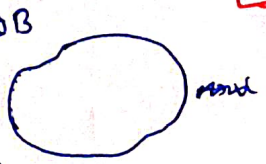
EMI - Super SN

① EMF of loop

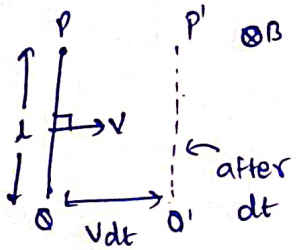
$$\mathcal{E} = \left|\frac{d\phi}{dt}\right|$$

EMF Induced.



② EMF of Motional conductor

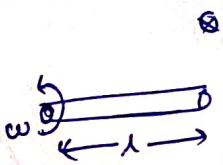
$$E = B_\perp l V_\perp = B_\perp l_\perp V$$



#Note: to check polarity of induced EMF, check dirⁿ of mag force.

Mag force dirⁿ = +ve

③ EMF of rotating rod.



$$E = \frac{B\omega l^2}{2}$$

FARADAYS LAW

$$\oint \vec{E}\cdot d\vec{l} = \frac{d\phi}{dt}$$

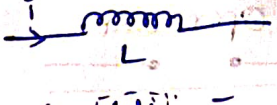
self ~~Inductance~~ Induction

$N\phi = Li$ → self Inductance. (unit: $\frac{Wb}{A}$ or Henry)

L depends on:
- Geometry ✓
- Medium ✓
- current ✗

$$E = \left|L\frac{di}{dt}\right|$$

Inductor



If $i\uparrow$ → then $\frac{di}{dt}$ = +ve

else: $\frac{di}{dt}$ = -ve. (OR/ELSE)

ENERGY:

$U = \frac{1}{2}Li^2$ → Energy in Inductor

Energy density = $\frac{dU}{dV} = \frac{B^2}{2\mu}$ → Energy Density.

COMbination

① series: $L_{eq} = L_1 + L_2$.

② parallel: $L_{eq} = \left(\frac{1}{L_1} + \frac{1}{L_2}\right)^{-1}$

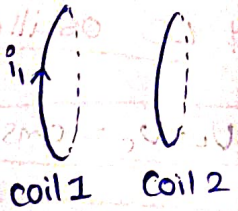
⇒ Ignore Mutual Inductance.

Mutual Induction

M = mutual inductance

$\phi = Mi$ (i in coil 1)

- ϕ: flux thru coil 2 due to coil 1
- M: Mutual Inductance
- i: coil 1



$M = k\sqrt{L_1 L_2}$

k: coupling factor ∈ [0,1]

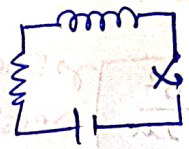
↳ depends on dist (I think)

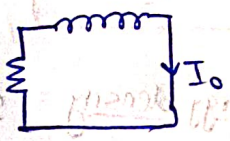
Indicates dirⁿ of NORTH

LR circuit:

State	Behaviour
Initial State	Open ckt
Steady State	Closed ckt

for Transient & Decay:



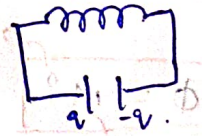


$$x(t) = Ie^{-t/\tau} + F(1-e^{-t/\tau})$$

I = Initial value.
F = Final value
X = Inductance (In this CH, tho it can also be used for Conductance, Current n more)

$$\tau = \frac{L}{R_{eq}}$$

LC oscillations:



① $V_L + V_C = \text{const}$

② $q = Q_0 \sin(\omega t + \phi) \rightarrow I_0 = \omega \cdot Q_0$

③ $\omega = \frac{1}{\sqrt{LC}} \rightarrow f = \frac{1}{2\pi\sqrt{LC}} \Big/ I_0 = \frac{Q_0}{\sqrt{LC}}$