

# 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  $B = \mu_0 \mu_r H$ :

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)

$$B = \mu_0 \mu_r \frac{NI}{l} = 4\pi \cdot 10^{-7} \cdot 1 \cdot \frac{240 \cdot 0.5}{0.3} = 0.0005026 \text{ Vs/m}$$

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

path

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

Putting in the numbers:

$$\Phi = 0.0005026 \text{ Vs/m} \cdot \pi \cdot \left( \frac{0.39 \text{ m}}{2} \right)^2 = 0.0006004 \text{ Vs}$$

Putting in the numbers:

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

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