \text{ W}$$

$$Q_L = \omega L \cdot I_2^2 \rightarrow Q_L = 39,9 \cdot 5,15^2 = 1058 \text{ VAR}$$

$$Q_C = \frac{1}{\omega C} \cdot I_1^2 \rightarrow Q_C = 37,7 \cdot 6,10^2 = 1403 \text{ VAR}$$

$$Q = Q_L - Q_C \Rightarrow Q = -345 \text{ VAR}$$

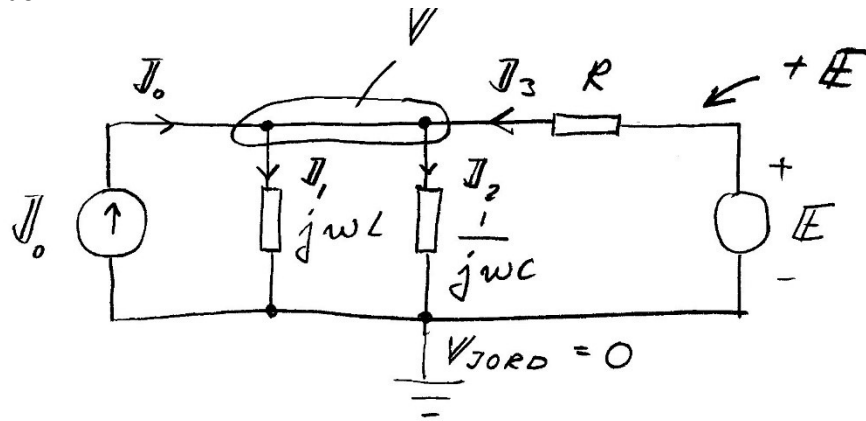
$$S = \sqrt{P^2 + Q^2} \rightarrow S = 632 \text{ VA}$$

$$S = U \cdot I \rightarrow 632 = 230 \cdot I \rightarrow \underline{I = 2,75 \text{ A}}$$

$$\cos \varphi = \frac{P}{S} \rightarrow \underline{\cos \varphi = 0,84}$$

2009-08-14

2/



$$J_2 = \frac{V-0}{1/j\omega C} \dots (*)$$

$$J_0 - J_1 - J_2 + J_3 = 0 \rightarrow$$

$$J_0 - \frac{V-0}{j\omega L} - \frac{V-0}{1/j\omega C} + \frac{E-V}{R} = 0 \rightarrow$$

$$0,010 \cdot e^{j90^\circ} - \frac{V-0}{j1000} - \frac{V-0}{1/j0,002} + \frac{10 \cdot e^{j0^\circ} - V}{1000} = 0$$

$$j0,010 + j0,001V - j0,002V + 0,010 - 0,001V = 0$$

$$\Rightarrow V = \frac{0,010 + j0,010}{0,001 + j0,001} = 10 \text{ mV } (*) \rightarrow$$

$$J_2 = \frac{10-0}{1/j0,002} = 0,020 \cdot e^{j90^\circ} \text{ A}$$

$$\Rightarrow i_2(t) = 20 \cdot \sin(1000 \cdot t + 90^\circ) \text{ mA}$$

2020-01-10

2.

$$\begin{aligned} Z_1 &= R_1 + j\omega L = 65 + j2000\pi = \\ &= \sqrt{65^2 + (2000\pi)^2} e^{j \arctan \frac{2000\pi}{65}} = \\ &\approx 6284 \cdot e^{j89,4^\circ} \Omega \end{aligned}$$

$$\begin{aligned} Z_2 &= R_2 + \frac{1}{j\omega C} = 100 - j \frac{10^6}{2000\pi} = \\ &\approx \sqrt{100^2 + (-159)^2} \cdot e^{j \arctan \frac{-159}{100}} = \\ &\approx 188 \cdot e^{-j57,9^\circ} \Omega \end{aligned}$$

$$\begin{aligned} Z &= \frac{Z_1 Z_2}{Z_1 + Z_2} = \frac{6284 \cdot e^{j89,4^\circ} \cdot 188 \cdot e^{-j57,9^\circ}}{65 + j2000\pi + 100 - j159} = \\ &\approx \frac{1,18 \cdot 10^6 \cdot e^{j31,5^\circ}}{165 + j6124} \approx \frac{1,18 \cdot 10^6 \cdot e^{j31,5^\circ}}{6126 \cdot e^{j88,5^\circ}} = \\ &\approx 193 \cdot e^{-j57^\circ} \Omega \end{aligned}$$

$$I = \frac{U}{|Z|} \quad \text{DÄR } U = \frac{\hat{U}}{\sqrt{2}} = 500 \text{ V}$$

$$I = \frac{500}{193} \approx \underline{2,6 \text{ A}}$$

$$P = U \cdot I \cdot \cos \varphi \rightarrow$$

$$P = 500 \cdot 2,6 \cdot \cos(-57^\circ) \approx \underline{0,71 \text{ kW}}$$

$$\left( \arg(Z) = \arg\left(\frac{U}{I}\right) = \arg(U) - \arg(I) = \varphi \Rightarrow \varphi = -57^\circ \right)$$

2019-08-26

2a)

$$I = \frac{U}{\sqrt{R^2 + (\omega L)^2}} \rightarrow$$

$$I = \frac{230}{\sqrt{24,0^2 + (2\pi \cdot 50,0 \cdot 57,3 \cdot 10^{-3})^2}} \approx$$

$$\approx \underline{\underline{7,67 \text{ A}}}$$

b)  $P = R \cdot I^2 \Rightarrow P \approx \underline{\underline{1,41 \text{ kW}}}$

(Q<sub>L</sub>)

$$Q = \omega L \cdot I^2 \Rightarrow Q \approx \underline{\underline{1,06 \text{ kVAR}}}$$

$$S = \sqrt{P^2 + Q^2} \Rightarrow \underline{\underline{S = 1,76 \text{ kVA}}}$$

c)  $Q = 0$  om  $Q_C = Q_L$

$$Q_C = \frac{U^2}{1/\omega C} = 2\pi f C U^2 \Rightarrow$$

$$1,06 \cdot 10^3 = 2\pi \cdot 50 \cdot C \cdot 230^2 \Rightarrow$$

$$\underline{\underline{C = 63,7 \mu\text{F}}}$$

d)  $Q = 0 \Rightarrow S = P$

$$S = U \cdot I \Rightarrow 1,41 \cdot 10^3 = 230 \cdot I \Rightarrow \underline{\underline{I = 6,13 \text{ A}}}$$