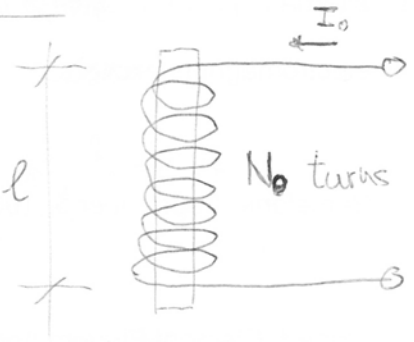
MULTIPLYING EFFECT OF ELECTROMAGNETIC INDUCTION

Magnetic field created by an electromagnet:

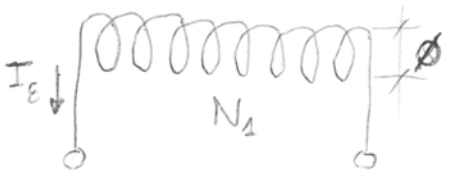
$$B = \frac{N_0 \cdot \mu \cdot I_0}{\ell} \qquad (1)$$



Induced current in a coil: (Faraday law)

(under a variable magnetic field)

$$\mathcal{E} = \Delta V_\varepsilon = R \cdot I_\varepsilon = -N_1 \cdot \frac{d\Phi_B}{dt} = -N_1 \cdot S \cdot \frac{dB}{dt} \qquad (2)$$



$$S = \frac{\pi}{4} \cdot \varnothing^2$$

Derivative of the magnetic field: (from eq. 1)

$$\frac{dB}{dt} = \frac{N_0 \cdot \mu}{\ell} \cdot \frac{dI_0}{dt}$$

Thus:

$$\Delta V_\varepsilon = R \cdot I_\varepsilon = -N_1 \cdot S \cdot \frac{N_0 \cdot \mu}{\ell} \cdot \frac{dB}{dt}$$

Induced current →

$$I_e = \frac{\mu \cdot S \cdot N_0 \cdot N_1}{\ell \cdot R} \cdot \frac{dI_0}{dt}$$

$\frac{dI_0}{dt}$: change in the primary current

Greater than 1 in some configurations →

- $\mu \uparrow$
- $dI_0/dt \uparrow$
- $N_0 \uparrow$
- $N_1 \uparrow$
- $S \uparrow$
- $\ell \downarrow$
- $R \downarrow$

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