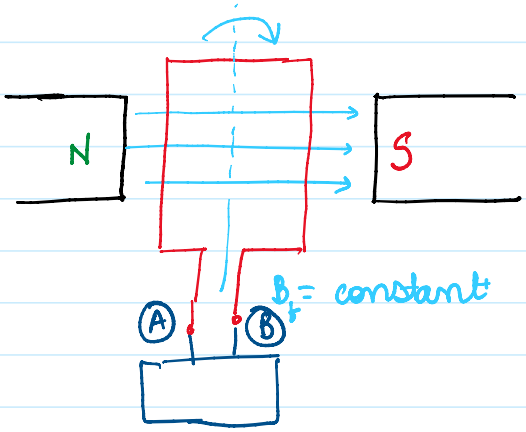
Lecture 02

19 February 2021 10:29

Basic ideas in physics class — Faraday's law

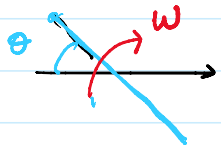


Effectively area of the coil changes as the coil is rotated

⇓

change in flux passing through the coil

$$\phi = B_f A$$
$$= B_f A \cos\theta$$



$$\theta = \omega t$$

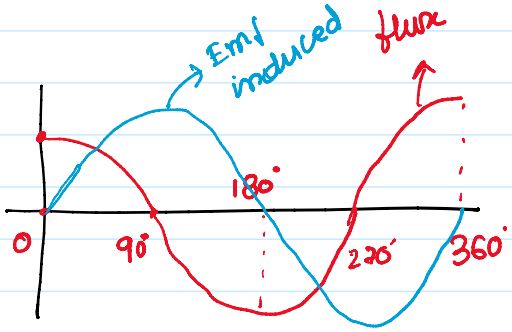
coil moved in a stationary magnetic field leads to a magnetic flux.

Faradays law of electromagnetic induction ⇒ whenever there is change is flux linking/associated with coil there will be emf induced

$$E = -\frac{d\phi}{dt}$$

$$E = -\frac{d}{dt}(B_f A \cos\theta)$$

$$E = -B_f A \frac{d}{dt}\cos\theta$$



$$= - B_f A \frac{d}{dt} (\cos \omega t)$$

$$E = - \omega B_f A (-\sin(\omega t))$$

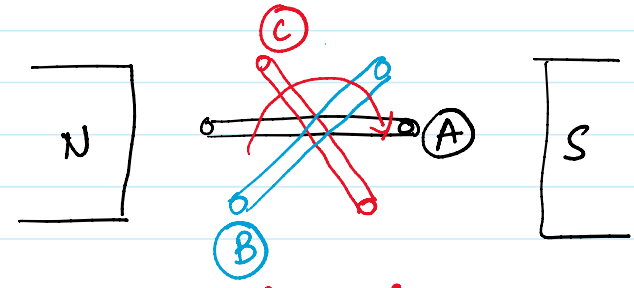
$$\boxed{E = \omega B_f A \sin \omega t}$$

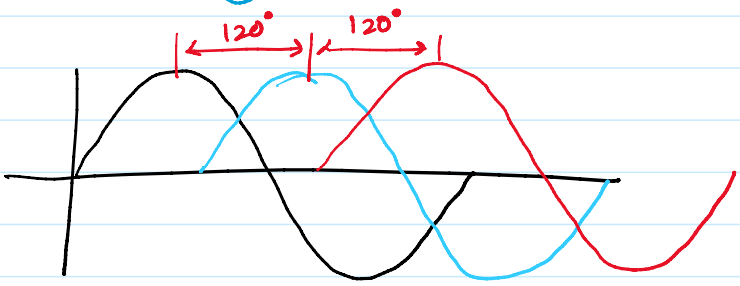
This coil has only one turn

$$\boxed{E = \omega N B_f A \sin \omega t}$$ — N turn coil

$\omega N B_f A$ ↓ constant = peak value

one coil → if we take 3 coils

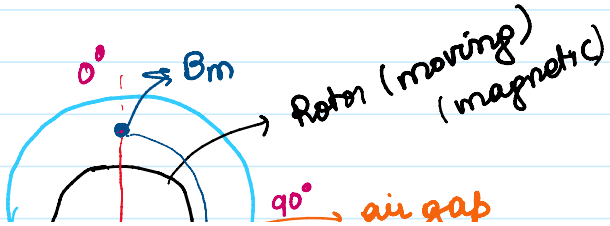


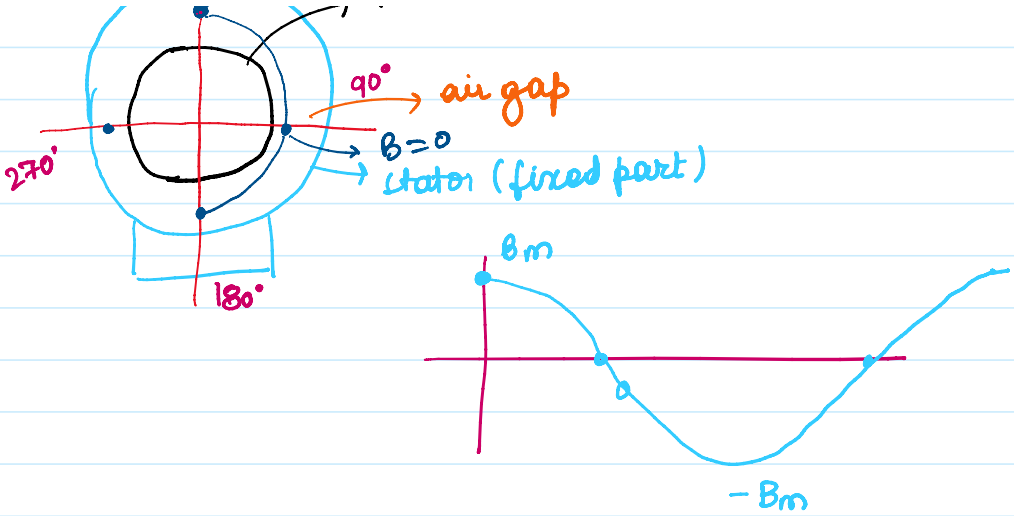


3 distinct coils and 3 distinct power supplies

Three phase system

we take this idea that three different coils in a magnetic field and magnetic field is stationary. ⇒ we will interchange the positions ⇒ make coils stationary and we will make the field move.




90°
air gap
B=0
stator (fixed part)
270°
180°
Bm
-Bm