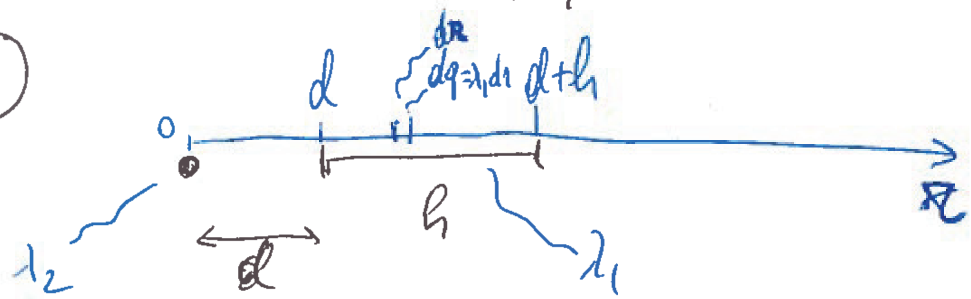
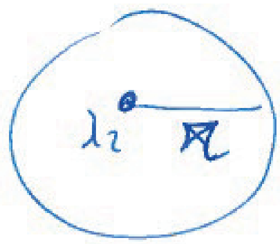
12/7/17

(1)



GAUSS



$$E(R)\,2\pi R\,\cancel{\ell} = \frac{\lambda_2 \cancel{\ell}}{\varepsilon}$$

$$\vec{E}(R) = \frac{\lambda_2}{2\pi\varepsilon R}\,\hat{r}$$

$$dF(r) = E(r)\,dq = \frac{\lambda_2}{2\pi\varepsilon r}\,\lambda_1\,dr$$

$$\vec{F} = \int_d^{d+h} d\vec{F} = \int_d^{d+h} \frac{\lambda_2\lambda_1}{2\pi\varepsilon}\,\frac{dr}{r}\,\hat{r} = \frac{\lambda_1\lambda_2}{2\pi\varepsilon}\ln\left(\frac{d+h}{d}\right)\hat{r}$$

(2') CASO (A)

$\tau_A = R_1 C$

$V_{CA} = f$

$U_{CA} = \frac{1}{2} C f^2$

Se volemi calcolare $U_{R_1} = \int_0^{+\infty} P_{R_1}\, dt = \int_0^{+\infty} R_1 i^2(t)\, dt =$

$\left[\text{Ma, } q_C(t) = Cf\left[1 - e^{-\frac{t}{\tau_A}}\right] \rightarrow i(t) = \frac{dq}{dt} = \frac{f}{R_1} e^{-\frac{t}{\tau_A}} \right]$

per cui $\boxed{U_{R_1}} = \int_0^{+\infty} R_1 \frac{f^2}{R_1^2} e^{-\frac{2t}{\tau}}\, dt = \frac{f^2}{R_1} \frac{R_1 C}{2} \boxed{= \frac{1}{2} C f^2 = U_{CA}}$

CASO (B)

$R_{eq} = R_2 + R_3$

$i(t) = -\frac{dq}{dt} = \frac{f}{R_{eq}} e^{-\frac{t}{\tau_B}}$ $\quad \boxed{\tau_B = R_{eq} C}$

$U_{R_{eq}} = U_{CA} = \frac{1}{2} C f^2$

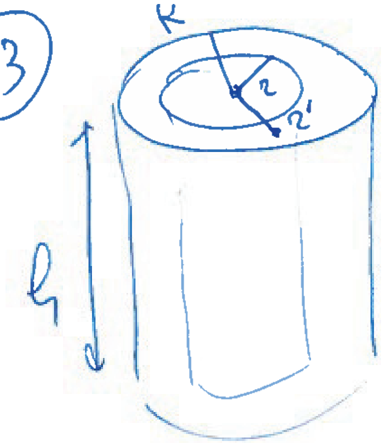
però $U_{R_{eq}} = \int_0^{+\infty} R_{eq}\, i^2\, dt = \int_0^{+\infty} (R_3 + R_2)\, i^2\, dt =$

$= R_3 \int_0^{+\infty} i^2\, dt + R_2 \int_0^{+\infty} i^2\, dt = \underbrace{R_3 \frac{1}{2} \frac{C f^2}{R_{eq}}}_{U_{R_3}} + \underbrace{R_2 \frac{1}{2} \frac{C f^2}{R_{eq}}}_{U_{R_2}}$

$U_{R_2} = R_2 \frac{\cancel{1}\, \cancel{C} f^2}{\cancel{2}(R_3 + R_2)} = \frac{1}{3} \frac{\cancel{1}}{\cancel{2}} \cancel{C} f^2$; $3R_2 = R_3 + R_2 \rightarrow 2R_2 = R_3$

$\boxed{R_2 = R_3/2}$

3



$\uparrow I$ $\quad h \gg R \qquad B(r') = ?$

USO CIRCUIT. AMPERE

per $r' < r$

$$2\pi r' B_0(r') = 0 \rightarrow B(r') = 0$$

per $r < r' < R$

$$j = \frac{I}{\pi(R^2 - r^2)} \rightarrow i(r') = j\,\pi(r'^2 - r^2) =$$

$$= \frac{I}{\cancel{\pi}(R^2 - r^2)} \cancel{\pi}(r'^2 - r^2) = I\frac{(r'^2 - r^2)}{(R^2 - r^2)}$$

$$2\pi r' B_1(r') = \mu_0\, i(r') = \mu_0 I \frac{(r'^2 - r^2)}{(R^2 - r^2)}$$

$$B_1(r') = \frac{\mu_0 I}{2\pi r'} \frac{(r'^2 - r^2)}{(R^2 - r^2)}$$

per $r' > R \qquad 2\pi r' B_2(r') = \mu_0 I$

$$B_2(r') = \frac{\mu_0 I}{2\pi r'}$$

$$B_1 = B_1(0{,}5\,\mathrm{cm}) = \frac{\mu_0 I}{2\pi(0{,}5\,\mathrm{cm})} \frac{((0{,}5\,\mathrm{cm})^2 - r^2)}{(R^2 - r^2)}$$

$$B_2 = B_2(2\,\mathrm{cm}) = \frac{\mu_0 I}{2\pi(2\,\mathrm{cm})}$$

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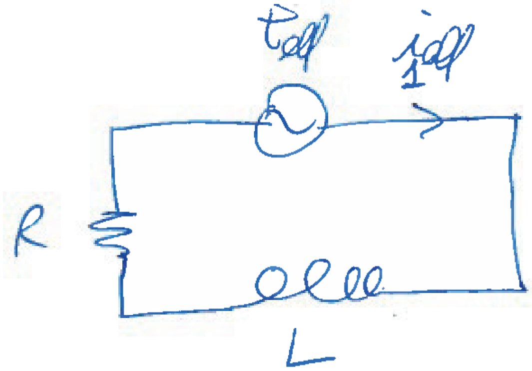
CASO APERTO



CASO CHIUSO

$$\boxed{\tilde{Z}_{RL} = R + j\omega L}$$

$$\boxed{\omega = 2\pi\nu}$$

$$E_{eff} = R\, i_{2eff} \rightarrow R = \frac{E_{eff}}{i_{2eff}}$$

$$E_{eff} = Z_{RL}\, i_{1eff} \rightarrow Z_{RL} = \frac{E_{eff}}{i_{1eff}}$$

$$Z_{RL} = \sqrt{R^2 + \omega^2 L^2} = \frac{E_{eff}}{i_{1eff}}$$

$$R^2 + \omega^2 L^2 = \frac{E^2_{eff}}{i^2_{1eff}} \rightarrow L = \sqrt{\frac{\frac{E^2_{eff}}{i^2_{1eff}} - R^2}{\omega^2}}$$

$$P_{m\,CHIUSO} = E_{eff}\, i_{2eff} = R\, i_{2eff}^2 \qquad P_{m\,APERTO} = R\, i_{1eff}^2$$