

task_0j7accfimmemytq9_with_calculation

Student Group

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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

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

The magnetic field strength $H = \mu_r \mu_0^{-1} \cdot B$

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)

$$B = \mu_0 \cdot N \cdot I / l = 4\pi \cdot 10^{-7} \cdot 240 \cdot 0.5 / 0.3 = 0.0005026 \text{ Vs/m}$$

$$A = \pi r^2 = \pi \left(\frac{d}{2} \right)^2$$

path

$$\Phi = B \cdot A = B \cdot \pi \left(\frac{d}{2} \right)^2$$

end{align*}

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

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

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