task_c9fj1si7l797equs_with_calculation

Student Group

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impedance, phasor, cutoff, exam ee1 SS2023

Exercise E1 Complex voltage dividers
(written test, approx. 16 % of a 60-minute written test, SS2023)

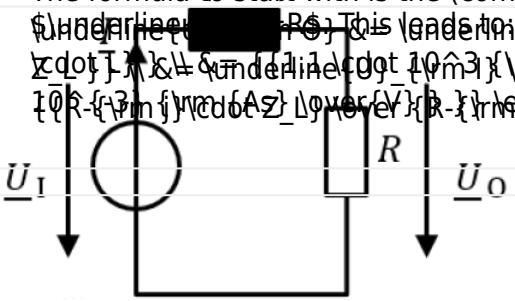
~~**Draw the two impedance phasors in the complex plane.**~~ ~~**Draw the resulting phasor for the total impedance**~~
~~**Result**~~ ~~**Choose an appropriate scaling**~~ ~~factor and write it down.

- $R = 1.1 ~\rm k\Omega$
- $L = 3.5 ~\rm mH$
- $\underline{U}_\rm I = 5 ~\rm V$

Solution

~~\begin{align*} \underline{Z} &= 0.5 ~\rm k\Omega - j \cdot 0.5 ~\rm k\Omega \end{align*}~~
\begin{align*} \underline{U}_{\rm O} &= 0.5 ~\rm V - j \cdot 1.5 ~V \end{align*}

~~The formula to start with is the (complex) voltage divider: \begin{align*}~~
~~\underline{U}_{\rm O} &= \underline{U}_{\rm I} \cdot {R} \over {R + {\rm j} \cdot \omega \cdot L} \\ &= \underline{U}_{\rm I} \cdot {R} \over {R + {\rm j} \cdot 2\pi \cdot 1.1 \cdot 10^3 ~{\rm V} \over {\rm A} \cdot 3.5 \cdot 10^{-3} ~{\rm As} \over {\rm V}} \end{align*}~~



1. Calculate the impedance $\underline{Z}_L$.

Solution

\begin{align*} \underline{Z}_L &= {\rm j} \cdot \omega \cdot L \\ &= {\rm j} \cdot 2\pi \cdot 3.5 ~\rm mH \end{align*}