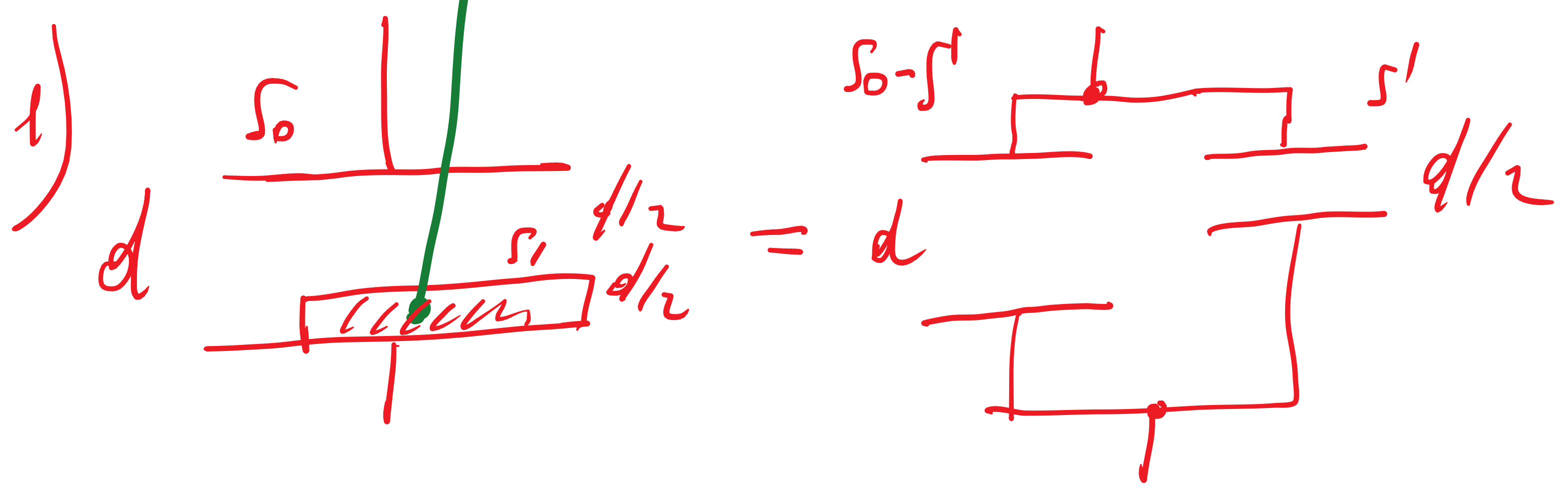
13/06/2023

1)



per cui

$$C_0 = \varepsilon_0 \frac{S_0}{d}$$

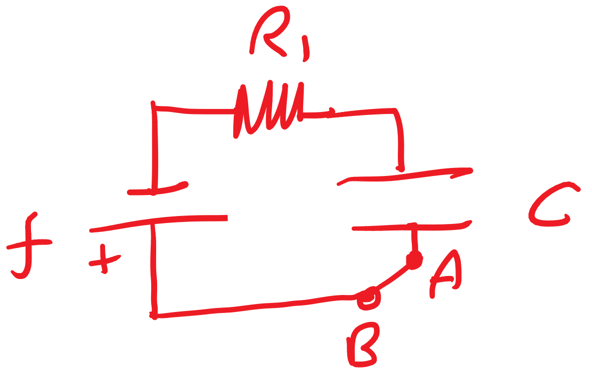
$$U_0 = \frac{1}{2} C_0 V^2$$

$$C = \varepsilon_0 \frac{S_0 - S'}{d} + \varepsilon_0 \frac{S'}{d/2}$$

$$U = \cancel{\frac{1}{2}} C \cancel{V^2} = \frac{3}{2} \cancel{\frac{1}{2}} C_0 \cancel{V^2} \qquad C = \frac{3}{2} C_0 \rightarrow \cancel{\frac{\varepsilon_0}{d}} \left[S_0 - S' + 2S' \right] = \frac{3}{2} \cancel{\frac{\varepsilon_0}{d}} S_0 \rightarrow$$

$$\rightarrow S_0 + S' = \frac{3}{2} S_0 \rightarrow S' = \frac{3}{2} S_0 - S_0 = \frac{1}{2} S_0$$

2) A

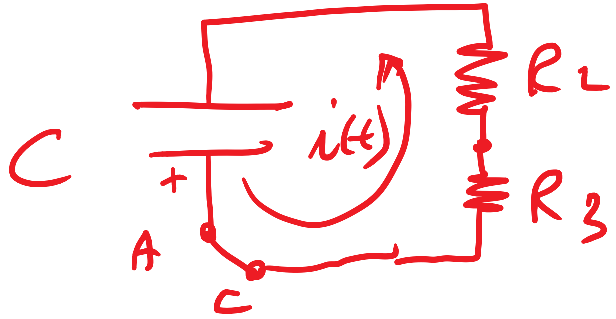


$Q_{C_i} = Cf$ $\qquad U_{C_i} = \frac{1}{2} C f^2$

P.2

$U_{R_1 i} = \frac{1}{2} C f^2$

B



$R_s = R_2 + R_3$

$i(t) = i_0 e^{-t/\tau}$

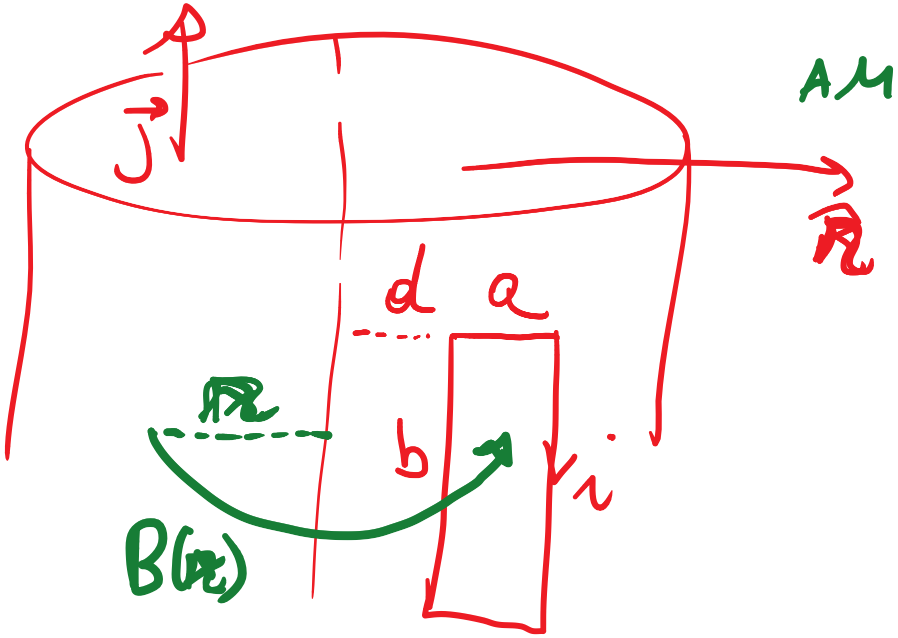
où $i_0 = \frac{f}{R_s}$ $\qquad \tau = R_s C$

$P_{R_2} = R_2 i^2(t)$ $\qquad U_{R_2} = \int_0^{+\infty} P_{R_2}\, dt = \int_0^{+\infty} R_2 \frac{f^2}{R_s^2} e^{-\frac{2t}{R_s C}}\, dt =$

$= \frac{R_2 f^2}{R_s^{\cancel{2}}} \frac{\cancel{R_s} C}{(-2)} \left[e^{-\frac{2t}{R_s C}} \right]_0^{+\infty} = \frac{R_2 \cancel{C f^2}}{\cancel{2}(R_2+R_3)} = \frac{1}{3} \frac{1}{\cancel{2}} \cancel{C f^2} \to 3R_2 = (R_2+R_3) \to$

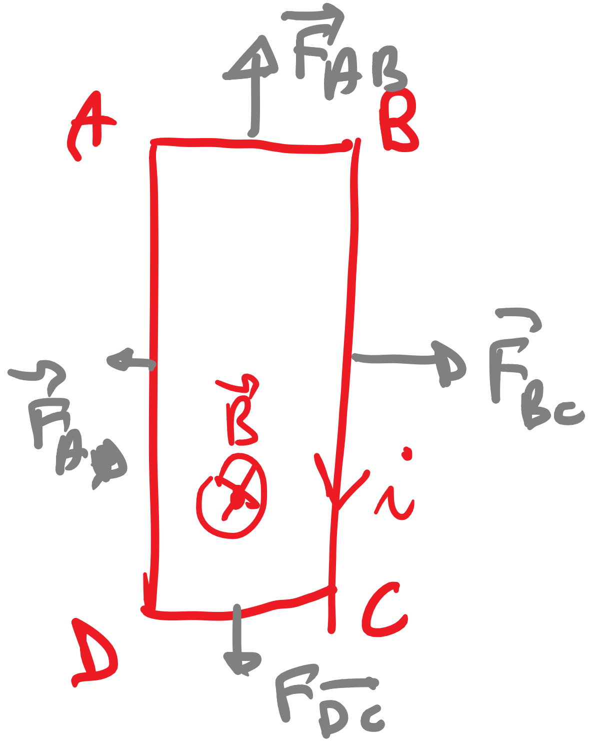
$\to 3R_2 - R_2 = R_3 \to R_2 = R_3/2$

3)



AMPERE → $2\pi r B(r) = \mu_0 (j \pi r^2)$

↳ $B(r) = \frac{\mu_0 j}{2} r$



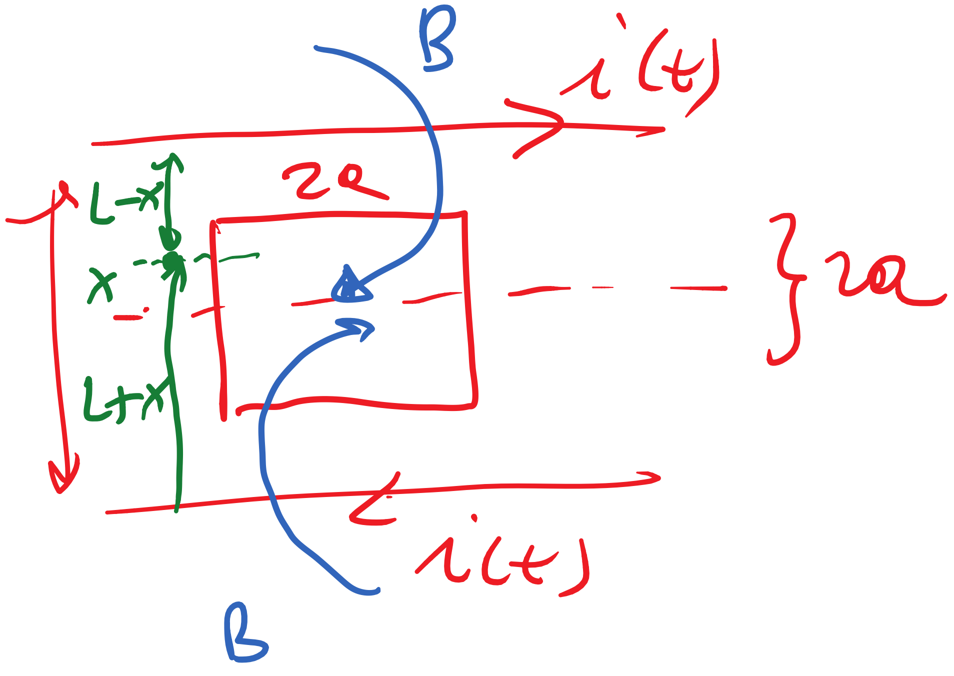
$\vec{F}_{AB} = -\vec{F}_{DC}$ Si annullano tra loro

$F_{BC} = i b [B(d+a)] = i b \frac{\mu_0 j}{2} (d+a)$

$F_{DA} = -i b B(d) = -i b \frac{\mu_0 j}{2} d$

$\vec{F}_{TOT} = \hat{r}\, i b \frac{\mu_0 j}{2} [\cancel{d} + a - \cancel{d}] = \hat{r} \frac{i a b \mu_0 j}{2}$

4)



P.4

B è ~~pa~~ entrambi i fili entrante

$$i(t) = i_0 \cos(\omega t)$$

$$B(x) = \frac{\mu_0 i(t)}{2\pi(L-x)}$$

$$B_{TOT}(x) = \frac{\mu_0 i(t)}{2\pi(L-x)} + \frac{\mu_0 i(t)}{2\pi(L+x)}$$

$\boxed{\text{2 VOLTE DA } 0 \to a}$

$$\phi(B) = 2a \cdot 2\int_{0}^{a} \left(\frac{\mu_0 i(t)}{2\pi(L-x)} + \frac{\mu_0 i(t)}{2\pi(L+x)}\right) dx =$$

$$= \frac{2a\mu_0 i(t)}{2\pi}\left[2\int_0^a \frac{dx}{L-x} + 2\int_0^a \frac{dx}{L+x}\right] =$$

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$$= \frac{\cancel{2}a\mu_0 i_0 \cos(\omega t)}{\cancel{2}\pi} 2 \left[-\ln\left(\frac{a-L}{-L}\right) + \ln\left(\frac{a+L}{L}\right) \right] =$$

$$= \frac{\mu_0 a i_0}{\pi} \cos(\omega t) 2 \left[\ln\left(\frac{a+L}{\cancel{L}} \cdot \frac{-\cancel{L}}{a-L} \right) \right] = \frac{2\mu_0 a i_0 \cos(\omega t)}{\pi} \ln\left(\frac{L+a}{L-a}\right)$$

$$fem = -\frac{d\phi(B)}{dt} = \frac{2\mu_0 a i_0 \omega \operatorname{sen}(\omega t)}{\pi} \ln\left(\frac{L+a}{L-a}\right)$$