2006–11–07

Uppgift 12.4 ⟨fig1⟩

$$u_c(t) = 5\cos\left(10^4\, t - 45°\right)\ \mathrm{V}$$

$$\omega = 10^4\ \mathrm{rad/s}$$

$$C = 100\,\mu\mathrm{F}$$

Antag sinusformat stationärtillstånd.

jω-transformera kretsen ⟨fig2⟩.

$$U_C = 5\angle -45°$$

$$\omega L = 10^4 \cdot 10^{-4} = 1$$

$$\frac{1}{\omega C} = \frac{1}{10^4 \cdot 100 \cdot 10^{-6}} = 1$$

$$I_C = \frac{U_C}{\frac{1}{\mathrm{i}\omega C}} = \frac{U_C}{-\mathrm{i}} = \mathrm{i}\,U_C = 1\angle 90° \cdot 5\angle -45° = 5\angle 45° = \frac{5}{\sqrt{2}}(1+\mathrm{i})$$

$$U_0 = I_C\left(R + \frac{1}{\mathrm{i}\,\omega\,C}\right) = I_C\,R + U_C = I_C(1-\mathrm{i}) = 5\angle 45°\,\sqrt{2}\angle -45° = 5\sqrt{2}\angle 0°$$

$$I_L = \frac{U_0}{\mathrm{i}\,\omega\,L} = \frac{5\sqrt{2}}{\mathrm{i}} = 5\sqrt{2}\angle -90°$$

$$I = I_L + I_C = -\,\mathrm{i}\,5\sqrt{2} + \frac{5}{\sqrt{2}} + \mathrm{i}\,\frac{5}{\sqrt{2}} = \frac{5}{\sqrt{2}} - \mathrm{i}\,\frac{5}{\sqrt{2}} = 5\angle -45°$$

$$U_R = I_C \cdot R = 5\angle 45°$$

Svar: $u_0(t) = 5\sqrt{2}\cos(10^4 t)$ V, $i(t) = 5\cos(10^4 t - 45°)$ A.

Vi räknade även 12.5, 12.8 och 12.9; 6.2