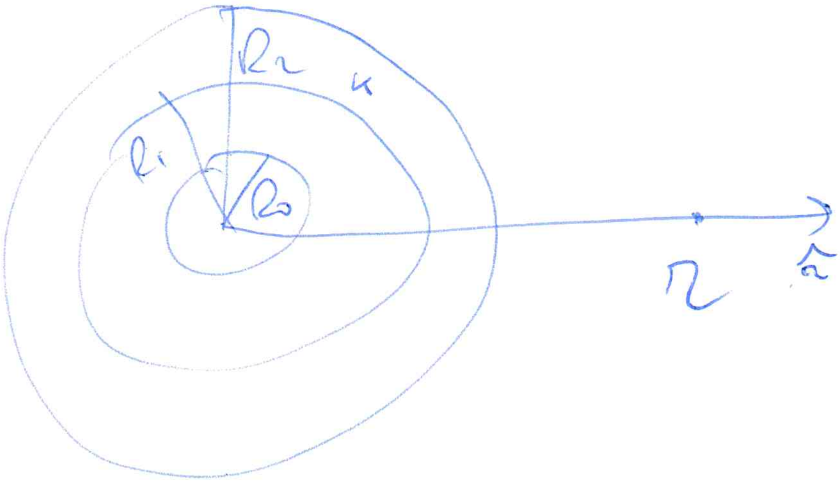
1)



Q si distribuisce sulle sup. del conduttore

calcolo i campi $\vec{E}(r)$ per $0 < r < +\infty$

$0 < r < R_0$ $\quad \oint(\vec{E}) = \frac{q_{int}}{\varepsilon_0} = 0 \rightarrow \vec{E} = 0$

$R_0 < r < 1$ $\quad \oint(\vec{E}) = 4\pi r^2 E(r) = \frac{Q}{\varepsilon_0} \rightarrow \vec{E}(r) = \frac{Q}{4\pi\varepsilon_0}\frac{\hat{r}}{r^2}$

$R_1 < r < R_2$ $\quad \oint(\vec{E}) = 4\pi r^2 E(r) = \frac{Q}{\varepsilon_0 k} \rightarrow \vec{E}(r) = \frac{Q}{4\pi\varepsilon_0 k}\frac{\hat{r}}{r^2}$

$r > R_2$ $\quad \oint(\vec{E}) = 4\pi r^2 E(r) = \frac{Q}{\varepsilon_0} \rightarrow \vec{E}(r) = \frac{Q}{4\pi\varepsilon_0}\frac{\hat{r}}{r^2}$

$$V(R_0) = \underbrace{V(+\infty)}_{0} - \int_{+\infty}^{R_0} \vec{E}(r)\,dr =$$

$$= -\int_{+\infty}^{R_2} \frac{Q}{4\pi\varepsilon_0}\frac{dr}{r^2} - \int_{R_2}^{R_1} \frac{Q}{4\pi\varepsilon_0 k}\frac{dr}{r^2} - \int_{R_1}^{R_0} \frac{Q}{4\pi\varepsilon_0}\frac{dr}{r^2} =$$

$$= \frac{Q}{4\pi\varepsilon_0}\left[\left(\frac{1}{R_2} - \underset{\overset{\shortparallel}{0}}{\underbrace{\frac{1}{+\infty}}}\right) + \frac{1}{k}\left(\frac{1}{R_1} - \frac{1}{R_2}\right) + \left(\frac{1}{R_0} - \frac{1}{R_1}\right)\right]$$

per l'energia ci sono vari metodi

per esempio si può vedere il sistema come un condensatore con un'armatura all'$+\infty$ e carico con Q $\rightarrow$

$$U_e = \frac{1}{2} Q \Delta V = \frac{1}{2} Q V(R_0)$$

2)

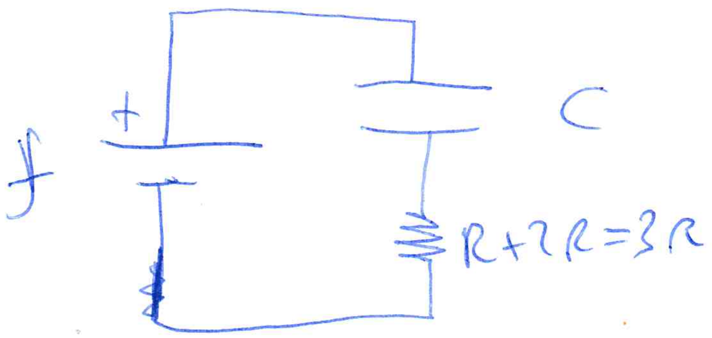
Caso A da lungo tempo

$i = 0$

$\Delta V_{3R} = 3R \cdot i = 0$

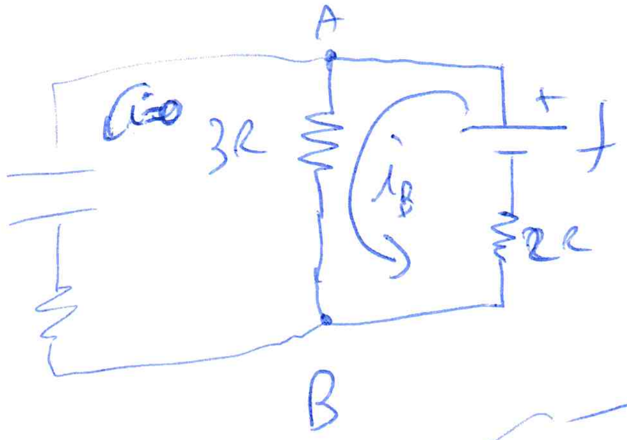
$\Downarrow$

$\Delta V_{C_A} = f$



$Q_A = C f \qquad U_A = \frac{1}{2} C f^2$

Caso B da molto tempo



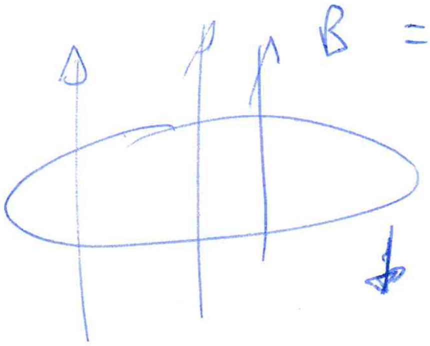
$i_B = \frac{f}{5R}$

$\Delta V_{C_B} = V_{AB} = 3R i_B = \frac{3\cancel{R}}{5\cancel{R}} f$

$Q_B = C \frac{3}{5} f \qquad U_B = \frac{1}{2} C \left(\frac{3}{5} f\right)^2$

$\Delta U = U_B - U_A = \frac{1}{2} C \left(\frac{3}{5} f^2\right) - \frac{1}{2} C f^2$

3



$B = \alpha z$

$v = -g t$

$z = z_0 - \frac{1}{2} g t^2$

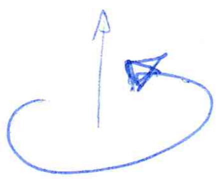
$$\Phi(B) = B \cdot \pi L^2 = \alpha z \pi L^2 =$$

$$= \alpha \pi L^2 \left(z_0 - \frac{1}{2} g t^2\right)$$

$$f_{em} = -\frac{d\Phi}{dt} = +\alpha \pi L^2 \frac{1}{\cancel{2}} g \cdot \cancel{2} \cdot t = \alpha \pi L^2 g t =$$

$$= \alpha \pi L^2 (-v)$$

$$i^* = \frac{f_{em}}{R} = \frac{\alpha \pi L^2 g}{R} t^*$$



ANTIORARIA

4

$$\tau = \frac{L}{R}$$

$$i(t_1) = i_{\infty}\left[1 - e^{-\frac{t_1}{\tau}}\right] \qquad i_{\infty} = \frac{V_0}{R}$$

$$i(t_1) = \frac{V_0}{R}\left[1 - e^{-\frac{t_1}{L}R}\right]$$

$$U_m(t_1) = \frac{1}{2} L\, i^2(t_1)$$

$$P_{gen} = V_0 \cdot i(t_1)$$