

task_ezrkjzifcegttcpc_with_calculation

Student Group

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Multiphase systems, RMS, power, exam ee2 SS2021

Exercise E21 Multiphase systems

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

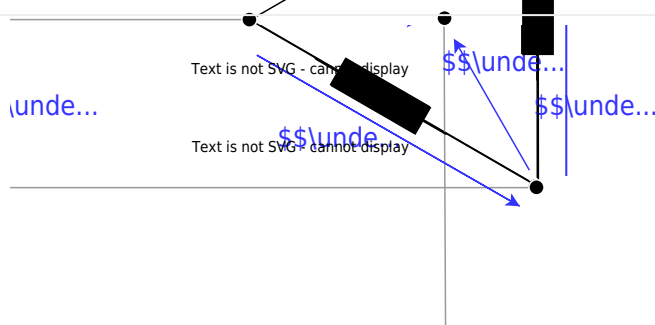
a) Specify the RMS value of the phase voltage U_{RMS} and the winding voltage U_{L} .
Result:

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

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

Since $U_{\text{RMS}} = 110 \text{ V}$ and $I_{\text{RMS}} = 5 \text{ A}$ is applied through each winding, the active power P is given by $P = 3 \cdot U_{\text{RMS}} \cdot I_{\text{RMS}} \cdot \cos(\varphi)$. For a phase shift of $\varphi = 25^\circ$, the active power P is $P = 3 \cdot 110 \text{ V} \cdot 5 \text{ A} \cdot \cos(25^\circ) = 1410.888 \text{ W}$. The total active power P_{total} must be zero: $\sum P_i = 0$.

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



one single phase as an example



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