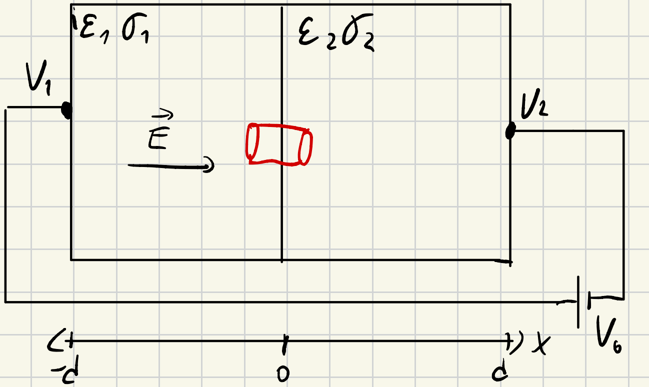
P1)

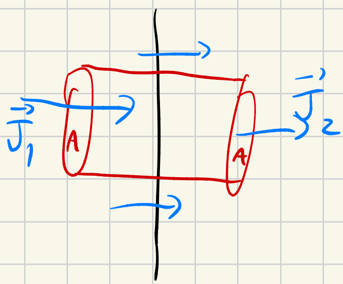


$$V_1 - V_2 = V_0$$

$$\varepsilon_1 = \varepsilon_2$$

$\vec{E}(x)$ uniforme a travez del Area transversal

En estado estacionario tenemos conservación de carga local

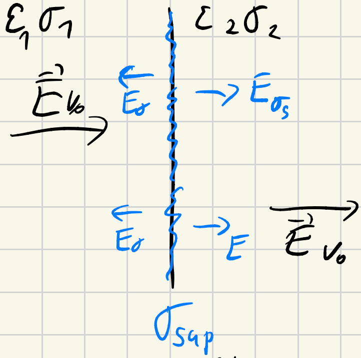


$$\nabla\cdot\vec{J} = \frac{\partial Q}{dt} = 0 \Rightarrow \int_V \nabla\cdot\vec{J}\,dV = \int_S \vec{J}\cdot dS$$

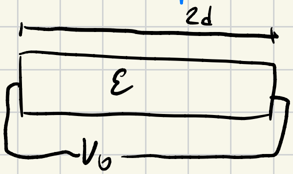
$$\int \vec{J}\cdot dS = -A\vec{J}_1 + A\vec{J}_2 = 0$$

$$\Rightarrow J_1\hat{x} = J_2\hat{x} \Rightarrow E_1\sigma_1 = E_2\sigma_2 \quad (1)$$

El campo producido por el ΔV_0 es uniforme entodo el prisma. Para que se cumpla (1) $E_1 \neq E_2$ por lo que debe haber una densidad ~~de~~ de carga Σ que genere diferencia de $\vec{E}_1 = \vec{E}_{V_0} - \vec{E}_\Sigma \neq \vec{E}_{V_0} + \vec{E}_\Sigma = \vec{E}_2$



Por $A \gg d^2$ aproximaremos σ_{sup} a una placa infinita de campo conocido $E = \frac{\sigma_{sup}}{2\varepsilon}$



Por otro lado por uniformidad el campo producido por V_0 es constante en el prisma. $E\hat{x}$

$$V_0 = \int \vec{E} \cdot d\ell = \int_{-d}^{d} \vec{E} \cdot dx = 2d\,E$$

$$\Rightarrow \vec{E}_{V_0} = \frac{V_0}{2d}\hat{x}$$

$$E_1 = E_{V_0} - E_\sigma \qquad \vec{E}_1 = \left(\frac{V_0}{2d} - \frac{\sigma_{sup}}{2\varepsilon}\right)\hat{x} \qquad -d < x < 0$$

$$E_2 = E_{V_0} + E_\sigma \qquad \vec{E}_2 = \left(\frac{V_0}{2d} + \frac{\sigma_{sup}}{2\varepsilon}\right)\hat{x} \qquad 0 < x < d$$

Tenemos: $E_1 \sigma_1 = E_2 \sigma_2$

$$\Rightarrow \left(\frac{V_0}{2d} - \frac{\sigma_{sup}}{2\varepsilon}\right)\sigma_1 = \left(\frac{V_0}{2d} + \frac{\sigma_{sup}}{2\varepsilon}\right)\sigma_2$$

$$\Rightarrow \frac{V_0}{2d}(\sigma_1 - \sigma_2) = \frac{\sigma_{sup}}{2\varepsilon}(\sigma_2 + \sigma_1)$$

$$\Rightarrow \frac{\varepsilon V_0}{d}\frac{(\sigma_1 - \sigma_2)}{\sigma_1 + \sigma_2} = \sigma_{sup}$$

$$E_1 = \frac{V_0}{2d} - \frac{V_0}{2d}\frac{(\sigma_1 - \sigma_2)}{\sigma_1 + \sigma_2} = \frac{V_0}{2d}\left(\frac{\sigma_1 + \sigma_2 - \sigma_1 + \sigma_2}{\sigma_1 + \sigma_2}\right)$$

$$= \frac{V_0}{d}\left(\frac{\sigma_2}{\sigma_1 + \sigma_2}\right)$$

$$E_2 = \frac{V_0}{2d} + \frac{V}{2d}\left(\frac{\sigma_1 - \sigma_2}{\sigma_1 + \sigma_2}\right)$$

$$= \frac{V_0}{d}\left(\frac{\sigma_1}{\sigma_1 + \sigma_2}\right)$$

$$\left.\begin{aligned} \vec{J}_1 &= \vec{E}_1 \sigma_1 = \frac{V_0 \sigma_1 \sigma_2}{d(\sigma_1 + \sigma_2)} \qquad x < 0 \\ \vec{J}_2 &= E_2 \sigma_1 = \frac{V_0 \sigma_1 \sigma_2}{d(\sigma_1 + \sigma_2)} \qquad x > 0 \end{aligned}\right\} \text{Iguales}$$

Resistencia $R = \frac{V}{I} = \frac{V_0}{I}$

$$I = \int_A \vec{J}\, dS$$

$$I = \vec{J} \cdot A$$

por simetria a travez del corte transversal

$$I = \frac{A V_0 \sigma_1 \sigma_2}{d(\sigma_1 + \sigma_2)}$$

$$\Rightarrow R = \frac{d(\sigma_1 + \sigma_2)}{A V_0 \sigma_1 \sigma_2}$$