מבחן 66a שאלה 2

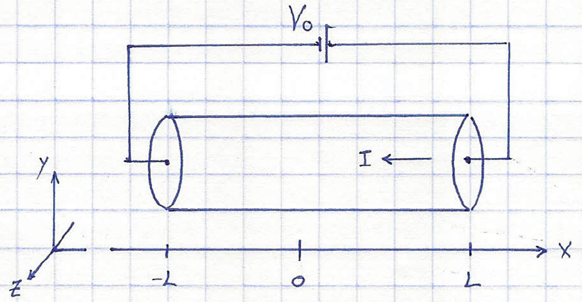
מופיע בדלף נוסף

[redacted]

<u>שאלה 3</u>

נמצא את הזרם לפי: $I = \frac{V_0}{R_T}$

נמצא את ההתנגדות תחילה: $\rho(x) = \rho_0 \cdot x^2$



אלמנט התנגדות: $dR = \rho(x)\frac{dl}{ds} = \rho_0 x^2 \frac{dx}{r\,d\theta\,dr}$

$$\frac{1}{R_p} = \int \frac{1}{dR} = \int_0^{2\pi}\int_0^{a} \frac{r\,dr\,d\theta}{\rho_0 x^2 dx} = \frac{\pi a^2}{\rho_0 x^2 dx} \longrightarrow R_p = \frac{\rho_0 x^2 dx}{\pi a^2} \Rightarrow R = \int R_p = \int_{-L}^{L} \frac{\rho_0 x^2 dx}{\pi a^2} = \frac{2\rho_0 L^3}{3\pi a^2}$$

V $I = \frac{V_0}{R} = \frac{3\pi a^2 V_0}{2\rho_0 L^3}$

V $\vec{E} = \rho \vec{J} = \rho \cdot \frac{I}{A} = \rho_0 x^2 \frac{3\pi a^2 V_0}{2\rho_0 L^3 \cdot \pi a^2} = \frac{3V_0}{2L^3} \cdot x^2$

$r > a$:

V $\oint B \cdot ds = \mu_0 I \rightarrow 2\pi r \cdot \vec{B} = \mu_0 I \rightarrow \vec{B} = \frac{3\pi \mu_0 a^2 V_0}{4\pi \rho_0 L^3 r} \cdot \hat{\theta} = \frac{3\mu_0 a^2 V_0}{4\rho_0 L^3 r} \cdot \hat{\theta}$

לא צריך לפי התשובות

$r < a$:

$J = \frac{I}{A} = \frac{I_r}{A_r} \rightarrow I_r = \frac{A_r}{A} I = \frac{\pi r^2}{\pi a^2} I = \left(\frac{r}{a}\right)^2 I$

V $\oint B \cdot dl = \mu_0 I_r \rightarrow 2\pi r \cdot \vec{B} = \mu_0 \frac{r^2}{a^2} \cdot \frac{3\pi a^2 V_0}{2\rho_0 L^3} \rightarrow \vec{B} = \frac{3\mu_0 V_0 \cdot r}{4\rho_0 L^3} \cdot \hat{\theta}$

V $J = \frac{I}{A} = nev \rightarrow V_d = \frac{I}{Ane} = \frac{3\pi a^2 V_0}{2\rho_0 L^3 Ane} = \frac{3\pi \cdot 16 \cdot a^2}{2 \cdot 3 \cdot 1^3 \cdot \pi a^2 \cdot 8 \cdot 10^{28} \cdot 1.6 \cdot 10^{-19}} = 10^{-9}\,\frac{m}{s}$