

task_ddjurcpk494go2q1_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

Table of Contents

Exercise E1 Capacitor (written test, approx. 12 % of a 120-minute written test, SS2024)	 2
---	---------

electric field, magnetic field, exam ee2 SS2024

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

A. On the left, the voltage of the cable is given. The right half of the cable is shown. The cable is a coaxial cable with the origin in the center of the coax cable. Due to the given

The cable has a length l and a cross-section A . The distance between the plates remains the same. Give a generalized formula

Path C_2 is a circle with radius r and length $2\pi r$. The current into the plane of the diagram is I . The displacement field is given by $D = \epsilon_0 \epsilon_r E$. The result for the capacitance C is $C = \frac{Q}{U}$.

There are two ways now. Either: $Q = C \cdot U = 1.1 \cdot 10^{-12} \cdot 3.3 \cdot 10^3 = 3.63 \cdot 10^{-9} \text{ C}$. Or: $Q = D \cdot A = 146 \cdot 10^{-12} \cdot 2.5 \cdot 10^{-2} = 3.65 \cdot 10^{-9} \text{ C}$.

The displacement field is given by $D = \epsilon_0 \epsilon_r E$. The result for the capacitance C is $C = \frac{Q}{U} = \frac{3.63 \cdot 10^{-9}}{3.3 \cdot 10^3} = 1.1 \cdot 10^{-12} \text{ F}$.

Therefore: $C = \frac{1}{\frac{1}{C_{\text{air}}} + \frac{1}{C_{\text{c}}}}$

With $C_{\text{air}} = \frac{\epsilon_0 A}{d}$ and $C_{\text{c}} = \frac{\epsilon_0 \epsilon_r A}{d}$. This leads to: $C = \frac{\epsilon_0 A}{d} \left(\frac{1}{1} + \frac{1}{\epsilon_r} \right)$

This leads to: $C = \frac{\epsilon_0 A}{d} \left(\frac{1}{1} + \frac{1}{\epsilon_r} \right)$

1. What is the magnitude of the magnetic field strength H at $x = (-0.1 \text{ mm} | 0)$ and $x = (0.55 \text{ mm} | 0)$?
2. Plot the graph of the magnitude of $H(x)$ from $x = (-0.6 \text{ mm} | 0)$ to $x = (0.6 \text{ mm} | 0)$ in one diagram. Use proper dimensions and labels for the diagram!
3. What is the magnitude of the electric displacement field D at $x = (-0.1 \text{ mm} | 0)$ and $x = (0.55 \text{ mm} | 0)$?

4. Plot the graph of the magnitude of $D(x)$ from $x = -0.6 \text{ mm}$ to $x = 0.6 \text{ mm}$ in one diagram. Use proper dimensions and labels for the diagram!

Path

```
\begin{align*} C &= \epsilon_0 \epsilon_r \frac{A}{d} \quad \text{with } \epsilon_r = 8.854 \cdot 10^{-12} \text{ As/Vm} \\ &\quad \cdot \frac{25 \cdot 10^{-6} \text{ m}}{200 \cdot 10^{-6} \text{ m}} \end{align*}
```

From:

<https://wiki.mexle.te.hs-heilbronn.de/> - MEXLE Wiki

Permanent link:

https://wiki.mexle.te.hs-heilbronn.de/ee2/task_ddjurcpk494go2q1_with_calculation?rev=1721055469

Last update: **2024/07/15 16:57**

