

task_ddjurcpk494go2q1_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

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electric field, magnetic field, exam ee2 SS2024

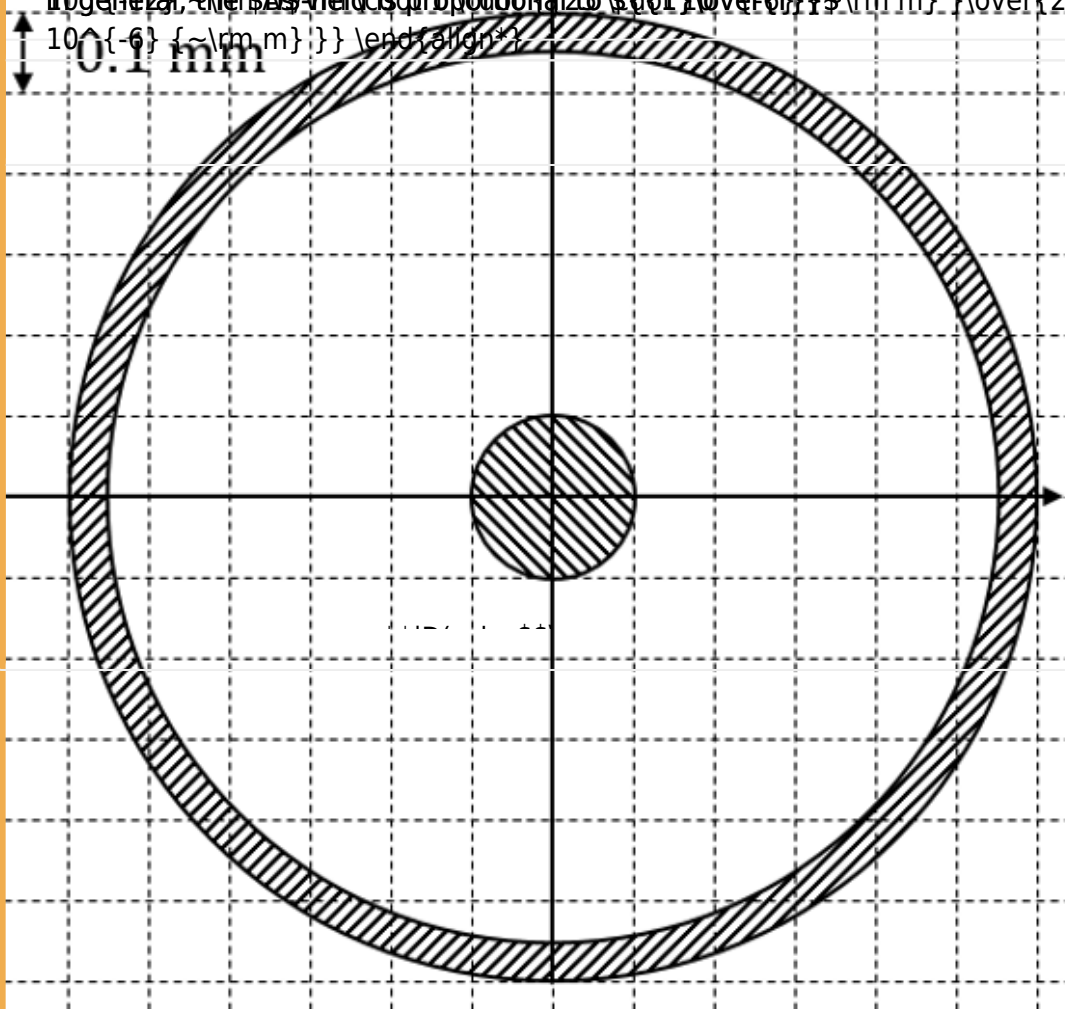
Exercise E1 Capacitor**(written test, approx. 12 % of a 120-minute written test, SS2024)**

2. With the graph of the magnitude of $B(r)$ with parameters B_0 of the diagram 4.06 shows the cross-section of a coaxial cable with (0.6 origin | 0) in cm in the diagram. Use appropriate dimensions and labels for the diagram.

- Path
- Inner conductor: $+3.3 \text{ ~mA}$, $+10 \text{ ~nC}$ (current into the plane of the diagram) pF
 - Outer conductor: -3.3 ~mA , 0 ~nC (current out of the plane of diagram)
 - $H_{\text{cm}} = 5.25 \text{ ~A/m}$
 - $H_{\text{cm}} = 0.955 \text{ ~A/m}$

$C = \epsilon_0 \epsilon_r \frac{A}{d} \parallel = 8.854 \cdot 10^{-12} \frac{\text{F}}{\text{m}} \cdot \frac{10^{-6} \text{ m}^2}{200 \cdot 10^{-6} \text{ m}} = 4.427 \text{ pF}$

In general, the B field is proportional to $\frac{1}{r}$ if $r > R_2$ and to r if $r < R_1$.



... What is the magnitude of the magnetic field strength B at $(-0.1 \text{ ~mm} | 0)$ and $(0.55 \text{ ~mm} | 0)$?

Path

The magnitude of the magnetic field strength H can be calculated by: $H = \frac{I}{2 \pi \cdot r}$
 So:

$$\begin{aligned} H_{\text{i}} &= \frac{I}{2 \pi \cdot r_{\text{i}}} \quad \&= \quad \frac{+3.3 \text{ A}}{2 \pi \cdot \{0.1 \cdot 10^{-3} \text{ m}\}} \quad \& H_{\text{o}} &= \frac{I}{2 \pi \cdot r_{\text{o}}} \quad \&= \quad \frac{+3.3 \text{ A}}{2 \pi \cdot \{0.55 \cdot 10^{-3} \text{ m}\}} \end{aligned}$$

Hint: For the direction, one has to consider the right-hand rule. By this, we get that the H -field on the right side points downwards.

Therefore, the sign of the H -field is negative.

But here, only the magnitude was questioned!

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