task_ddjurcpk494go2q1_with_calculation

Student Group

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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)

a. What is the magnitude of the electric field strength E at $\rm (-0.1 ~mm | 0)$ and $\rm (0.55 ~mm | 0)$?

b. What is the magnitude of the magnetic flux density B at $\rm (-0.1 ~mm | 0)$ and $\rm (0.55 ~mm | 0)$?

c. What is the capacitance per unit length of the coaxial line?

Result

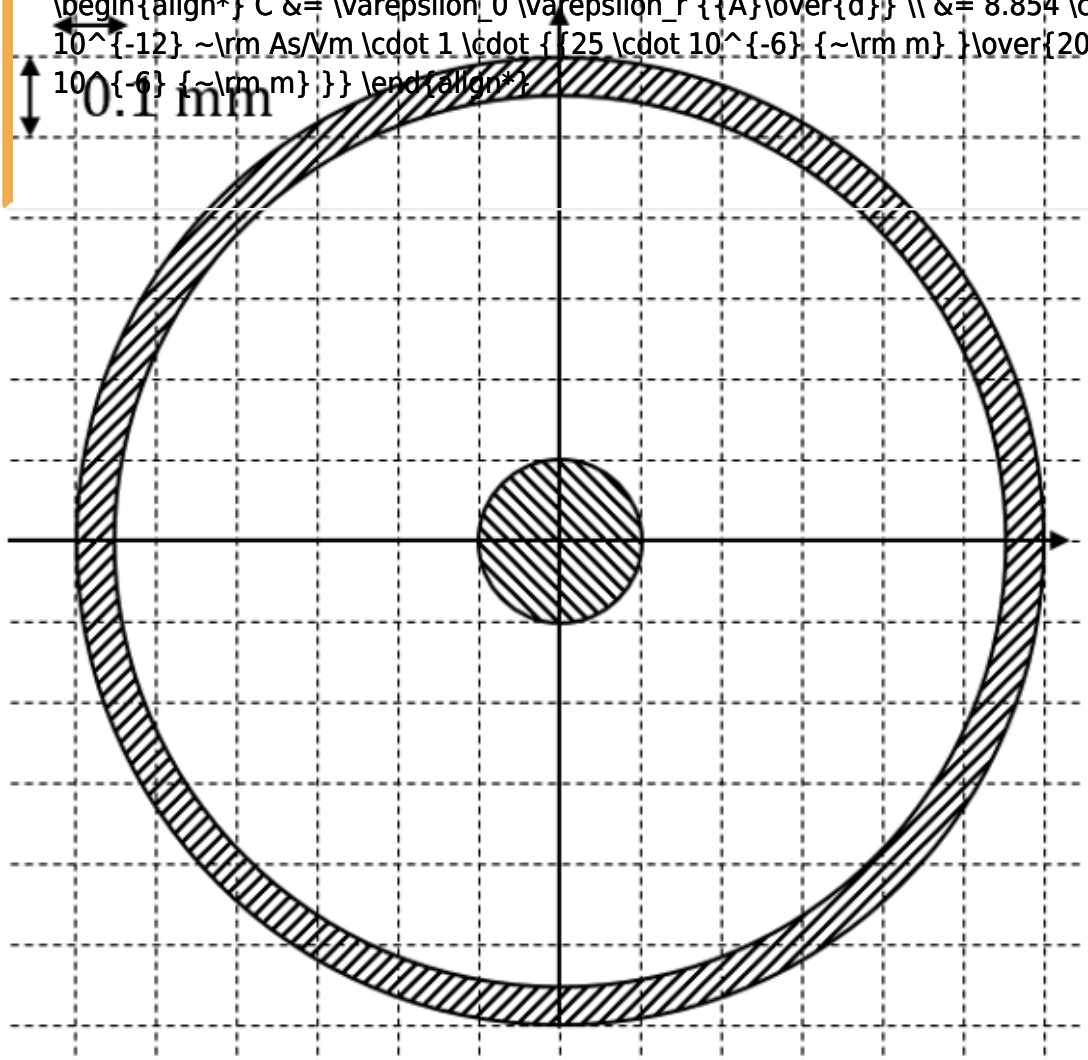
Sketch the diagram (use proper dimensions and labels for the diagram). Due to the given load, the following situation appears:

Path

- Inner conductor: $+3.3 ~\rm mA$, $+10 ~\rm nC$ (current into the plane of the diagram)
- Outer conductor: $-3.3 ~\rm mA$, $ 0 ~\rm nC$ (current out of the plane of diagram)

$C = 1.1 ~\rm pF$

$$\begin{align*} C &= \varepsilon_0 \varepsilon_r {{A}\over{d}} \\ &= 8.854 \cdot 10^{-12} ~\rm As/Vm \cdot 1 \cdot {{25 \cdot 10^{-6} {~\rm m} }\over{200 \cdot 10^{-6} {~\rm m} }} \end{align*}$$



1. What is the magnitude of the magnetic field strength H at $\rm (-0.1 ~mm | 0)$ and $\rm (0.55 ~mm | 0)$?

Path

$$\begin{align*} C &= \varepsilon_0 \varepsilon_r {{A}\over{d}} \\ &= 8.854 \cdot 10^{-12} ~\rm As/Vm \cdot 1 \cdot {{25 \cdot 10^{-6} {~\rm m} }\over{200 \cdot 10^{-6} {~\rm m} }} \end{align*}$$