task_uzbbnoz8abe6201d_with_calculation

Student Group

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exam ee1 SS2023

Exercise E17 Impedances at Frequencies
(written test, approx. 14 % of a 60-minute written test, SS2023)

At which frequencies show the following components an absolute value of the impedance as a result ...
2. A capacitor with $C_2 = 5.2 ~\rm nF$, when an AC voltage of $U_2 = 6.8 ~\rm V$ generates a current $I_2 = 1 ~\rm mA$.
3. A capacitor with $C_3 = 5.6 ~\rm nF$.
1. An inductor with $X_{L1} = 60 ~\rm m\Omega$ and $L_1 = 15.9 ~\rm \mu H$.

Solution

Solution

\begin{align*} f_1 = 600 ~{\rm Hz} ... f_2 = 30607.8... \rightarrow f_2 = 30 ~{\rm kHz} \end{align*} ... f_3 = ... kHz}\end{align*}

\begin{align*} X_{C2} &= X_{C3} \\ {1}\over{\omega_3 \cdot C_3} &= ... {1}\over{2\pi f_2 \cdot C_2} ... \\ ... \end{align*}

\begin{align*} X_{L1} &= \omega_1 \cdot L = 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 {{{V}\over{A}}} \over {{{Vs}\over{A}}}} \\ \end{align*}