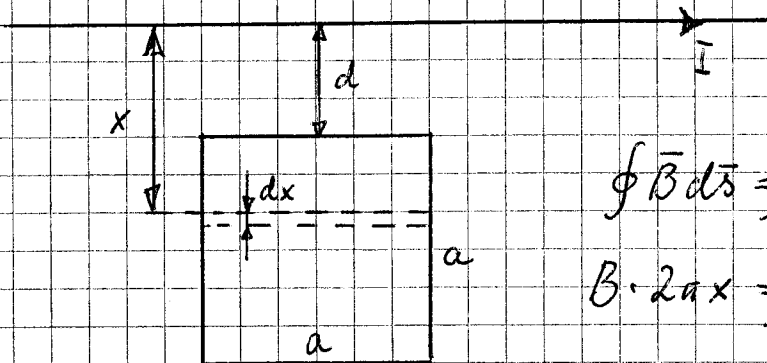


Fysikkoppgaven

a)



$$\oint \vec{B} \cdot d\vec{s} = \mu_0 I$$

$$B \cdot 2ax = \mu_0 I \Rightarrow B = \frac{\mu_0 I}{2\pi x}$$

$$\Phi = \int \vec{B} \cdot d\vec{A} = \int_d^{d+a} \frac{\mu_0 I}{2\pi x} a \, dx = \frac{\mu_0 I a}{2\pi} \ln\left(\frac{d+a}{d}\right) = \frac{\mu_0 I a}{2\pi} \ln\left(1 + \frac{a}{d}\right)$$

$$\text{Gjensidig induktans } M = \frac{\Phi}{I} = \frac{\mu_0 a}{2\pi} \ln\left(1 + \frac{a}{d}\right)$$

b) Målespole har  $N$  viklinger. Solenoide har  $n$  viklinger/m  
Feltet gjennom målespolen:

$$B = \mu_0 n I \quad (\text{men bare inne i solenoiden})$$

$$\begin{aligned} \text{Flux } \Phi_B &= N \int \vec{B} \cdot d\vec{A} = N \cdot B \cdot A_{\text{sol}} = N \mu_0 n I A_{\text{sol}} \\ &= N \mu_0 n A_{\text{sol}} I_0 \cos \omega t \end{aligned}$$

Elektromotorisk spenning

$$\mathcal{E} = - \frac{d\Phi_B}{dt} = - N \mu_0 n A_{\text{sol}} I_0 (-\sin \omega t) \cdot \omega$$

$$= \underline{N \mu_0 n A_{\text{sol}} I_0 \omega \sin \omega t}$$

$$= 10 \cdot 4\pi \cdot 10^{-7} \cdot 10^5 \cdot 10 \cdot 10^{-4} \cdot 10 \cdot 2\pi \cdot 50 \cdot \sin(2\pi \cdot 50 \cdot t) \text{ V}$$

$$= \underline{3.95 \sin(314 t) \text{ V}}$$

$$I = \frac{\mathcal{E}}{R} = \frac{3.95 \cdot \sin(314 t)}{5} \text{ A} = \underline{0.79 \sin(314 t) \text{ A}}$$