

task_ezrkjzifcegttcpc_with_calculation

Student Group

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Exercise E22 Multiphase systems

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

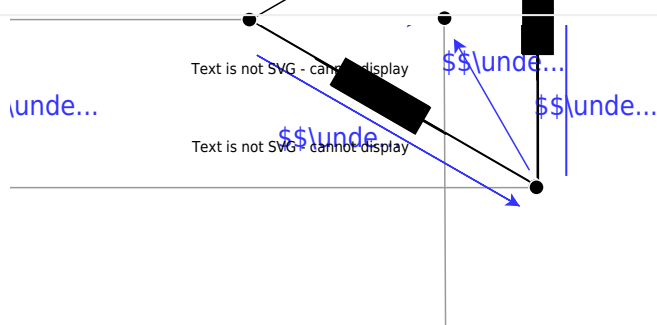
a) Specify the RMS value of the phase voltage U_{RMS} and the winding voltage U_{L} .
Result:

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 $\varphi = \pm 25^\circ$ and $U_{\text{RMS}} = 110 \text{ V}$, $I_{\text{RMS}} = 5 \text{ A}$, $\cos(25^\circ) = 0.9063$, $P = 1610.88 \text{ W}$. The total power must be zero: $\sum P_i = 0$.

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



one single phase as an example



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