task_uzbbnoz8abe6201d_with_calculation

Student Group

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Exercise E1 Impedances at Frequencies
(written test, approx. 14 % of a 60-minute written test, SS2023)

2. An inductor with $L_2 = 50 ~\rm mH$ and an AC voltage of $U_2 = 6.8 ~\rm V$ the impedance and current at $f_2 = 1 ~\rm kHz$.
3. A capacitor with $C_3 = 5.6 ~\rm nF$, the AC voltage of $U_3 = 6.8 ~\rm V$ the impedance and current at $f_3 = 5 ~\rm kHz$.
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_2 &= 1000 ~\rm Hz \rightarrow f_2 &= 1000 ~\rm Hz \end{align*}
kHz}\end{align*}

\begin{align*} X_{L2} &= \omega_2 \cdot L_2 = 2 \pi f_2 \cdot L_2 \\ &= 2 \pi \cdot 1000 ~\rm Hz \cdot 50 ~\rm mH = 314.16 ~\rm \Omega \end{align*}
\begin{align*} X_{L1} &= \omega_1 \cdot L_1 = 2 \pi f_1 \cdot L_1 \\ &= 2 \pi \cdot 1 ~\rm kHz \cdot 15.9 ~\rm \mu H = 100 ~\rm m\Omega \end{align*}
\cdot C_2}} &= {{U_2}\over{X_{C2}}} = {{U_2}\over{\omega_2 \cdot C_2}} = {{U_2}\over{2 \pi f_2 \cdot C_2}} \\ &= {{6.8 ~\rm V}\over{2 \pi \cdot 1000 ~\rm Hz \cdot 5.6 ~\rm nF}} = 1.2 ~\rm mA \end{align*}
&= {{U_1}\over{X_{L1}}} = {{U_1}\over{2 \pi f_1 \cdot L_1}} = {{1 ~\rm V}\over{2 \pi \cdot 1 ~\rm kHz \cdot 15.9 ~\rm \mu H}} \\ &= {{1 ~\rm V}\over{2 \pi \cdot 1000 ~\rm Hz \cdot 15.9 ~\rm \mu H}} = 10 ~\rm A \end{align*}
&= {{60 ~\rm m\Omega}\over{2 \pi \cdot 15.9 ~\rm \mu H}} = {{60 ~\rm m\Omega}\over{2 \pi \cdot 15.9 \cdot 10^{-6} ~\rm H}} \\ &= {{60 \cdot 10^{-3} ~\rm \Omega}\over{2 \pi \cdot 15.9 \cdot 10^{-6} ~\rm Vs/A}} = {{1 ~\rm V}\over{2 \pi \cdot 1000 ~\rm Hz \cdot 15.9 ~\rm \mu H}} = 10 ~\rm A \end{align*}
\cdot A/Vs}} \\ \end{align*}

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