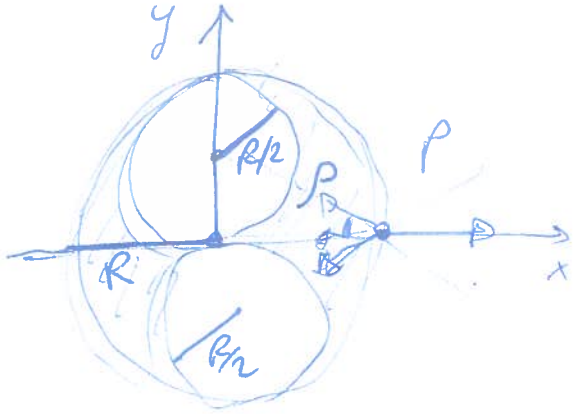
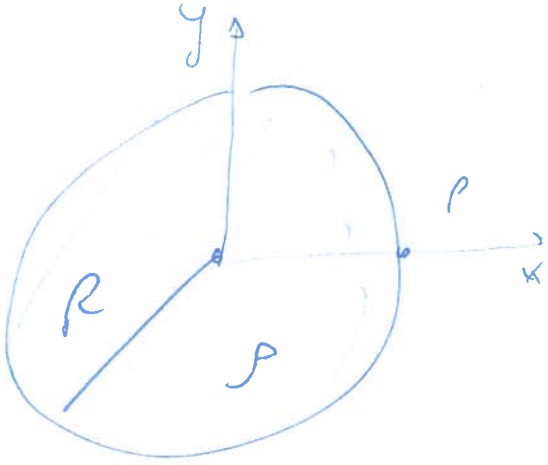
10 - 11 - 2011

Es. 1



USO SOVRAPP. EFFETTI

II



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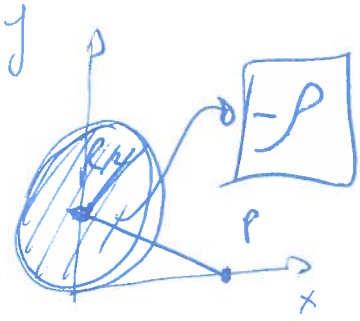

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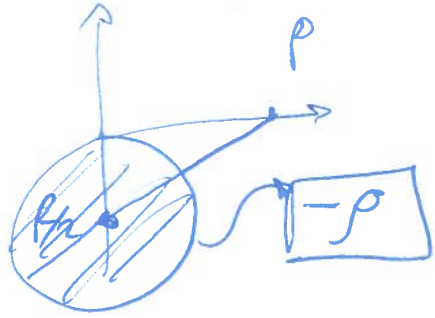


E calcolo → $r \geq R$

$$2\pi r l E(r) = \frac{\rho \pi R^2 l}{\varepsilon_0} \qquad \vec{E}(r) = \frac{\rho R^2}{2\varepsilon r}\hat{r}$$

V calcolo $= V(r_0) - V(r_{RIF}) = -\int_{V_{RIF}}^{V_r} \vec{E}(r)\cdot d\vec{r}$

$$V(r) = V_{RIF}^{0} - \int_{R_{RIF}}^{r} \frac{\rho R^2}{2\varepsilon_0}\frac{dr}{r} = V_{RIF}^{0} - \frac{\rho R^2}{2\varepsilon}\ln\left(\frac{r}{R_{RIF}}\right)$$

$$V(r) = -\frac{\rho R^2}{2\varepsilon_0}\ln\left(\frac{r}{R_{RIF}}\right)$$

$$\vec{E}(P) = \vec{E}_{1,2}(P)\hat{x} - \vec{E}_{1,3}(P)\hat{x}$$

$$= \frac{\rho R^2}{2\varepsilon R} - \frac{2\rho\left(\frac{R}{2}\right)^2}{2\varepsilon\sqrt{\left(\frac{R}{2}\right)^2+R^2}} \frac{R}{\sqrt{\left(\frac{R}{2}\right)^2+R^2}} = \text{Cost}$$

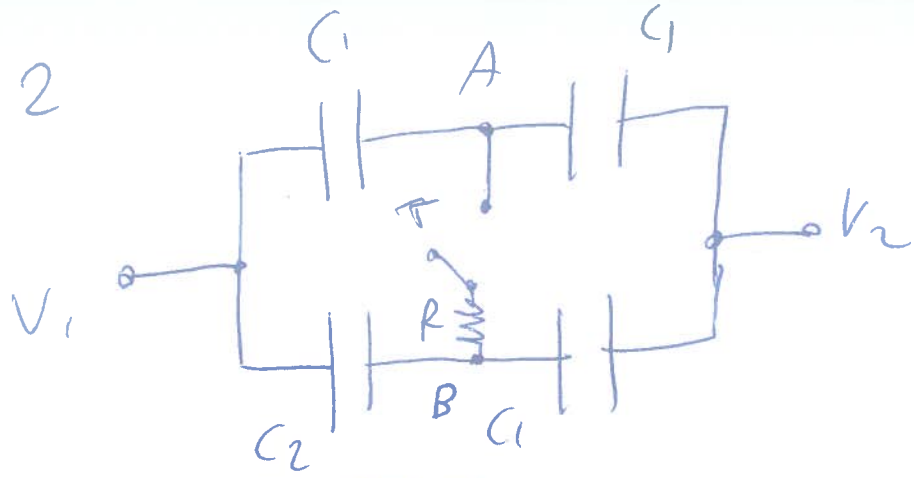
$$= \frac{\rho R}{2\varepsilon} - \frac{\rho R^2 R}{4\varepsilon\left[\left(\frac{R}{2}\right)^2+R^2\right]} =$$

$$= \frac{\rho R}{2\varepsilon} - \frac{4\rho R^2 R}{4\varepsilon 5R^2} = \frac{\rho R}{2\varepsilon} - \frac{\rho R}{5\varepsilon} = \frac{\rho R}{\varepsilon}\left(\frac{1}{2}-\frac{1}{5}\right) =$$

$$= \frac{\rho R}{\varepsilon}\frac{3}{10}\hat{x}$$

$$V(P) = -\frac{\rho R^2}{2\varepsilon}\ln\left(\frac{R}{R_{RIF}}\right) + 2\frac{\rho\left(\frac{R}{2}\right)^2}{2\varepsilon}\ln\left(\frac{\sqrt{\frac{R^2}{4}+R^2}}{R_{RIF}}\right)$$

Es. 2



$$C = \frac{Q}{\Delta V}$$

CASO INIZIALE T APERTO

$$V_B - V_2 = \frac{Q_B}{C_1} \qquad V_1 - V_2 = \frac{Q_A}{\frac{1}{\frac{1}{C_1}+\frac{1}{C_1}}} = \frac{2Q_A}{C_1}$$

$$V_1 - V_B = (V_1 - V_2) - (V_B - V_2) = \frac{2Q_A}{C_1} - \frac{Q_B}{C_1}$$

$$V_1 - V_B = \frac{Q_B}{C_2} \longrightarrow C_2 = \frac{Q_B}{V_1 - V_B} = \frac{Q_B}{\frac{2Q_A}{C_1} - \frac{Q_B}{C_1}}$$

$$U_{IN} = \frac{1}{2} C_{eq_1} (V_1 - V_2)^2$$

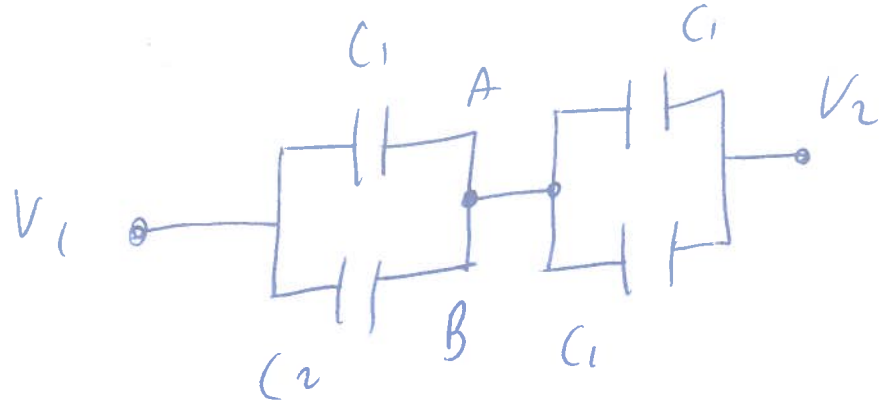
$$\text{con } C_{eq_1} = \frac{1}{\frac{1}{C_1}+\frac{1}{C_1}} + \frac{1}{\frac{1}{C_1}+\frac{1}{C_2}}$$

[illegible]

$$V_A - V_2 = \frac{Q_A}{C_1}$$

$$V_B - V_A = (V_B - V_2) - (V_A - V_2) = \frac{Q_B}{C_1} - \frac{Q_A}{C_1}$$

CASO FINALE T CHIUSO



SU R A REGIME NON SCORRE CORRENTE

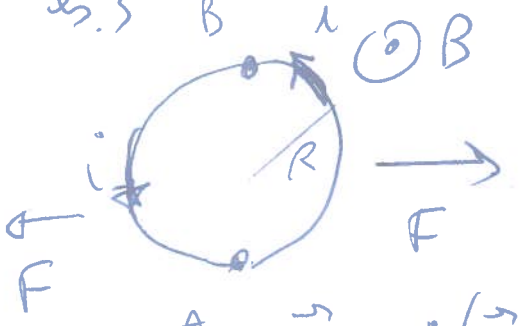
$$C_{eq_2} = \frac{1}{\frac{1}{C_1+C_2} + \frac{1}{2C_1}}$$

$$U_{FIN} = \frac{1}{2} C_{eq_2} (V_1 - V_2)^2$$

$$\Delta U = U_{FIN} - U_{IN} = \frac{1}{2}(V_1 - V_2)^2 (C_{eq_2} - C_{eq_1})$$

$$U_{DISSIPATA} = \Delta U = \frac{1}{2} U_{GENERATORE}$$

Es. 3



$\vec{F}_{TOT} = \int_A^B i\, d\vec{l} \times \vec{B}$

$\vec{F}_{TOT} = i\left(\vec{r}_A - \vec{r}_B\right) \times \vec{B}$

$F_{TOT} = i\, B\, 2R$

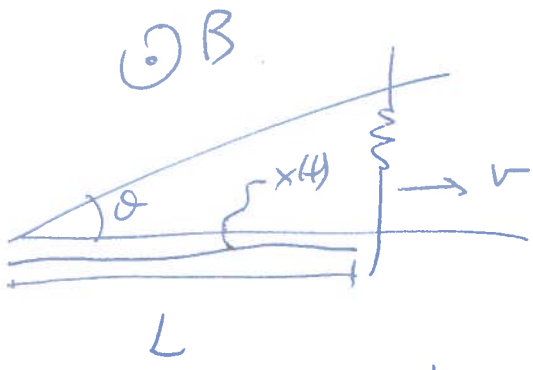
"

$F_{TOT} \geq \tau$

$i\, B\, 2R \geq \tau$

$i \geq \frac{\tau}{B\,2R}$

Es. 4



$x(t) = vt + x_0$

$$f_{em}(t) = -\frac{d}{dt}\phi(B) = -\frac{d}{dt}\left(\frac{1}{2}x(t)\cdot x(t)\,tg\theta\, B\right)$$

$$= -\frac{1}{2}B\,tg\theta\,\frac{d}{dt}\left(x^2(t)\right) =$$

$$= -\frac{1}{2}B\,tg\theta\,2\,x(t)\,\frac{d}{dt}x(t) =$$

$$f_{em}(t) = -B\,tg\theta\,x(t)\,v$$

$$i(t) = \frac{f_{em}}{R} = -\frac{B\,tg\theta\,v}{R}\,x(t)$$

$$i(L) = -\frac{B\,tg\theta\,v}{R}\,L$$