

task_kricv9fh7haauo6q_with_calculation

Student Group

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Exercise E1.1 Complex Impedance Circuit

(written test, approx. 15 % of a 60-minute written test, WS2022)

A. Draw the three fundamental phasors for $i(t)$, $v(t)$, and $p(t)$ in the complex plane. The voltage $v(t)$ is the reference phasor. The current $i(t)$ is the reference phasor. The power $p(t)$ is the reference phasor.

Solution
This linear source is connected with an inductor of $330 \sim \{\rm \mu H\}$ and a capacitor of $0.22 \sim \{\rm \mu F\}$, all in series.

Result

$$\begin{aligned} Z &= 10 \angle 31.1^\circ \text{ mV} \text{ and } Z \angle 6^\circ = 48.2 \sim \Omega \\ Z &= 19.8 \sim \Omega \end{aligned}$$

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label all components, voltages, and currents.
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$$\begin{aligned} Z &= \{ \{ \hat{U} \} \over \{ \hat{I} \} \} \} \parallel \hat{I} \quad \&= \{ \{ \hat{U} \} \over \{ Z \} \} \parallel \end{aligned}$$

$$\lfloor \log_2 \frac{1}{\epsilon} \rfloor \cdot Z \cdot C \leq \left\{ \frac{1}{2\pi \cdot f \cdot C} \right\} \leq \left\{ \frac{1}{2\pi \cdot 15} \right\}$$

$$f_{\text{res}} \approx \frac{1}{2\pi} \sqrt{\frac{1}{LC}} \approx 0.22 \text{ MHz}$$

With $\alpha = 1$ over $\sqrt{2}$ and $\beta = 1$ we have $\gamma = 0.22$

$$\frac{\{1\} \overline{\{1\}}}{\sqrt{2}} \cdot \frac{\{1\} \overline{\{1\}}}{\sqrt{2}} = \frac{\{1\} \overline{\{1\}}}{2}$$

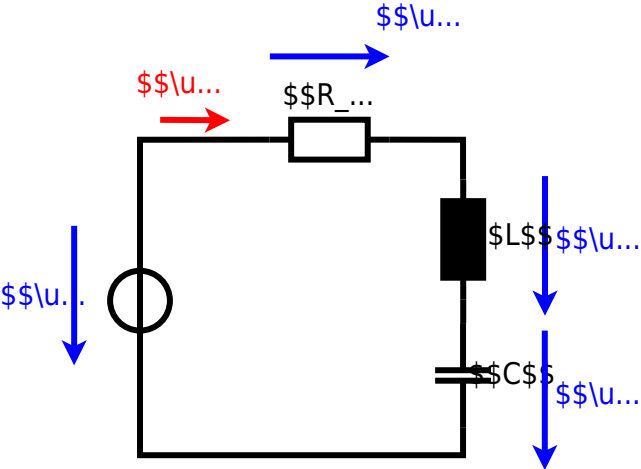
[illegible]

$$\sim \{\text{kHz}\} \cdot 330 \sim \{\text{μH}\} \}$$

$$\begin{aligned} \underline{Z} &= R + \underline{Z} \quad L + \underline{Z} \quad C \end{aligned}$$

[illegible]

$$\sqrt{R^2 + (\underline{Z} L - \underline{Z} C)^2}$$



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