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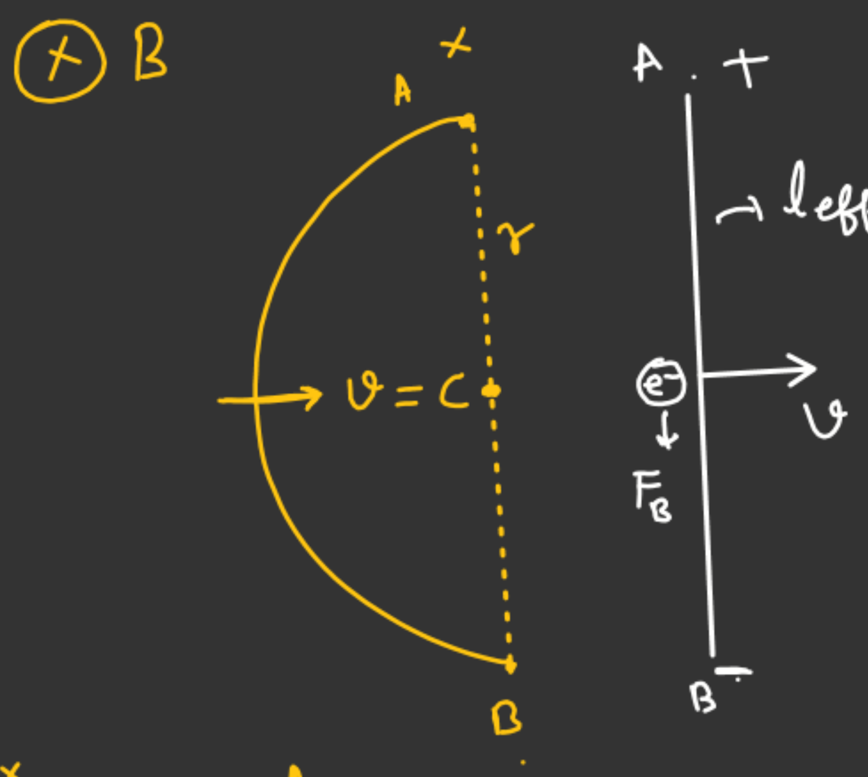
$$\boxed{\mathcal{E}_{ind} = B l v_{\perp}}$$

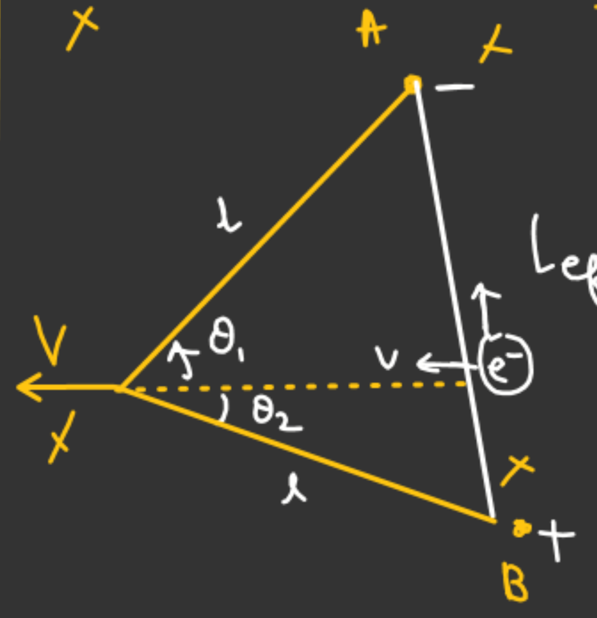
$v_{\perp} \rightarrow$ perpendicular to length vector

$$\boxed{\mathcal{E}_{ind} = B v l_{eff}}$$

l_{eff} = Effective length vector perpendicular to v



$$V_A - V_B = Bv(2r)$$



$V_A - V_B = ??$

$L_{eff} = l(\sin\theta_1 + \sin\theta_2)$

$$V_A - V_B = -\left[Bl(\sin\theta_1 + \sin\theta_2)v\right]$$

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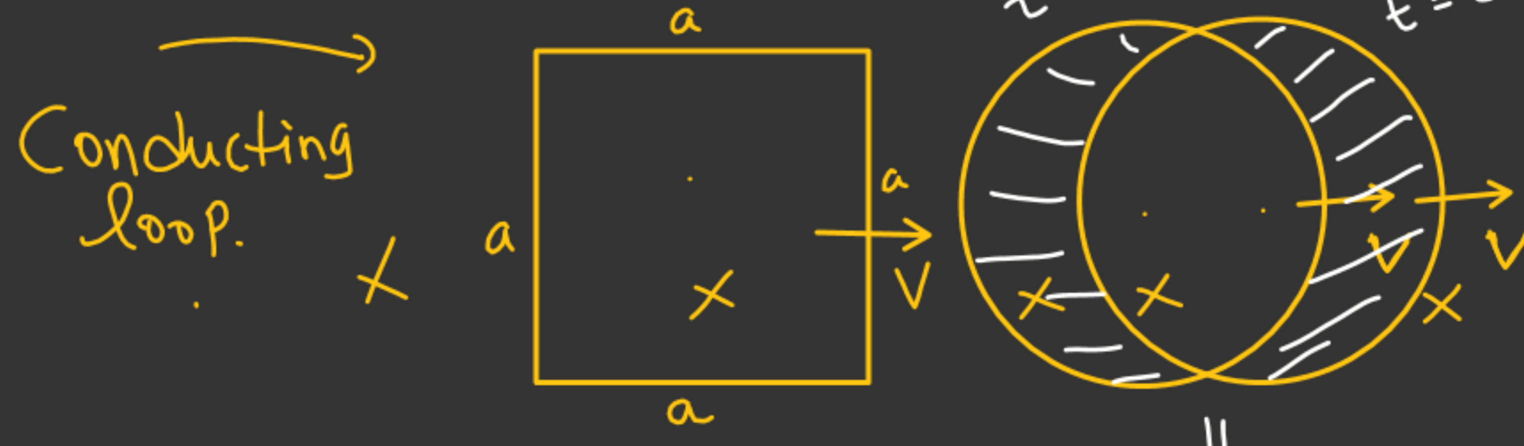
$\otimes B = C$

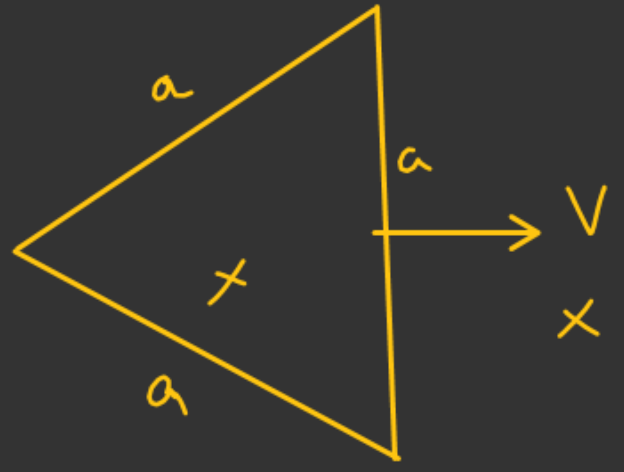


$\Downarrow$

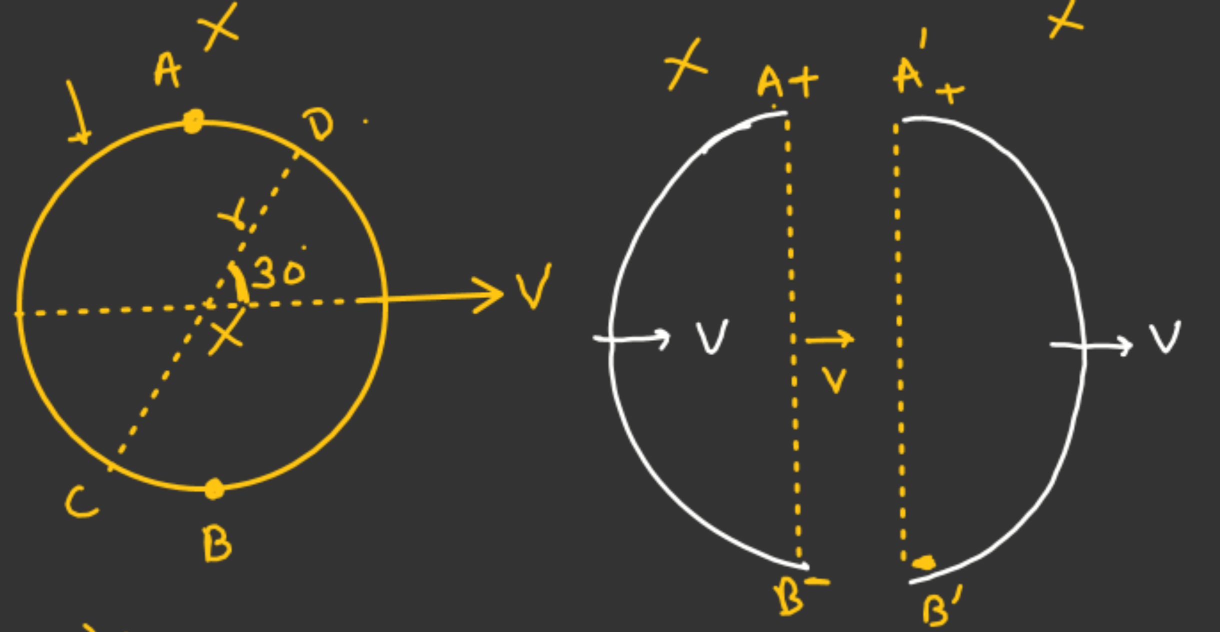
Net Area Swept = 0

ϕ = Constant

$[\mathcal{E}_{ind} = 0]$

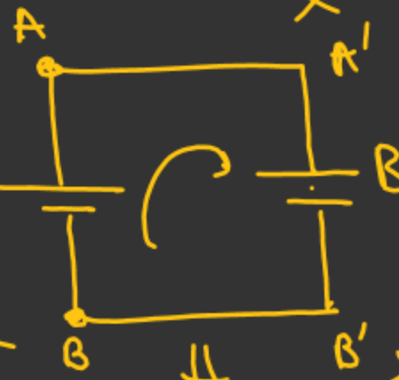


Conducting loop



$V_A - V_B = BV(2r)$

$\Downarrow$



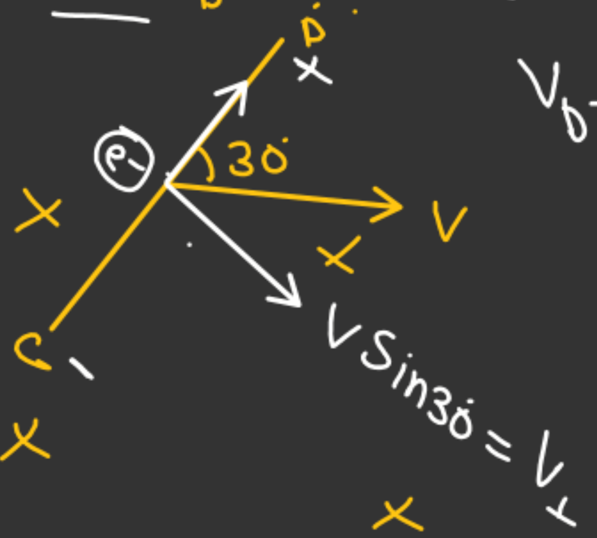
$\mathcal{E}_{ind} = B2rV$

$BV2r$

$\Downarrow$

$(\mathcal{E}_{ind})_{net} = 0.$

$V_C - V_D = ?? = -BVr$



$V_D - V_C$

$= B\frac{V}{2}\cdot 2r$

$= BVr$

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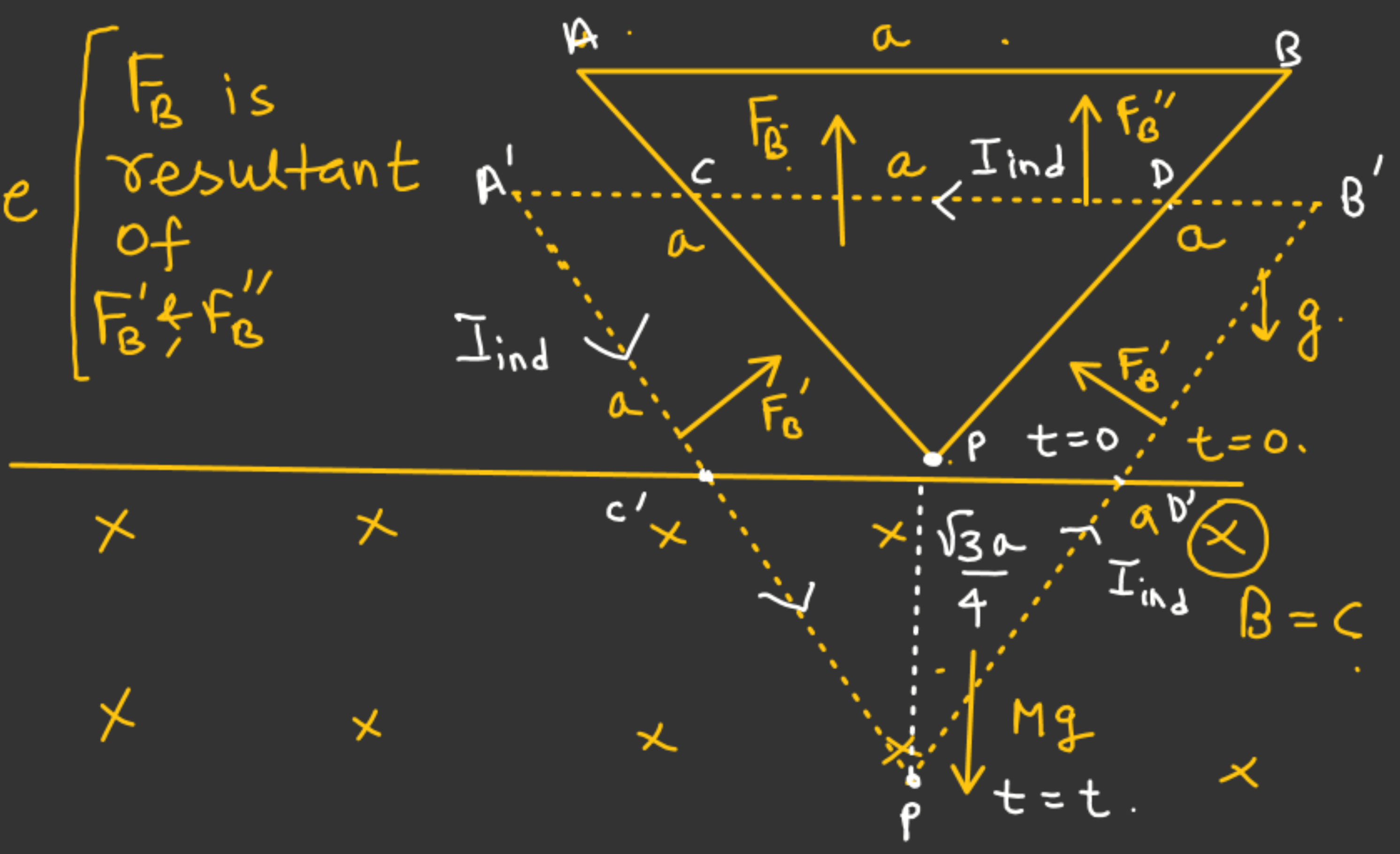
Q. A conducting equlaterial triangular wire frame is released from the position shown in the fig. When it travels vertical distance $\frac{\sqrt{3}a}{4}$ frame is in Equilibrium.

a) Find I_{ind} when frame is in equlibrium

b) Prove that frame perform S.H.M.

M = Mass of frame

F_B is resultant of F_B' & F_B''

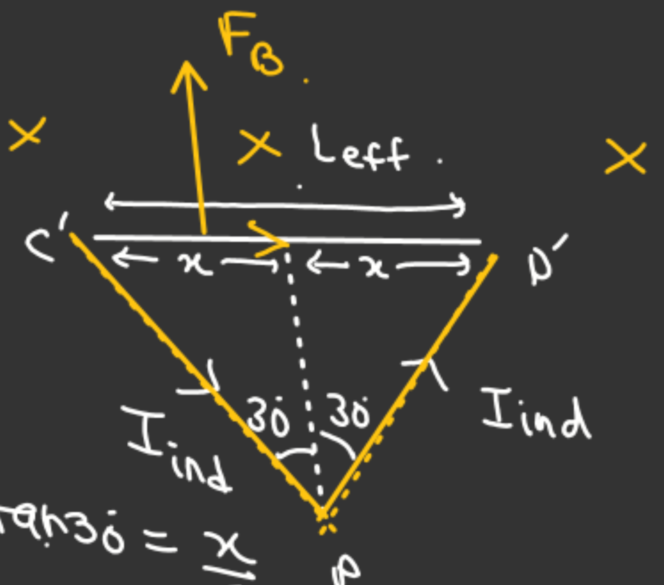


At Equlibrium

$$F_B = Mg$$

$$\frac{IBa}{2} = Mg$$

a) $$I = \left(\frac{2Mg}{Ba}\right) \text{ Ans}$$



$$F_B = I l_{eff} \cdot B$$

$$= I\, 2 \times \frac{a}{4} \times B$$

$$= \left(\frac{IBa}{2}\right).$$

$$\tan 30 = \frac{x}{\frac{\sqrt{3}a}{4}}$$

$$x = \frac{a}{4}$$

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$$F_r = -\left[F_B' - Mg\right]$$

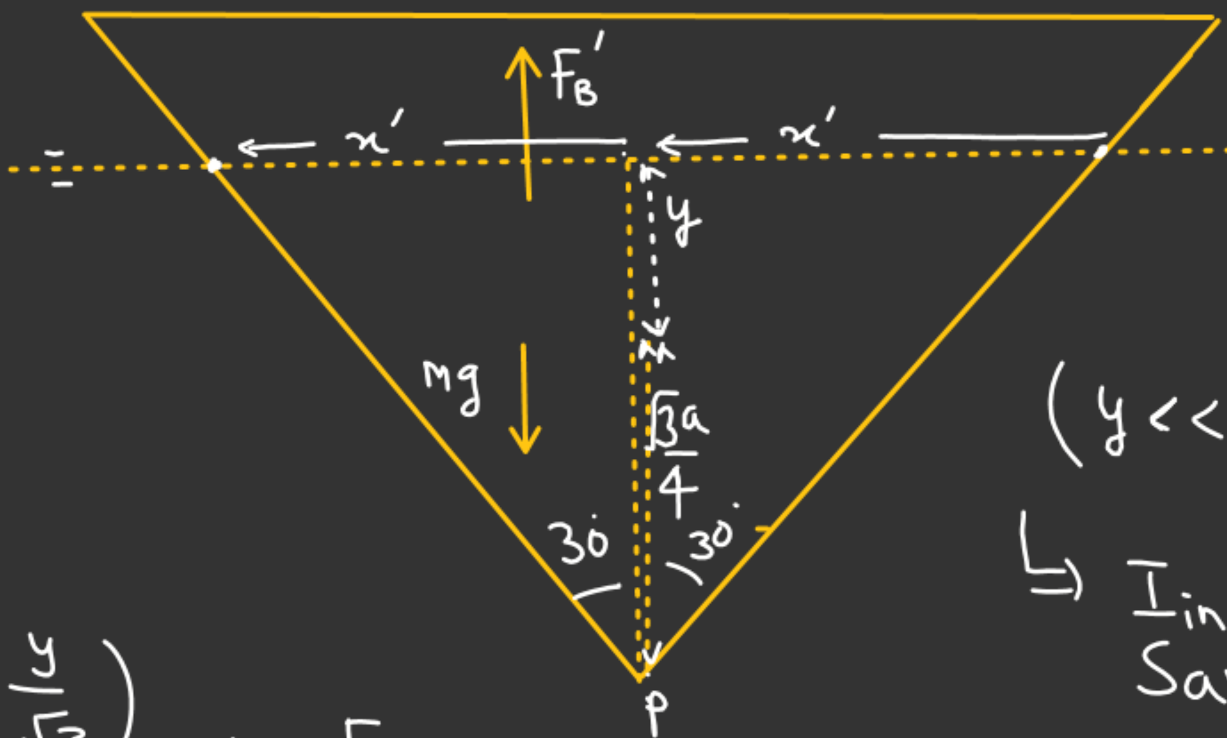
$$\tan 30^\circ = \frac{x'}{\left(\frac{\sqrt{3}a}{4}+y\right)}$$

$$\frac{1}{\sqrt{3}}\left(\frac{\sqrt{3}a}{4}+y\right) = x'$$

$$x' = \left(\frac{a}{4}+\frac{y}{\sqrt{3}}\right)$$

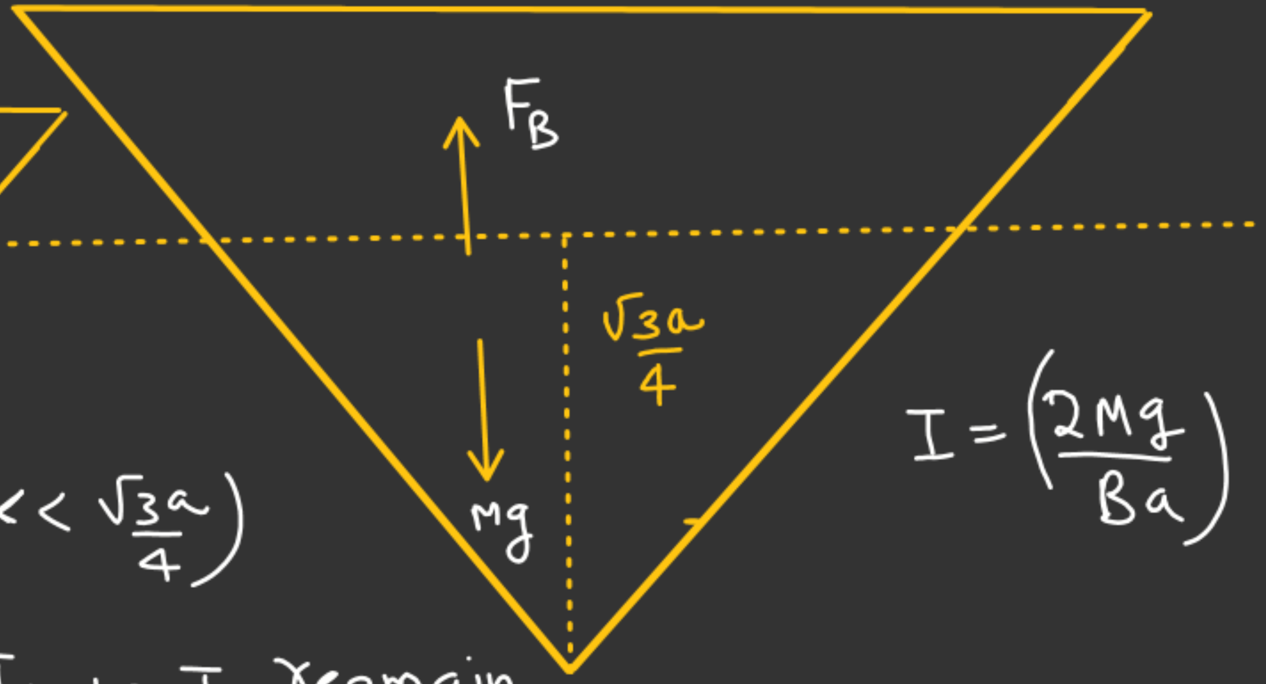
$$F_B' = 2Ix'B$$

$$F_B' = 2IB\left(\frac{a}{4}+\frac{y}{\sqrt{3}}\right)$$



$\left(y << \frac{\sqrt{3}a}{4}\right)$

$\hookrightarrow$ $I_{ind} = I$ reamain Same for y displacement.



$$I = \left(\frac{2Mg}{Ba}\right)$$

$$\Rightarrow F_r = -\left[2IB\frac{a}{4} + \frac{2IB}{\sqrt{3}}y - Mg\right]$$

$$F_r = -\left[\left(\frac{IBa}{2} - Mg\right) + \frac{2IB}{\sqrt{3}}y\right]$$

$$\underbrace{\left(\frac{IBa}{2} - Mg\right)}_{= 0}$$

$$F_r = -\frac{2IB}{\sqrt{3}}y$$

$$F_r = -\frac{2B}{\sqrt{3}} \times \frac{2Mg}{Ba}\cdot y = -\frac{4Mg}{\sqrt{3}a}y$$

$$a = -\frac{4g}{\sqrt{3}a}y$$

$$a = -\omega^2 y$$

$$T = 2\pi\sqrt{\frac{\sqrt{3}a}{4g}} \checkmark$$

$$T = \pi\sqrt{\frac{\sqrt{3}a}{g}} \checkmark$$

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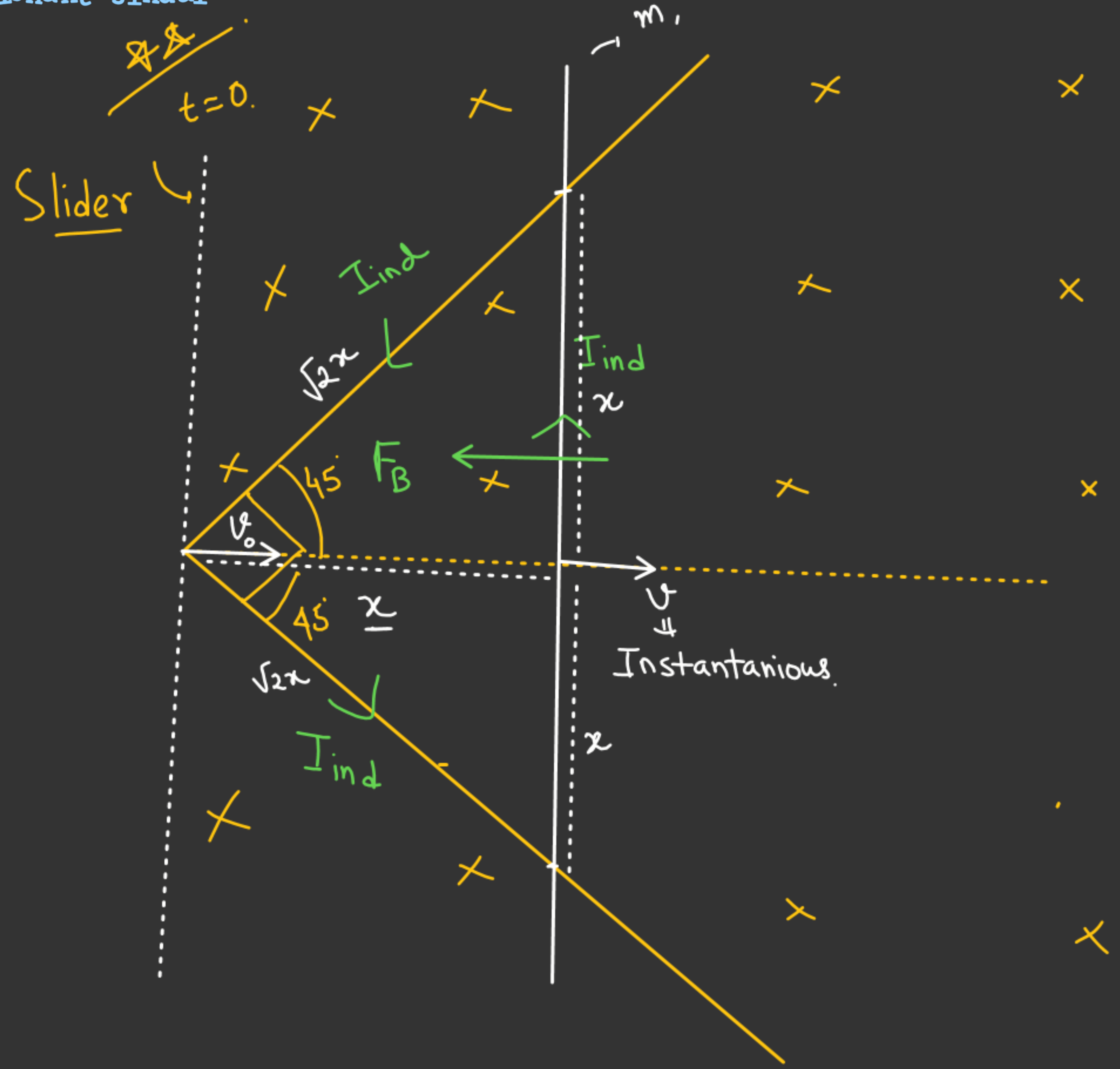


Slider and V-Shape rails very long.

$\lambda \rightarrow$ Resistance per Unit length of Slider as well as V-Shape rail

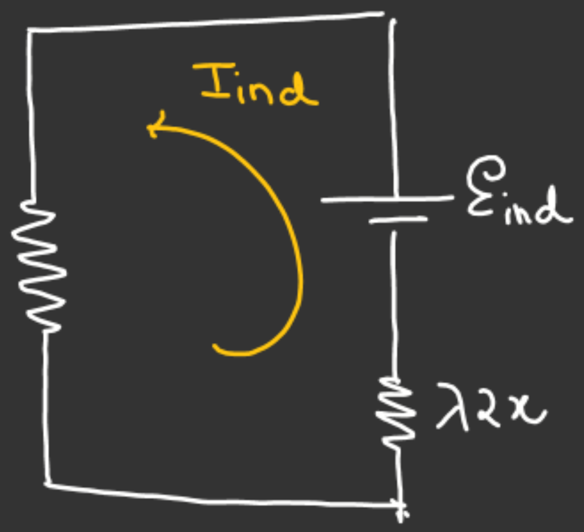
Initially Slider projected with velocity v_0. Find total distance travelled by slider before it come to rest

Effective Ckt diagram

$$\mathcal{E}_{ind} = B(2x)v$$

$$I_{ind} = \frac{2Bvx}{(2\sqrt{2}\lambda x + 2\lambda x)} \quad 2\sqrt{2}\lambda x$$

$$I_{ind} = \frac{Bv}{\lambda + \sqrt{2}\lambda} = \frac{Bv}{(\sqrt{2}+1)\lambda}$$



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$$F_B = I_{ind}(2x)B$$

$$F_B = \frac{Bv}{(\sqrt{2}+1)\lambda}(2xB)$$

$$F_B = \frac{2B^2v}{(\sqrt{2}+1)\lambda}x$$

$$a = -\frac{F_B}{m} = \frac{-2B^2vx}{(\sqrt{2}+1)\lambda m}$$

$$\Downarrow$$

$$\cancel{v}\frac{dv}{dx} = -\frac{2B^2}{(\sqrt{2}+1)\lambda m}\cancel{v}x$$

$$\frac{dv}{dx} = -\frac{2B^2}{(\sqrt{2}+1)\lambda m}x$$

$$\int_{v_0}^{0} dv = \frac{-2B^2}{(\sqrt{2}+1)\lambda m}\int_0^{x_{max}} x\,dx$$

$$\cancel{-}v_0 = \frac{\cancel{-}\cancel{2}B^2}{(\sqrt{2}+1)m\lambda}\cdot\left(\frac{x_{max}^2}{\cancel{2}}\right)$$

$$x_{max} = \sqrt{\left[\frac{(\sqrt{2}+1)m\lambda v_0}{B^2}\right]}$$ ✓

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Find.

$\mathcal{E}_{ind} \to f(t)$ ✓

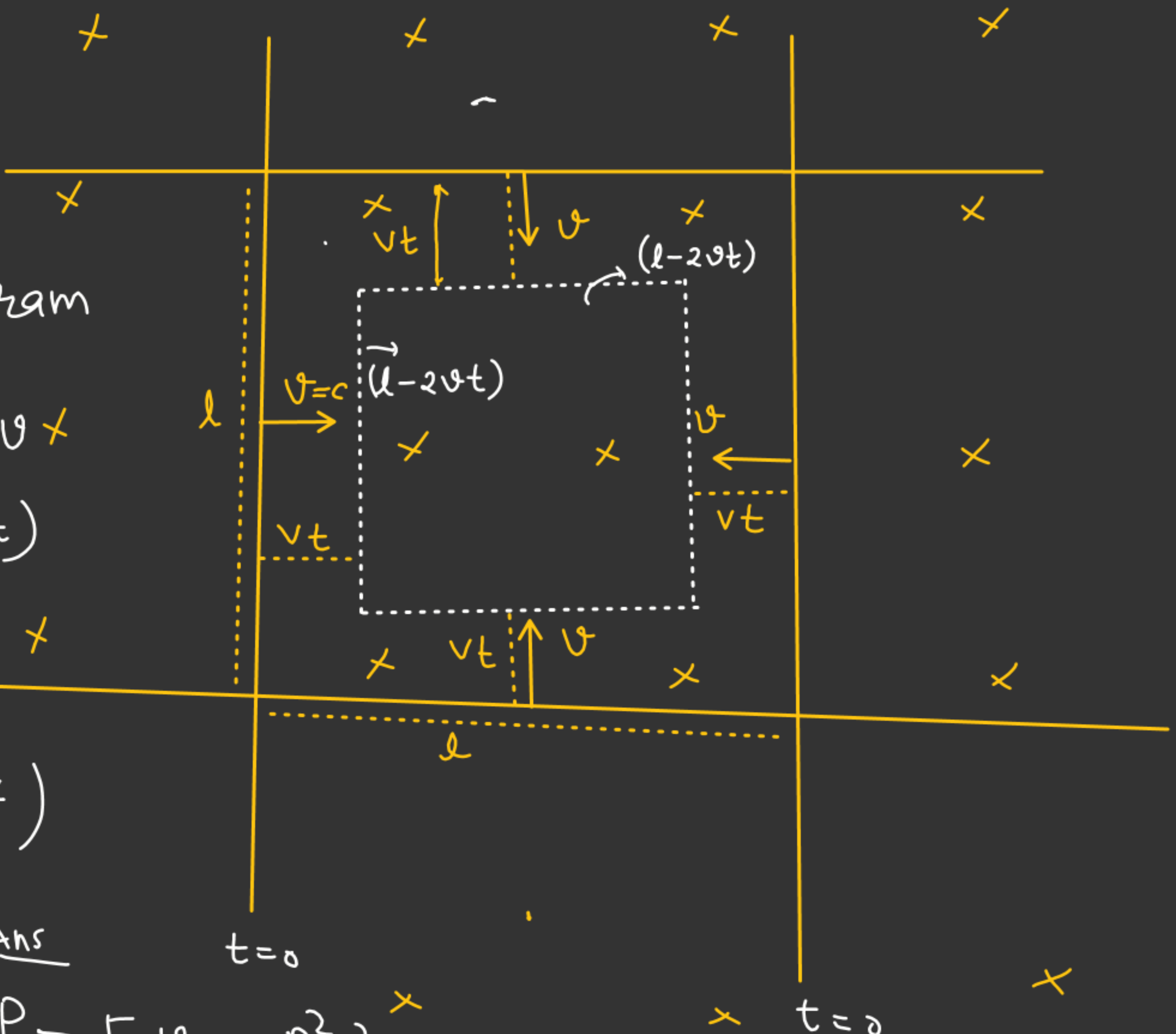
(Constant) $I_{ind} \to f(t)$ ✗

$F_{ext} \to f(t)$ ✓

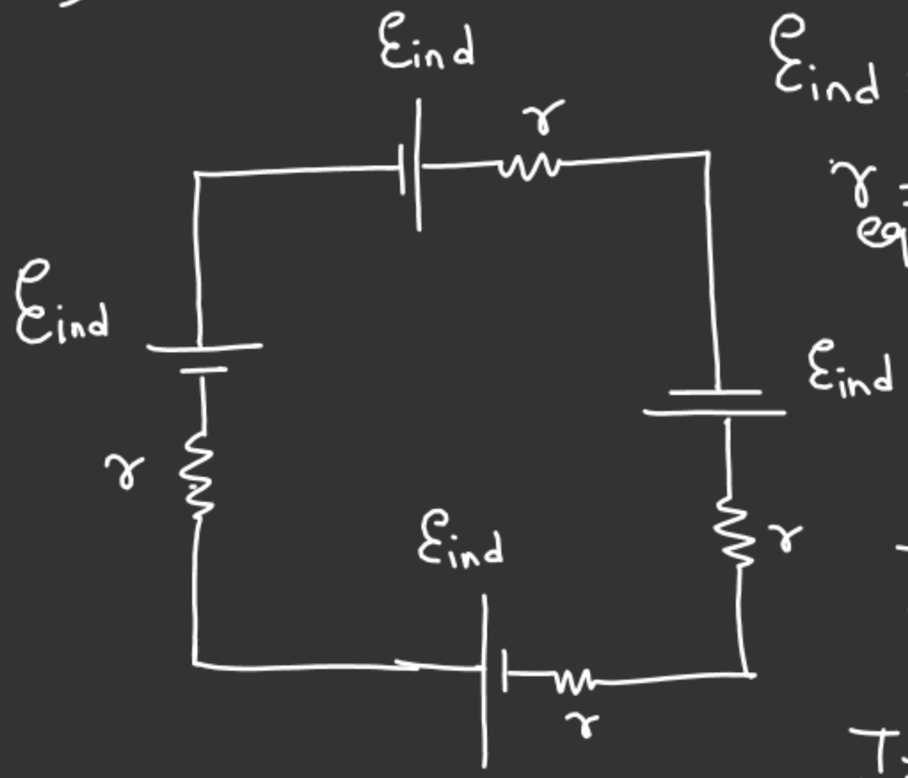
Power $\to f(t)$ ✓

[λ = Resitance per unit length of the wire.

(v = Constant)



Eq. Ckt. diagram



$$\mathcal{E}_{ind} = 4B(l-2vt)v$$

$$r_{eq} = 4\lambda(l-2vt)$$

$$I_{ind} = \left(\frac{4\mathcal{E}_{ind}}{4r}\right)$$

$$I_{ind} = \left(\frac{Bv}{\lambda}\right) \text{ Ans}$$

$$F_{ext} = F_B = I_{ind}(l-2vt)B$$

$$= \frac{B^2 v}{\lambda}(l-2vt) \text{ Ans}$$

$$P = F\cdot v = \frac{B^2 v^2}{\lambda}(l-2vt) \text{ Ans}$$