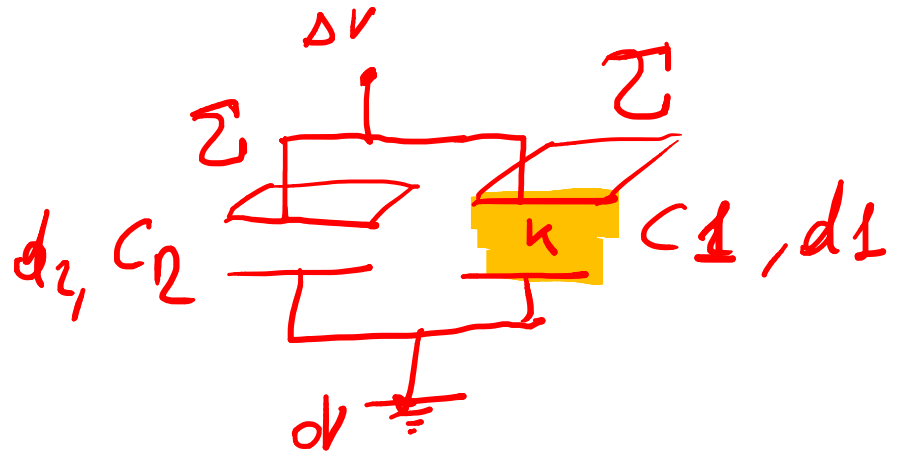


20-10-2022

P.1

1)

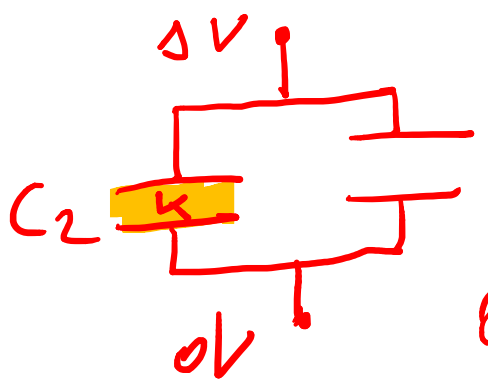


$$C_{IN1} = \frac{\epsilon_0 \Sigma}{d_1}$$

$$C_{IN2} = \frac{\epsilon \Sigma}{d_2}$$

$$C_{//IN} = C_{IN1} + C_{IN2} = \epsilon \Sigma \left( \frac{\kappa}{d_1} + \frac{1}{d_2} \right)$$

$$Q_{IN} = C_{//IN} \Delta V$$



$$C_{FN1} = \frac{\epsilon \Sigma}{d_1}$$

$$C_{FN2} = \frac{\epsilon \kappa \Sigma}{d_2}$$

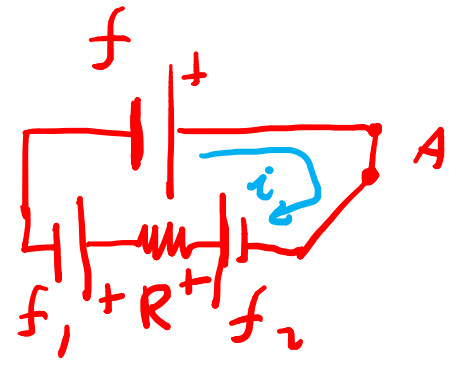
$$C_{//FN} = C_{FN1} + C_{FN2} = \epsilon \Sigma \left( \frac{1}{d_1} + \frac{\kappa}{d_2} \right)$$

$$Q_{FN} = C_{//FN} \Delta V$$

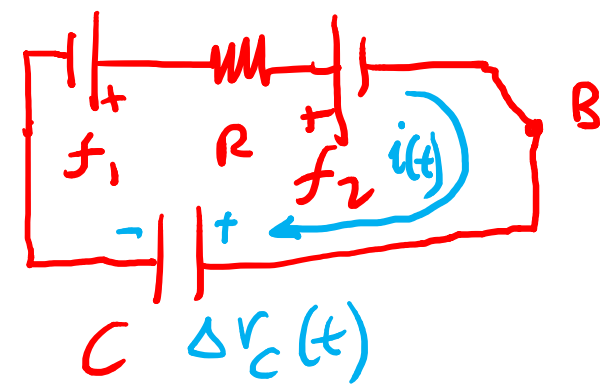
$$\Delta Q = Q_{FN} - Q_{IN} = \epsilon \Sigma \Delta V \left[ \frac{1}{d_1} + \frac{\kappa}{d_2} - \frac{\kappa}{d_1} - \frac{1}{d_2} \right]$$

$$W_{GEN} = \Delta Q \cdot \Delta V = \epsilon \Sigma \Delta V^2 \left[ \frac{1-\kappa}{d_1} + \frac{\kappa-1}{d_2} \right]$$

2)



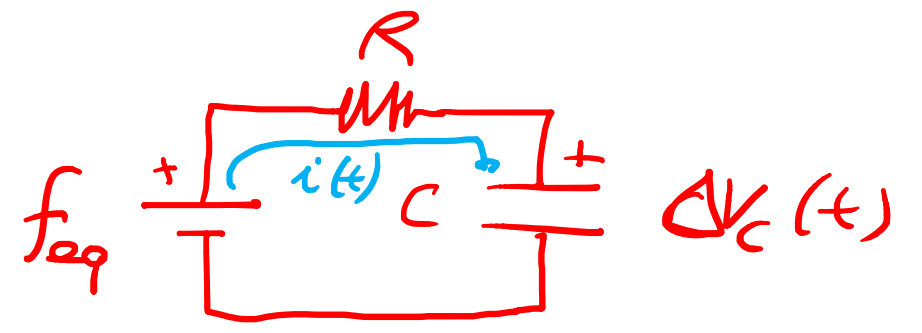
$$Ri = f + f_2 - f_1 \rightarrow i = \frac{f + f_2 - f_1}{R}$$



$$\Delta V_{C,IN} = 0$$



$$f_{eq} = f_1 - f_2$$

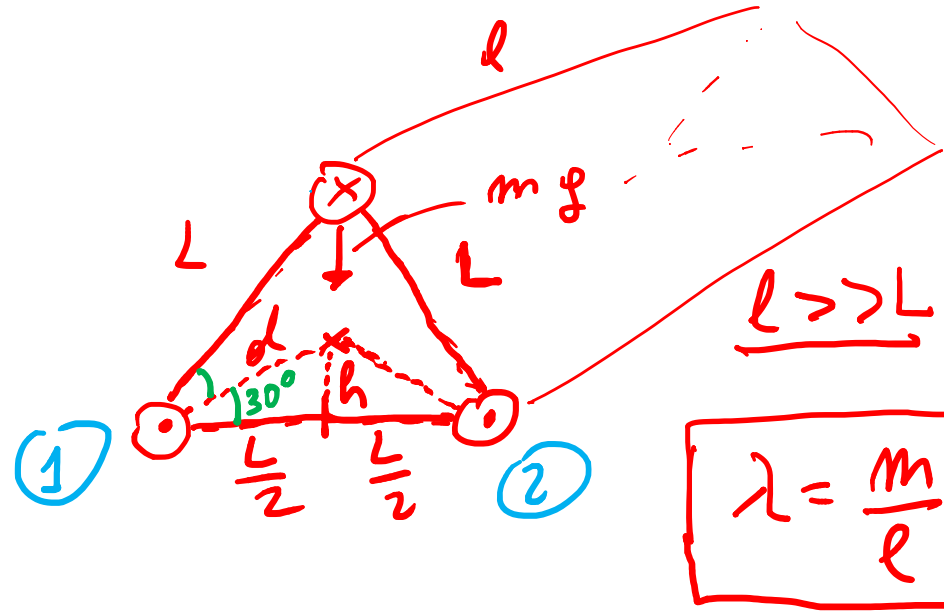


$$t^* \rightarrow \Delta_C(t^*) = \frac{2}{3} f_{eq} \quad f_2 + \frac{f}{1} = \frac{f}{1} f_1 = \frac{f}{1} f_1 = \frac{f}{1} f_{eq} = f_1 - f_2$$

$$\Delta V_C(t^*) = (f_1 - f_2) \left[ 1 - e^{-\frac{t^*}{RC}} \right] = \frac{2}{3} (f_1 - f_2) \rightarrow 1 - \frac{2}{3} = e^{-\frac{t^*}{RC}} \rightarrow$$

$$\rightarrow \frac{3-2}{3} = \frac{1}{3} = e^{-\frac{t^*}{RC}} \rightarrow 3^{-1} = e^{-\frac{t^*}{RC}} \rightarrow \ln 3 = -\frac{t^*}{RC} \rightarrow t^* = RC \ln 3$$

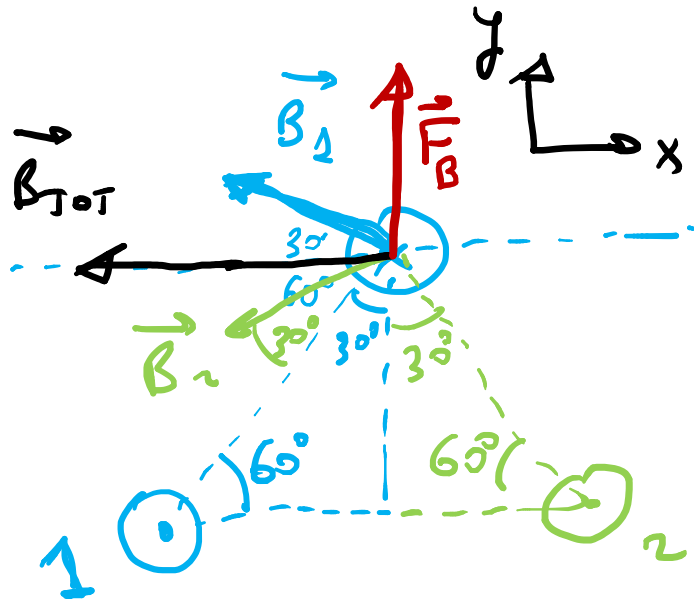
3)



$$\lambda = \frac{m}{l}$$

$$d \cos 30^\circ = \frac{L}{2} \rightarrow d = \frac{L}{2 \cos 30^\circ} = \frac{L \cdot \pi}{2 \sqrt{3}} = \frac{L}{\sqrt{3}}$$

$$d \sin 30^\circ = h = \frac{d}{2} \rightarrow d = 2h$$



$$\vec{B}_{\text{tot}} = -\hat{x} \cdot 2 \cdot B_1 \cdot \cos 30^\circ = -\hat{x} \cdot 2 \cdot \frac{\sqrt{3}}{2} B_1$$

$$B_1 = \frac{\mu_0 i}{2\pi L} \rightarrow \vec{B}_{\text{tot}} = -\hat{y} \frac{\sqrt{3} \mu_0 i}{2\pi L}$$

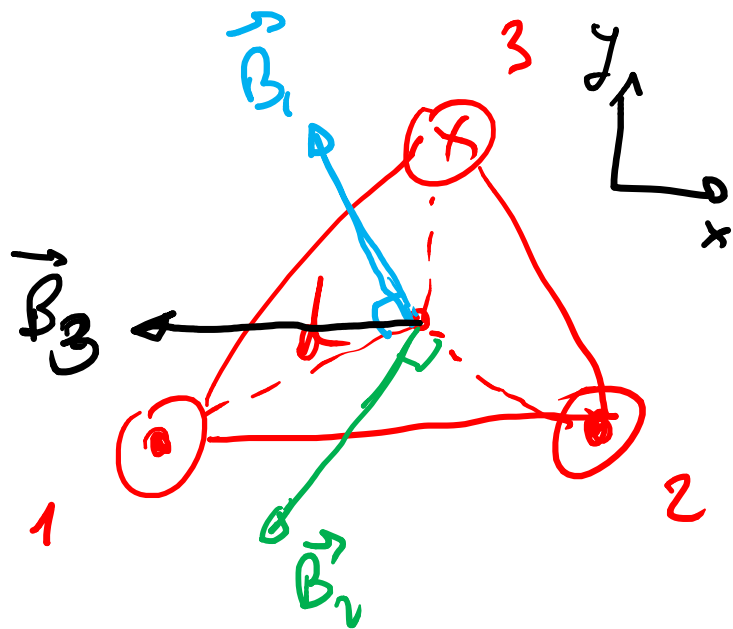
$$\vec{F}_B = i \vec{l} \times \vec{B}_{\text{tot}} = \hat{y} i l \frac{\sqrt{3} \mu_0 i}{2\pi L} \quad |F_B| = mg = \lambda l g$$

$$\frac{\cancel{l} \sqrt{3} i^2 \mu_0}{2\pi L} = \lambda l g \quad \rightarrow \quad i = \sqrt{\frac{2\pi L g \lambda}{\mu_0 \sqrt{3}}}$$

СМРД

В АС СМТНО

P.6

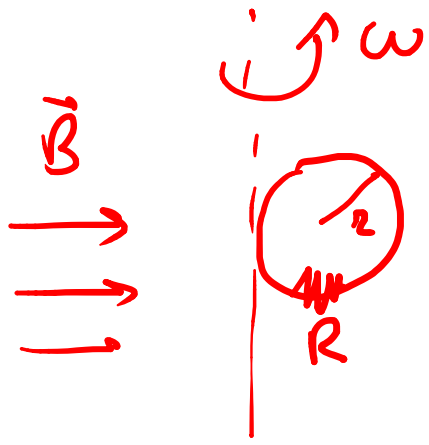


$$|B_1| = |B_2| = |B_3| = \frac{\mu_0 i}{2\pi d} \quad d = \frac{L}{\sqrt{3}}$$

$$|B_3| = |B_1| = |B_2| = \frac{\mu_0 i \sqrt{3}}{2\pi L}$$

$$\begin{aligned} \vec{B}_{TOT} &= -\hat{x} \left( B_1 \cos 60^\circ + B_2 \cos 60^\circ + B_3 \right) = \\ &= -\hat{x} \left( \frac{B_1}{2} + \frac{B_2}{2} + B_3 \right) = -\hat{x} \frac{\mu_0 i \sqrt{3}}{2\pi L} \left( \frac{1}{2} + \frac{1}{2} + 1 \right) = \\ &= -\hat{x} \frac{\mu_0 i \sqrt{3}}{2\pi L} (2) = -\hat{x} \frac{\mu_0 i \sqrt{3}}{\pi L} \end{aligned}$$

4)



$$\theta(t) = \omega t$$

$$\Phi(\vec{B}) = \pi r^2 B \cos(\omega t)$$

$$f_{em} = -\frac{d\Phi}{dt} = +(\omega) \pi r^2 B \sin(\omega t)$$

$$f_{em}(t) = \omega \pi r^2 B \sin(\omega t) \quad i(t) = \frac{f_{em}(t)}{R}$$

$$P(t) = f_{em}(t) \cdot i(t) = \frac{f_{em}^2(t)}{R} = \frac{\omega^2 \pi^2 r^4 B^2 \sin^2(\omega t)}{R}$$

$$P_{max} = \frac{\omega^2 \pi^2 r^4 B^2}{R} \quad [\text{da } \sin(\omega t) = \pm 1]$$

$$\bar{P} = P_{med} = \frac{1}{2} P_{max} = \frac{\omega^2 \pi^2 r^4 B^2}{2R}$$

