İç yarıçapı R_i küresel kabuk merkezinde $+q$ yük dış " R_o var

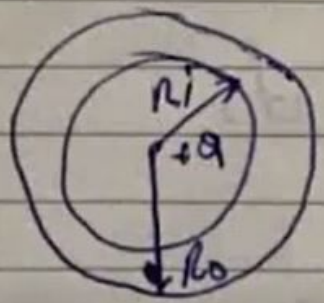
$\vec{D} = ?$

$\vec{E} = ?$

$\vec{P} = ?$

$\rho_{ps} = ?$

$\rho_{pv} = ?$



a) Gauss yasası

$$\oint D \cdot ds = Q$$

$R < R_i$, $R > R_o$, $R_i < R < R_o$ için

$$\iint (\hat{a}_R D_R) \cdot (\hat{a}_R R^2 \sin\theta \, d\theta \, d\phi) = \Phi$$

$$R^2 D_R \int_0^{\pi} \sin\theta \, d\theta \int_0^{2\pi} d\phi = Q$$

$$\vec{D} = \hat{a}_R \frac{Q}{4\pi R^2} \qquad D_R = \frac{Q}{4\pi R^2}$$

$R < R_i$ $R > R_o$ için

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$R^2 D_R \int_0^{\pi} \sin\theta \, d\theta \int_0^{2\pi} d\phi = Q$

$D_R = \frac{Q}{4\pi R^2}$

$\vec{E}$

$R < R_i$ $R > R_0$ için

$\vec{D} = \hat{a}_R \frac{Q}{4\pi R^2}$

$\vec{E} = \frac{\vec{D}}{\varepsilon_0} \Rightarrow \vec{E} = \hat{a}_R \frac{Q}{4\pi\varepsilon_0 R^2}$

Katmanlı dielektrik

$\vec{P}$ $R_i < R < R_0$

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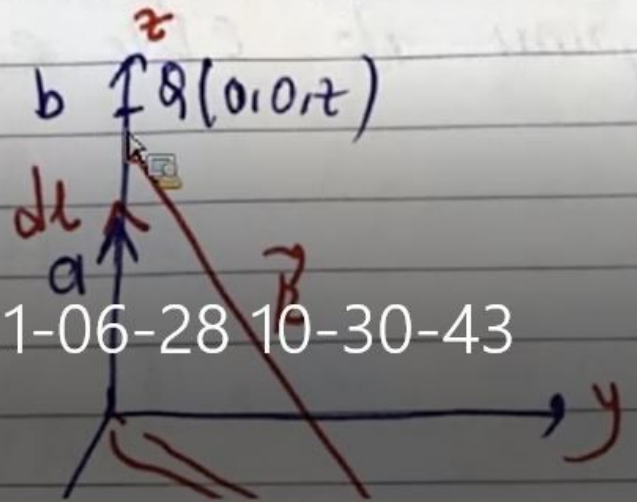
$\vec{P} = \vec{D} - \varepsilon_0 \vec{E}$ $\vec{P} = \hat{a}_R \left[\frac{Q}{4\pi R^2} - \frac{Q}{4\pi\varepsilon_r R^2} \right]$

ÖRNEK

Sonlu uzunlukta bir iletken $z=0$ ve $z=b$ noktaları arasında uzanmakta ve I akımı taşımaktadır. xy düzleminde bir P noktasında meydana gelen $\vec{B}$'yi bulunuz



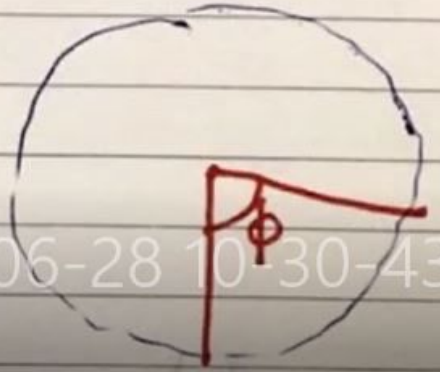
$$I.d\vec{l} = I.dz.\vec{a_z}$$

$$\vec{R} = \rho\vec{a_\rho} - z.\vec{a_z}$$

$$R = \sqrt{\rho^2 + z^2}$$

Serbest uzayda $\vec{H} = \frac{2,39 \times 10^{6}}{\rho} \cos\phi \, \vec{a}_\rho$ A/m ise

$-\pi/4 \leq \phi \leq \frac{\pi}{4}$, $0 \leq z \leq 1$ m ile tanımlanan yüzeyden geçen ϕ'yi bulun.



$$B = \mu_0 \vec{H} = \frac{3}{\rho} \cos\phi \, \vec{a}_\rho \quad (T)$$

$$\phi = \int_S \vec{B} \cdot d\vec{s} = \int_0^1 \int_{-\pi/4}^{\pi/4} \left(\frac{3}{\rho} \cos\phi\right) \vec{a}_\rho \cdot \rho \, d\phi \, dz \, \vec{a}_\rho$$