

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 $I = 0.5 \text{ A}$ The voltage of the inductor $U = 500 \text{ mV}$,

- 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: $B = \mu_0 \cdot 1 \cdot \frac{240 \cdot 0.5}{0.3} = 0.0005026 \text{ Vs/m}^2$

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

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

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

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

Putting in the numbers: $H = \frac{240 \cdot 0.5}{0.3}$

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