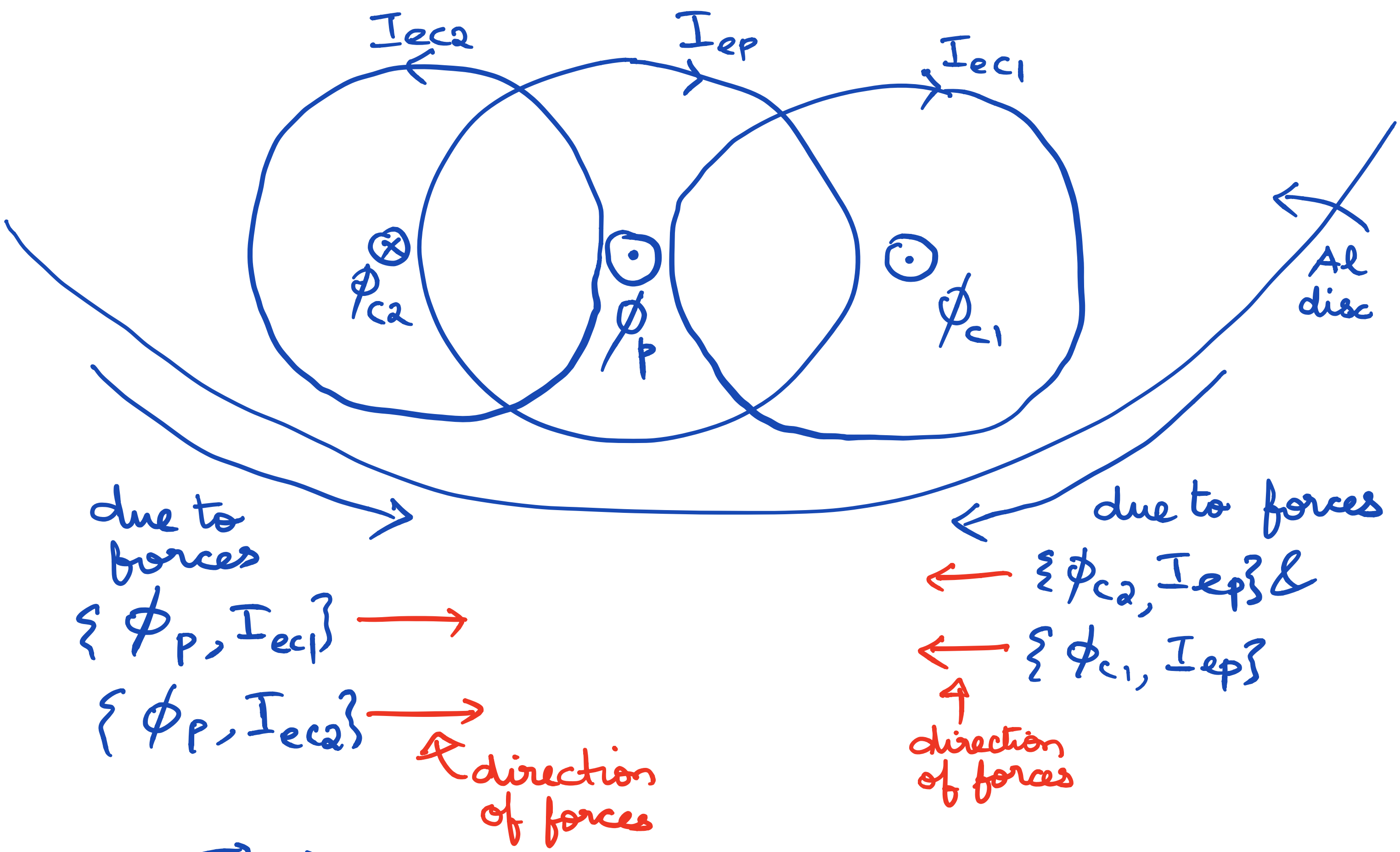
ELL301

19.02.2019

• ← centre of disc



What are forces ($\sim \vec{i} \times \vec{B}$) exerted by these magnetic (B) fluxes on these eddy currents (i)?

$$\phi_p \sim V \sin(\omega t - 90^\circ)$$ [pressure coil is inductive

$$\phi_{c1}, \phi_{c2} \sim I \sin(\omega t + \theta)$$ → phase difference

$$I_{ep} \sim V \cos(\omega t - 90^\circ)$$ [as $I_{ep} \sim -\frac{d\phi_p}{dt}$

$$I_{ec1}, I_{ec2} \sim I \cos(\omega t + \theta)$$ [''

Net torque =

$\left\{ \text{Torque generated by } \{\phi_p, I_{ec1}\} \text{ \& } \{\phi_p, I_{ec2}\} \right\}$

$- \left\{ \text{Torque generated by } \{\phi_{c1}, I_{ep}\} \text{ \& } \{\phi_{c2}, I_{ep}\} \right\}$

$$\sim VI \sin(\omega t - 90^\circ) \cos(\omega t + \theta)$$
$$- VI \sin(\omega t + \theta) \cos(\omega t - 90^\circ)$$

$$= VI \sin(\omega t - 90^\circ - \omega t - \theta)$$
$$= VI \sin(-90^\circ - \theta)$$

$$= VI \cos\theta$$

— in the ideal case, '$\cos\theta$' appears. In reality, may be different due to factors such as pressure coil is not purely inductive

—

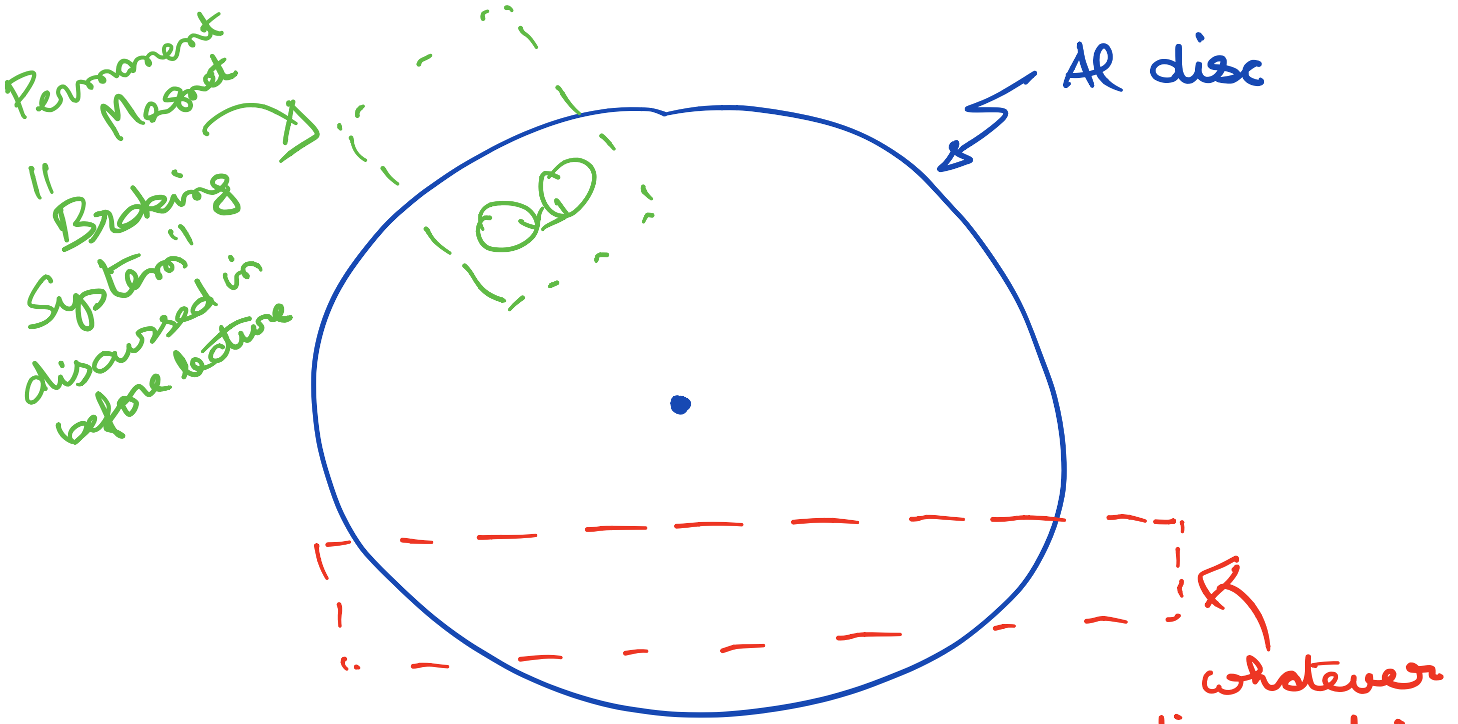
Generating torque

$$\dot{\omega} + b\omega = \tau \sim \quad \cos\theta$$

Actually, $\tau = K \, V \, I \cos\theta$

K → geometric factors

VI → Check appropriate V_s or V_L & I_s or I_L



Question: field is ⊥ to disc