task_1m3izw2szosswtto_with_calculation

Student Group

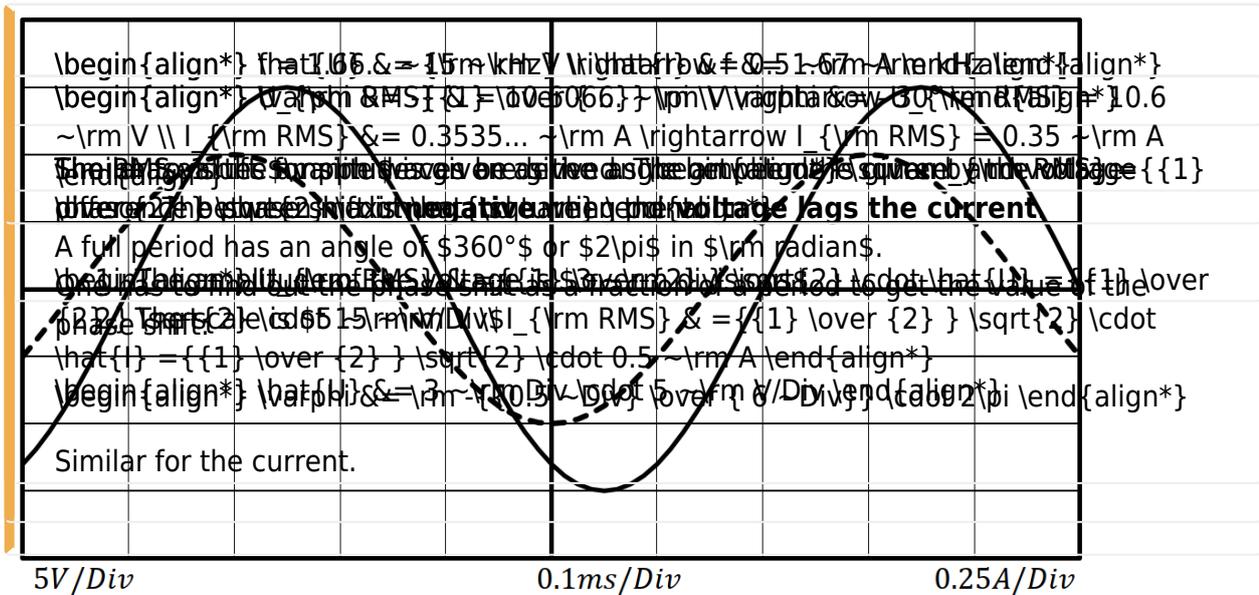| First Name	Surname	Matrikel Nr.

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Exercise E3 Analyzing a Scope Plot
(written test, approx. 12 % of a 60-minute written test, SS2023)

3. What is the phase shift of the current and the voltage (in radian and degree)?

Result

The measured current curve shall be visible as a dashed line.

The continuous line shows the voltage.

Solution

$$\begin{align*} f &= 1.66 \ldots \rm kHz \rightarrow f = 1.67 \rm kHz \end{align*}$$

$$\begin{align*} U_{\rm RMS} &= 0.066 \ldots \rm V \rightarrow U_{\rm RMS} = 10.6 ~\rm V \\ I_{\rm RMS} &= 0.3535 \ldots \rm A \rightarrow I_{\rm RMS} = 0.35 ~\rm A \end{align*}$$

The RMS values for the sine wave are given as the amplitude $\hat{U}$ divided by $\sqrt{2}$:

A full period has an angle of $360°$ or 2π in $\rm radian$.

One has to determine the phase shift as a fraction of a period to get the value of the phase shift.

$$\begin{align*} \varphi &= \rm ~\ldots \end{align*}$$

Similar for the current.

$5V/Div$ $0.1ms/Div$ $0.25A/Div$

Use the correct symbols and units in your answers!

1. Calculate the frequency f of the periodic signals.

Solution

Frequency f is given by the period T. The period can be measured in the imagine of the scope.

1. The sine waves repeat after $6 ~\rm divisions$ (e.g. from falling turning point to falling turning point of one curve)
2. The scale is $0.1 ~\rm ms/Div$

$$\begin{align*} f &= {{1} \over {T}} \\ T &= 6 ~\rm Div \cdot 0.1 ~ms/Div \\ \rightarrow f &= {{1} \over {6 ~\rm Div \cdot 0.1 ~ms/Div}} \end{align*}$$