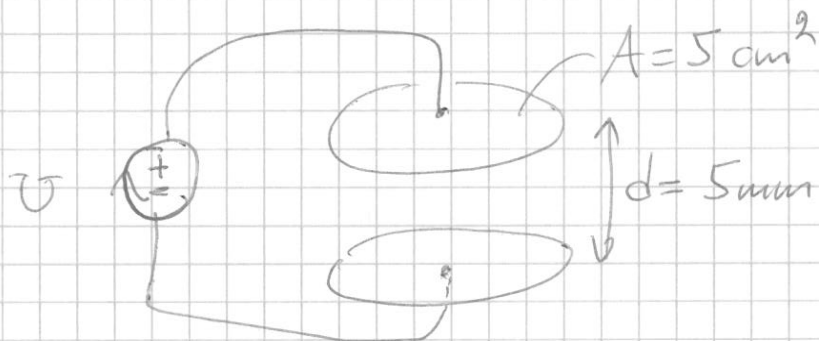


FM11



$$U = 40 \text{ volt}$$

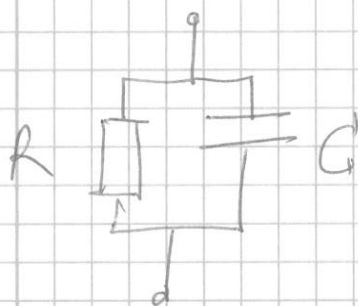
$$\omega = 2\pi \cdot 10^4 \text{ rad/s}$$

$$\epsilon_r = 2,25$$

$$\sigma = 10^{-6} \text{ siemens/meter}$$

$$\mu_r = 1$$

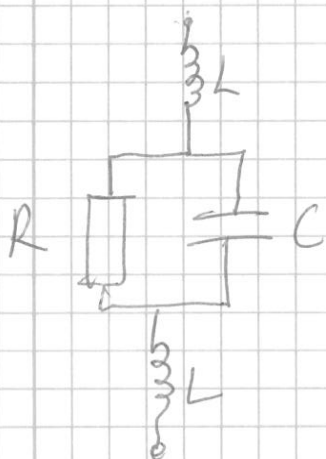
a) ekvivalent schema för kondensatorn:



$$R = \frac{d}{\sigma \cdot A} = 10^7 \Omega$$

$$C = \frac{\epsilon A}{d} \approx 1,992 \cdot 10^{-12} \text{ F}$$

Om induktans medtas:



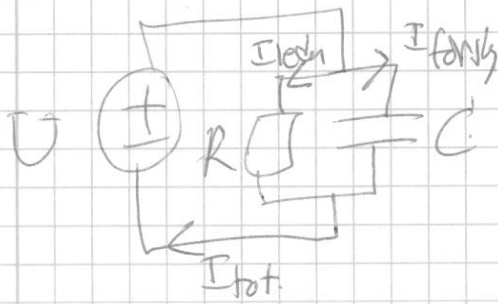
Låga ω : L "kortslutna"
 C "öppna"

$$Z \approx R$$

Höga ω : L "öppna"
 C "kortslutna"

$$Z \text{ hög}$$

b/



Tidsfunktioner: $i_{ledn} = \frac{u(t)}{R}$

$$i_{forsky.} = \epsilon A \left| \frac{\partial E}{\partial t} \right| = \frac{\epsilon A}{d} \frac{\partial u}{\partial t}$$

komplekse størrelser:

$$I_{ledn.} = \frac{U}{R} = 4 \cdot 10^{-6} \text{ ampere}$$

$$\begin{aligned} I_{forsky.} &= \epsilon A j\omega E = \frac{\epsilon A}{d} j\omega U \\ &= j\omega C \cdot U \approx j 5,006 \cdot 10^{-6} \text{ ampere} \end{aligned}$$

$$I_{tot} = I_{ledn} + I_{forsky.} = (4 + j5) \cdot 10^{-6} \approx 6,4 \cdot 10^{-6} \angle 51,3^\circ$$

$|I_{tot}| \approx 6,4 \cdot 10^{-6} \text{ ampere}$, forskyden $51,3^\circ$ relativt spændingen.

c) vid låga ω dominerar I_{ledn}
vid höga ω ——— $I_{förskj}$

$$|I_{ledn}| = |I_{förskj}| \Leftrightarrow \frac{U}{R} = \omega C U$$

$$\Rightarrow \omega = \frac{1}{RC} \approx 5,02 \cdot 10^4 \text{ rad/s}$$

motsvarar $f \approx 8000 \text{ Hz}$.

d) Uppladdning till 25 volt likspänn.

Tidskonstant för självurladdning:

$$\tau = RC = \frac{\epsilon}{\sigma} \approx 2 \cdot 10^{-5} \text{ s.}$$

EM12

$$\sigma = 10^{-6} \text{ siemens/meter}$$

$$RC = \frac{\epsilon}{\sigma} \Rightarrow R_{\text{lack}} = \frac{\epsilon}{C \cdot \sigma}$$

$$\text{uppg. EM6} \Rightarrow C \approx 4,86 \cdot 10^{-10} \text{ F} \Rightarrow R_{\text{lack}} \approx \underline{\underline{4,12 \cdot 10^4 \Omega}}$$

$$I_{\text{lack}} = \frac{U}{R_{\text{lack}}} \approx 9,715 \cdot 10^{-4} \text{ ampere}$$

Elw. schema:



Strömstäthet vid inreledarens yta:

$$|J_{\text{lack}}| = \frac{|I_{\text{lack}}|}{\text{mantelytans area}} = \frac{|I_{\text{lack}}|}{2\pi r_i \cdot l} \approx$$

$$\approx 7,62 \cdot 10^{-2} \text{ ampere/m}^2 \quad \text{från EM6}$$

$$\begin{aligned} \text{alt. lös n.} \quad |J_{\text{lack}}| &= \sigma E_{\text{vid } r=r_i} = 10^{-6} \cdot 7,62 \cdot 10^4 \\ &= 7,62 \cdot 10^{-2} \text{ A/m}^2 \end{aligned}$$