

task_0j7accfimmemytq9_with_calculation

Student Group

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Table of Contents

Exercise E1 Cylindrical Coil (written test, approx. 6 % of a 120-minute written test, SS2021)
..... 2

magnetostatic, flux density, magnetic field strength, coil, flux, exam ee2 SS2021

Exercise E1 Cylindrical Coil
(written test, approx. 6 % of a 120-minute written test, SS2021)

A) The magnetic flux (2 points) information is given:

Result

- Length $l = 30 \text{ cm}$,

Path Winding diameter $d = 390 \text{ mm}$,

- Number of windings $N = 240$,
- Current in the conductor $I = 500 \text{ mA}$.

Material inside: Air

$$\mu_0 = 4\pi \cdot 10^{-7} \frac{\text{Vs}}{\text{Am}}$$

The magnetic field strength $B = \mu_0 \mu_r H$:

The proportion of the magnetic voltage outside the coil can be neglected. Determine the following for the inside of the coil:

a) the magnetic field strength (2 points)

$$B = \mu_0 \cdot N \cdot I = 4\pi \cdot 10^{-7} \frac{\text{Vs}}{\text{Am}} \cdot 240 \cdot 0.5 \text{ A} = 0.0005026... \frac{\text{Vs}}{\text{m}^2}$$

path

$$\Phi = B \cdot A = 0.0005026... \frac{\text{Vs}}{\text{m}^2} \cdot \pi \cdot \left(\frac{0.39 \text{ m}}{2}\right)^2 = 0.00006004... \text{ Vs}$$

$$H = \frac{N \cdot I}{l} = \frac{240 \cdot 0.5 \text{ A}}{0.3 \text{ m}} = 400 \text{ A/m}$$

$$B = \mu_0 \cdot H = 4\pi \cdot 10^{-7} \frac{\text{Vs}}{\text{Am}} \cdot 400 \text{ A/m} = 0.0005026... \frac{\text{Vs}}{\text{m}^2}$$

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