SEE035 19/8 2021 (Svar/kortlösn.)

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(1) a) $R_L = |Z_c| = \sqrt{(10 \cdot M)^2 + \left(\frac{D-15{,}5}{1000}\right)^2}$

b & c) se kurslitt.

d) Magnetflödet = noll

El. flödet = $Q_{tot} = -2\,nC$ ut i omvärlden, då negativt.

Effektflödet = noll
(ingen nettotransport av energi här)

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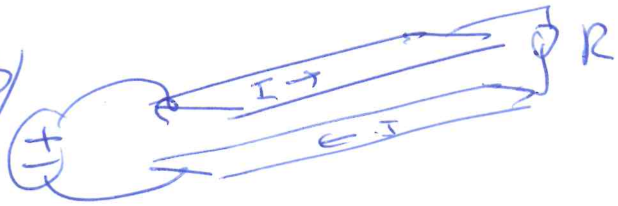
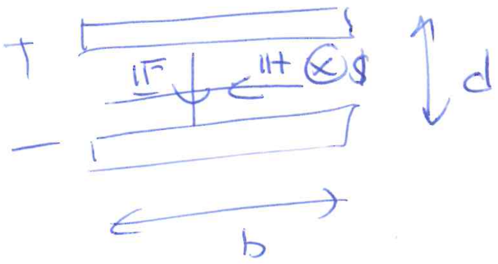
(2) a) $E = \frac{U}{d} = 5000\ V/m$, $B = \frac{\mu I}{b} \approx 1{,}26\ \mu T$

$I = \frac{U}{R}$

b)

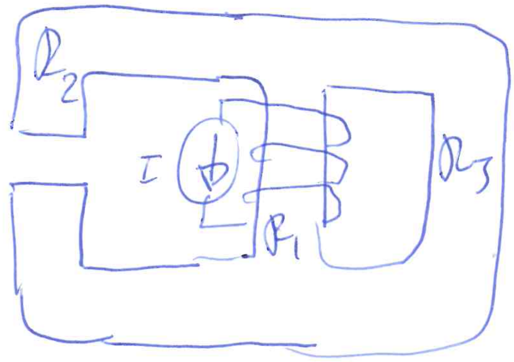


vy in i ingången:



c) $E \approx 0$ utanför plattorna (lika stora men motriktad

③ a)



b) $N \cdot I = R_{tot} \cdot \Phi_1$

↑ flödet genom lindning & R_1

$$R_{tot} = R_1 + \frac{R_2 R_3}{R_2 + R_3} \approx 3{,}727 \cdot 10^5 \text{ 1/H}$$

$$\Rightarrow \Phi_1 \approx 1{,}34 \cdot 10^{-4} \text{ Wb} \Rightarrow H_1 = \frac{B_1}{\mu} = \frac{\Phi_1 / A}{\mu} \approx 214 \text{ A/m}$$

$\mu = 1000 \cdot \mu_0$

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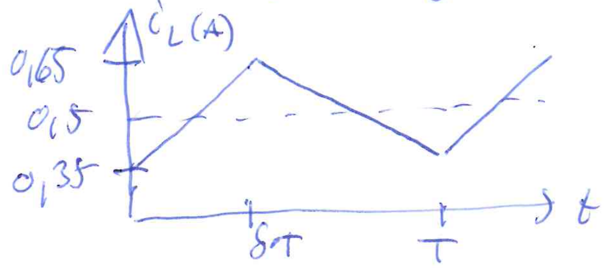
④ $U_{IN} = 9V$, $U_{UT} = 15V$ } ⇒ step-up omvandlare

a)

$$\frac{U_{UT}}{U_{IN}} = \frac{1}{1-\delta} \Rightarrow \delta = 0{,}4 \quad , T = \frac{1}{f_{sw}} = 2 \cdot 10^{-5} s$$

$$|\Delta i_L| = \frac{\delta \cdot T \cdot U_{IN}}{L} \Rightarrow L \approx 240 \, \mu H$$

b) $i_{L,medel} = \frac{I_{UT}}{1-\delta} = \frac{U_{UT}/R}{1-\delta} = 0{,}5 A$



(5) a) $|A_u| = g_m \cdot R_D = K \cdot (U_{GSQ} - U_T) \cdot R_D \Rightarrow U_{GSQ} \simeq 4{,}08\ V$

$\uparrow$

$10^{24/20} \simeq 15{,}85$

$$U_{GSQ} = \frac{R_2}{R_1 + R_2} \cdot V_{DD} \Rightarrow R_1 \simeq \underline{\underline{220\ k\Omega}}$$

b) $R_{ut} = R_D = \underline{\underline{270\ \Omega}}$

c) $i_D = I_{DQ} + i_d$

$\uparrow$ vilopunkten $\uparrow$ småsignalströmmen

$$I_{DQ} = \frac{k}{2}(U_{GSQ} - U_T)^2 \simeq 28{,}7\ mA \simeq 29\ mA$$

$$\hat{i}_d \approx \frac{\hat{u}_{ut}}{R_D} \simeq 5{,}9\ mA \simeq 6\ mA$$

∴ cosinusformad variation med amplitude 6 mA, kring ett medelvärde på ≃ 29 mA.

RITA GRAF...

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(6) a) $$\omega_r = \frac{1}{\sqrt{L C_{tot}}} \Rightarrow C_{tot} = \frac{1}{(2\pi f_r)^2 L}$$

$$C_{tot} = C_i + C \Rightarrow C_i = -C + C_{tot} = \begin{cases} 4\ nF & \text{fall 1} \\ 10\ nF & \text{fall 2} \end{cases}$$

b) resonans ⇒ källan "ser" enbart R & R_{last}

$R = R_{last}$ ⇒ delar spänningen, hälften var.

$$\Rightarrow \quad P_{last} = \frac{1}{2} \frac{(U_{källa}/2)^2}{R_{last}} = \underline{\underline{20 \text{ mW}}}$$

c) $u_L = L \frac{di}{dt} \Rightarrow U_L = j\omega L \cdot I$

resonans : $I = \frac{U_{källa}}{R + R_{last}} = 0{,}02 \text{ A}$

$\Rightarrow U_L = j\, 2\pi f \cdot 4{,}7 \cdot 10^{-3} \cdot 0{,}02$ (komplexa spänn)

$\Rightarrow$ amplituden är $2\pi f \cdot 4{,}7 \cdot 10^{-3} \cdot 0{,}02 = \begin{cases} 17{,}7 \text{ V} & \text{fall 1} \\ 11{,}8 \text{ V} & \text{fall 2} \end{cases}$