

task_kricv9fh7haauo6q_with_calculation

Student Group

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Exercise E8 Complex Impedance Circuit**(written test, approx. 15 % of a 60-minute written test, WS2022)**

1. Calculate the complex impedance $\underline{Z}$ of the circuit shown in the figure. The voltage source $u(t) = 3.0 \cdot \sin(2\pi \cdot 15 \cdot t) \text{ V}$ is connected in series with an inductor of $330 \text{ } \mu\text{H}$ and a capacitor of $0.22 \text{ } \mu\text{F}$.

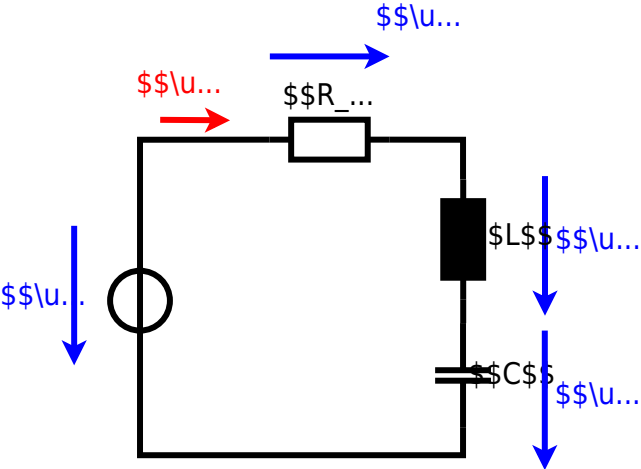
Solution
The linear source is connected with an inductor of $330 \text{ } \mu\text{H}$ and a capacitor of $0.22 \text{ } \mu\text{F}$, all in series.

Result
 $\underline{Z} = 19.8 - j48.2 \text{ } \Omega$

Draw the circuit diagram of the given circuit.

Solution
The circuit diagram is shown in the figure. The voltage source $u(t) = 3.0 \cdot \sin(2\pi \cdot 15 \cdot t) \text{ V}$ is connected in series with an inductor of $330 \text{ } \mu\text{H}$ and a capacitor of $0.22 \text{ } \mu\text{F}$.

Result
The complex impedance $\underline{Z}$ is calculated as follows:
$$\underline{Z} = \underline{Z}_L + \underline{Z}_C = j\omega L - j\omega C = j(2\pi \cdot 15 \cdot 330 \cdot 10^{-6}) - j(2\pi \cdot 15 \cdot 0.22 \cdot 10^{-6})$$
$$\underline{Z} = j0.006216 - j0.002199 = j0.004017 \text{ } \Omega$$
$$\underline{Z} = 19.8 - j48.2 \text{ } \Omega$$



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