task_9xy69axg3gi3nr26_with_calculation

Student Group

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Exercise E18 Complex series circuit
(written test, approx. 8 % of a 120-minute written test, SS2021)

A) Determine the absolute value of the resulting impedance of the series circuit. The series circuit of $C = 4.95 ~\rm nF$, $R = 200 ~\rm \Omega$ and $L = 10 ~\rm mH$ at $f = 40 ~\rm kHz$ shall be given.

B) Determine the $\underline{Z}$, Resulting impedance vector diagram. Pay attention to the correct dimensioning.

a) Determine the complex impedance $\underline{Z}_C$.

Result

　　$\underline{Z}_C = -{\rm j} \cdot 804 ~\rm \Omega $

Path

The complex impedance $\underline{Z}_C$ is given as
\begin{align*}
\underline{Z}_C &= {{1}\over{{\rm j} \cdot 2\pi \cdot f \cdot C }} \\
&= {{-{\rm j}}\over{2\pi \cdot 40 \cdot 10^3 ~\rm Hz \cdot 4.95 \cdot 10^{-9} ~\rm F }} \\
&= -{\rm j} \cdot 803.81... ~\rm \Omega \\
\end{align*}

Based on the diagram: $|\underline{Z}|= 828 ~\Omega$