task_n1kwu944m7jac3tf_with_calculation

Student Group

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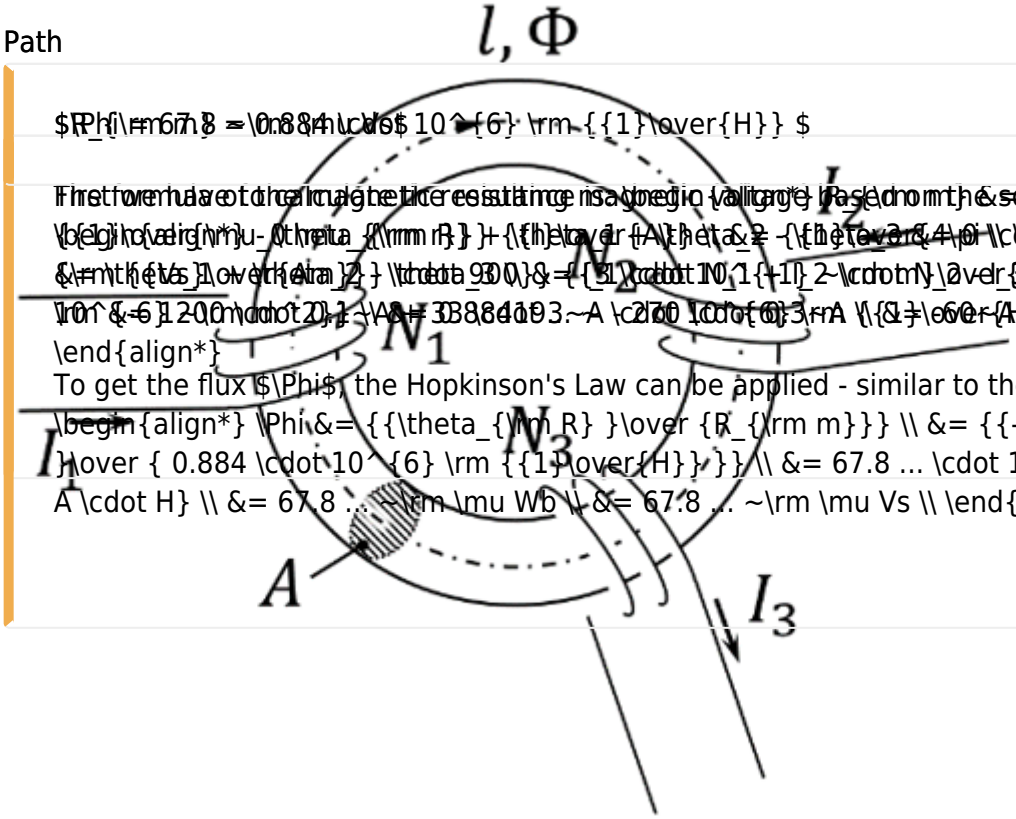
magnetic circuit, exam ee2 SS2024

Exercise E17 Magnetic Circuit
(written test, approx. 9 % of a 120-minute written test, SS2024)

A toroidal core (material: cast iron) has a cross-sectional area of $A=300 ~\rm mm^2$ and an average circumference of $l=3 ~\rm dm$.

Path



On the core, there are three coils with:

- Coil 1: $N_1 = 1200$, $I_1=100 ~\rm mA$
- Coil 2: $N_2 = 33 $, $I_2= 3 ~\rm A$
- Coil 3: $N_3 = 270 $, $I_3=0.3 ~\rm A$

Refer to the drawing for the direction of the windings, current, and flux!

1. Draw the equivalent magnetic circuit that fully represents the setup.
Name all the necessary magnetic resistances, fluxes, and voltages.

Result

- Since the material, and diameter of the core is constant, one can directly simplify the magnetic resistor into a single $R_\rm m$.
- For the orientation of the magnetic voltages θ_1, θ_2, and θ_3, the orientation of the coils and the direction of the current has to be

taken into account by the right-hand rule.
- There is only one flux Φ
- The magnetic voltages are antiparallel to the flux for sources and parallel for the load.