

# task\_jti0uzudcmg4u22t\_with\_calculation

## Student Group

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## complex impedance, exam ee1 WS2022

## Exercise E1 Analyzing complex Impedances

(written test, approx. 14 % of a 60-minute written test, WS2022)

2. Calculate the complex impedance  $\underline{Z}$  of the circuit shown in Figure 1. The voltage  $\underline{U}$  and the current  $\underline{I}$  shall be given.

After analysis, the full bridge dimensioned circuit impedance  $\underline{Z}$  shall be extracted and brought into the phase  $\angle \varphi$  and the magnitude  $|\underline{Z}|$  of the impedance  $\underline{Z}$  shall be calculated.

3. Calculate the physical values of the two components.

Solution:  $\underline{Z} = \frac{\underline{U}}{\underline{I}} = \frac{10 \angle 0^\circ}{0.24 \angle -2.6^\circ} = 41.67 \angle 2.6^\circ \Omega$

Solution

$\underline{Z} = \frac{\underline{U}}{\underline{I}} = \frac{10 \angle 0^\circ}{0.24 \angle -2.6^\circ} = 41.67 \angle 2.6^\circ \Omega$

The current  $\underline{I}$  and voltage  $\underline{U}$  are given. The impedance  $\underline{Z}$  is calculated as follows:

The current  $\underline{I}$  is  $0.24 \angle -2.6^\circ$  A and the voltage  $\underline{U}$  is  $10 \angle 0^\circ$  V.

The impedance  $\underline{Z}$  is calculated as follows:

$\underline{Z} = \frac{\underline{U}}{\underline{I}} = \frac{10 \angle 0^\circ}{0.24 \angle -2.6^\circ} = 41.67 \angle 2.6^\circ \Omega$

The magnitude  $|\underline{Z}|$  is  $41.67 \Omega$  and the phase  $\angle \varphi$  is  $2.6^\circ$ .

With the complex part comes the physical value of the components.

The phase  $\varphi$  is calculated as  $\varphi = \arctan \left( \frac{\text{Im}(\underline{Z})}{\text{Re}(\underline{Z})} \right) = \arctan \left( \frac{-4.68}{0.24} \right) = -2.6^\circ$

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