task_abh4vhlgczdbni37_with_calculation

Student Group

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Exercise E1 Signal Analysis
(written test, approx. 6 % of a 120-minute written test, SS2021)

At an AC consumer, the following signal functions of voltage and current were measured.
b) Determine the phase angle in degrees (°) (independent)
The quantities are available in the consumer arrow system. (hard)

Result

- $u(t) = 50{~\rm V} \cdot \cos (6000 {{1}\over{\rm s}} \cdot t + 4) $
- $i(t) = 30{~\rm A} \cdot \sin (6000 {{1}\over{\rm s}} \cdot t + 5) $

Path

Path

a) Determine the amplitude values $\hat{U}$, $\hat{I}$ and the RMS values U, I

\begin{align*} Z = \sqrt{ (2\pi \cdot f \cdot L_{\rm M})^2 + R_{\rm M}^2 }
\end{align*}

The complex impedance $\underline{Z}$ for a resistive-inductive load (=R-L series circuit) is given as \begin{align*} \underline{Z} &= {\rm j} \cdot X_L + R_{\rm M} \\ &= {\rm j} \cdot 2\pi \cdot f \cdot L_{\rm M} + R_{\rm M} \\ \end{align*}

Path

The Pythagorean theorem can derive the absolute value: \begin{align*} |\underline{Z}|&= \sqrt{ (2\pi \cdot f \cdot L_{\rm M})^2 + R_{\rm M}^2 }\\ \end{align*}

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