

task_jti0uzudcmg4u22t_with_calculation

Student Group

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complex impedance, exam ee1 WS2022

Exercise E1.1 Analyzing complex Impedances (written test, approx. 14 % of a 60-minute written test, WS2022)

2. Calculate the phasor voltage \underline{U} and the current \underline{I} in the circuit shown in the figure. The components (R and X_L) shall be given.

After analysis, the full bridge dimensioned circuit impedance Z has been extracted and is given in phase form $Z = |Z| \cdot e^{j\varphi}$ with $|Z| = 20 \Omega$ and $\varphi = 26.6^\circ$.

Solution
.. Calculation of physical values of the components.
Solution $R = 10 \Omega$ and $X_L = 20 \Omega$

Solution
$$\underline{I} = \frac{\underline{U}}{Z} \quad \text{with } \underline{U} = 50 \text{ V} \angle 0^\circ \text{ and } Z = 20 \Omega \angle 26.6^\circ$$

The current \underline{I} is $2.5 \text{ A} \angle -26.6^\circ$.
The voltage \underline{U} across the resistor is $25 \text{ V} \angle -26.6^\circ$.
The voltage \underline{U} across the inductor is $50 \text{ V} \angle 3.4^\circ$.
The phase φ is 26.6° .
With the complex part comes the complex value $\underline{U} = 50 \text{ V} \angle 0^\circ$.
The phase φ can be calculated as $\varphi = \arctan\left(\frac{-4.68}{0.24}\right)$.

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