

task_0j7accfimmemytq9_with_calculation

Student Group

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

Exercise E5 Cylindrical Coil

(written test, approx. 6 % of a 120-minute written test, SS2021)

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

Result

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

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

- Number of windings $N = 240$,

• Current through the inductor $I = 500 \text{ mA}$,

- Material inside: Air

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

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

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)

Putting in the numbers: $B = \mu_0 \cdot N \cdot I / \ell = 4\pi \cdot 10^{-7} \cdot 240 \cdot 0.5 / 0.3 = 0.0005026 \text{ Vs/m}$

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

Path

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

Putting in the numbers: $\Phi = 0.0005026 \cdot \pi \left(\frac{0.39}{2} \right)^2 = 0.00006004 \text{ Vs}$

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

Putting in the numbers: $H = \frac{240 \cdot 0.5}{0.3} = 400 \text{ A/m}$

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