

task_kricv9fh7haauo6q_with_calculation

Student Group

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complex impedance, exam ee1 WS2022

Exercise E15 Complex Impedance Circuit

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

[illegible]

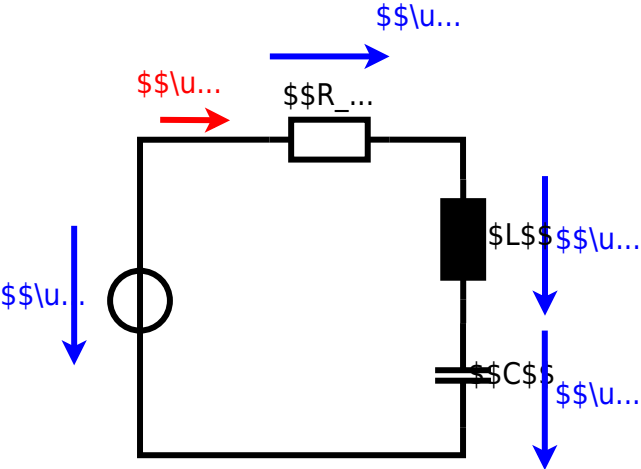
Solution A linear source is connected with an inductor of $330 \sim \{\rm \mu H\}$ and a capacitor of $0.22 \sim \{\rm \mu F\}$, all in series.

Result

$$\begin{aligned} \begin{aligned} & \text{Draw the circuit diagram of the given circuit.} \\ & \text{Given: } Z_1 = 10 \angle 31.6^\circ \Omega, Z_2 = 10 \angle 0^\circ \Omega, Z_3 = 48.2 \angle -90^\circ \Omega, Z_4 = 19.8 \angle -90^\circ \Omega \end{aligned} \end{aligned}$$

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label all components, voltages, and currents.
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$$\begin{aligned} Z &= \frac{\hat{U}}{\hat{I}} \quad \&= \frac{\hat{U}}{Z} \\ Z_C &= \frac{1}{2\pi \cdot f \cdot C} \quad \&= \frac{1}{2\pi \cdot 15 \text{ kHz} \cdot 0.22 \text{ }\mu\text{F}} \end{aligned}$$
$$\begin{aligned} \omega_{\text{eff}} &= \omega_0 \sqrt{1 - \frac{1}{Q^2}} \\ \omega_0 &= \frac{1}{\sqrt{LC}} \\ Q &= \frac{R}{\omega_0 L} \\ \omega_{\text{eff}} &= \frac{1}{\sqrt{LC}} \sqrt{1 - \frac{1}{Q^2}} \end{aligned}$$



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