

task_ezrkjzifcegttcpc_with_calculation

Student Group

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resonance, resonant circuit, RMS, power, exam ee2 SS2021

Exercise E1 Resonant Circuit

(written test, approx. 4 % of a 120-minute written test, SS2021)

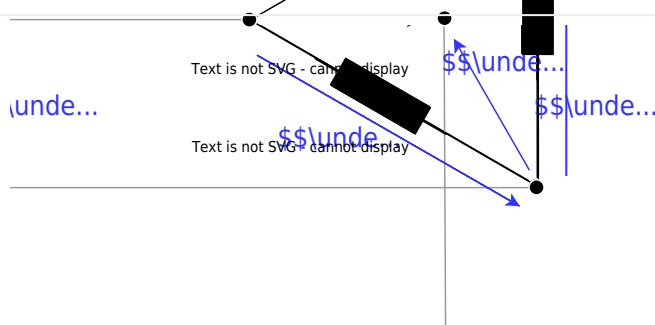
Specify the RMS value of the phase voltage U_{eff} and the winding voltage U_{eff} .
Result: Be considered in the following.

A voltage with the RMS value $U_{\text{eff}} = 110 \text{ V}$ is applied between the terminals of each winding.

Through each of the windings, there is a current with an RMS value $I_{\text{eff}} = 5 \text{ A}$ and a phase shift $\varphi = \pm 25^\circ$ compared to the voltage.

a) Draw the circuit diagram.
Since $U_{\text{eff}} = 110 \text{ V}$ and $I_{\text{eff}} = 5 \text{ A}$ is applied through each winding, the active power P is given by $P = 3 \cdot U_{\text{eff}} \cdot I_{\text{eff}} \cdot \cos(\varphi)$.
For $\varphi = 0^\circ$, $P = 3 \cdot 110 \text{ V} \cdot 5 \text{ A} \cdot \cos(0^\circ) = 1650 \text{ W}$.
For $\varphi = \pm 25^\circ$, $P = 3 \cdot 110 \text{ V} \cdot 5 \text{ A} \cdot \cos(\pm 25^\circ) = 1461.888 \text{ W}$.
The active power must be zero: $\sum P_i = 0$.

By this (and showing in the example in the image below), One can see, that $I_{\text{eff}} = \sqrt{3} \cdot I_{\text{eff}} = \sqrt{3} \cdot 5 \text{ A}$



one single phase as an example



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