task_rdz03rspbwusy7wk_with_calculation

Student Group

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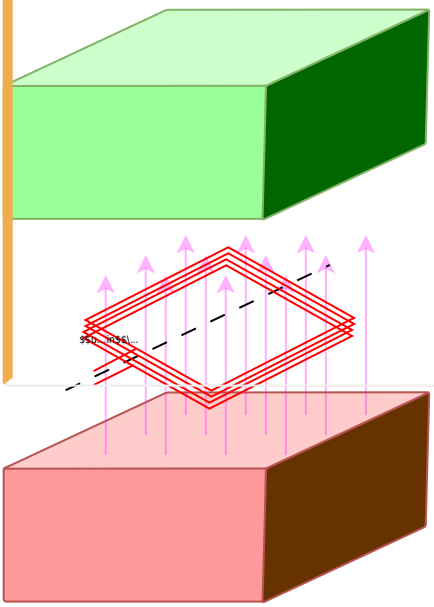
induction, flux, induced voltage, exam ee2 SS2021

Exercise E1 Coil in a magnetic Field
(written test, approx. 4 % of a 120-minute written test, SS2021)

A coil with a number of turns $n = 300$ and a cross-sectional area $A = 600 ~\rm cm^2$ is located in a homogeneous magnetic field.
The rotation of the coil causes a sinusoidal change in the magnetic field in the coil with the frequency $f = 80~\rm Hz$.
The maximum value of the magnetic flux density in the coil is $\hat{B} = 2 · 10-6 ~\rm [{Vs}\over{cm^2}}$.

Result



Derive the formula for the voltage induced in the coil and calculate the voltage amplitude.

Path

The induced voltage is given by:

$$\begin{align*} U_{\rm ind} &= - {{{\rm d}\Psi}\over{{\rm d}t}} \\ &= - n{{{\rm d}\Phi}\over{{\rm d}t}} \\ \end{align*}$$