task_uzbbnoz8abe6201d_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

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Exercise E7 Impedances at Frequencies
(written test, approx. 14 % of a 60-minute written test, SS2023)

2. A capacitor with $C_2 = 50 ~\rm nF$ is fed with a sinusoidal voltage of $U_2 = 6.8 ~\rm V$ the impedance and the current at $f_2 = 1 ~\rm kHz$.
3. An inductor with $L_3 = 5.6 ~\rm nF$.
1. An inductor with $X_{L1} = 60 ~\rm m\Omega$ and $L_1 = 15.9 ~\rm \mu H$.

Result

Solution

Solution

\begin{align*} f_2 &= 1 ~\rm kHz \rightarrow f_2 = 1000 ~\rm Hz \end{align*}

\begin{align*} f_3 &= 40000 ~\rm Hz \rightarrow f_3 = 40 ~\rm kHz \end{align*}

\begin{align*} X_{C2} &= {1 \over \omega_2 \cdot C_2} = {1 \over 2\pi f_2 \cdot C_2} = {1 \over 2\pi \cdot 1 ~\rm kHz \cdot 50 ~\rm nF} = 3.18 ~\rm k\Omega \end{align*}

\begin{align*} X_{L3} &= \omega_3 \cdot L_3 = 2\pi f_3 \cdot L_3 = 2\pi \cdot 40 ~\rm kHz \cdot 5.6 ~\rm nF = 1.4 ~\rm m\Omega \end{align*}

\begin{align*} X_{L1} &= \omega_1 \cdot L_1 = 2\pi f_1 \cdot L_1 \rightarrow f_1 = {X_{L1} \over 2\pi \cdot L_1} = {60 ~\rm m\Omega \over 2\pi \cdot 15.9 ~\rm \mu H} = {60 \cdot 10^{-3} \over 2\pi \cdot 15.9 \cdot 10^{-6}} ~\rm {1 \over s} = {1 \over \rm {V/As \cdot A/Vs}} = {1 \over \rm {V/A}} = {{Vs} \over {A}} \end{align*}

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