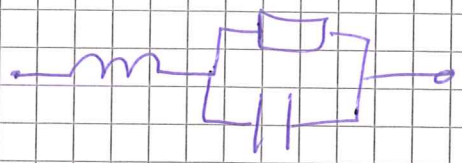
LEU460, 29/10-2014 | Svar/kortfattade lösn.

① a) $R = |R_0 + j\omega L| \simeq 39{,}7\ \Omega \simeq \underline{\underline{40\ \Omega}}$

b) $Q_{\text{vid resonans}} = \dfrac{\omega_0 \cdot L}{R} \simeq \underline{\underline{9{,}6}}$

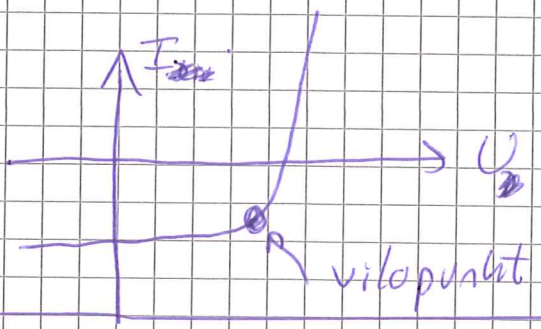
$\omega_0 = \dfrac{1}{\sqrt{LC}}$

c)



(se elektronikbok / anteckningar)

d)



(se anteckningar)

vilopunkt för max. uteffekt

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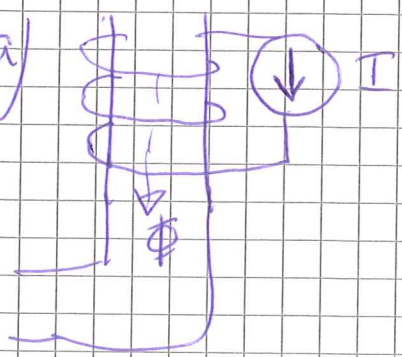
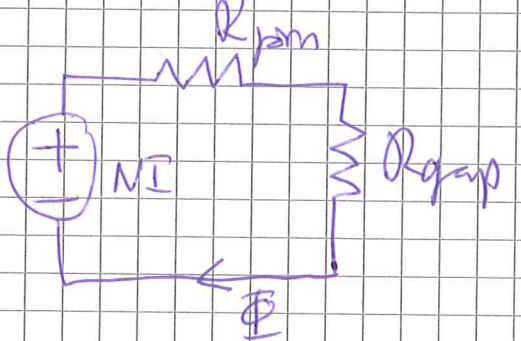
② a)



b)



$NI = (R_{järn} + R_{gap}) \cdot \Phi = \ldots =$

$= \left(l_{gap} + \dfrac{45 - l_{gap}}{\mu_{r,järn}} \right) \dfrac{B}{\mu_0}$

där s = sidlängden hos järnkärnan $= 0{,}1$ m

l_{gap} = gapets vidd

$$\Rightarrow l_{gap} \approx 2{,}12 \cdot 10^{-3} \text{ m} \approx \underline{\underline{2{,}1 \text{ mm}}}$$

---

(3) $\left|\frac{dU_2}{dt}\right| \leq$ slew rate, $U_2 = U_1 \Rightarrow \left|\frac{dU_1}{dt}\right| \leq$ slew rate

Ur graf: $\left|\frac{dU_1}{dt}\right| = \frac{2\hat{U}_1}{10^{-6}} \Rightarrow \hat{U}_1 \leq \underline{\underline{2{,}5 \text{ V}}}$

---

(4) step-down omvandlare $\Rightarrow \delta = \frac{U_{UT}}{U_{IN}} = \frac{1}{3}$

$\underline{U_L = ?}$

TILL-läge: $U_{IN} - U_L - U_{UT} = 0 \Rightarrow U_L = 12 \text{ V}$

FRÅN-läge: $-U_L - U_{UT} = 0 \Rightarrow U_L = -6 \text{ V}$

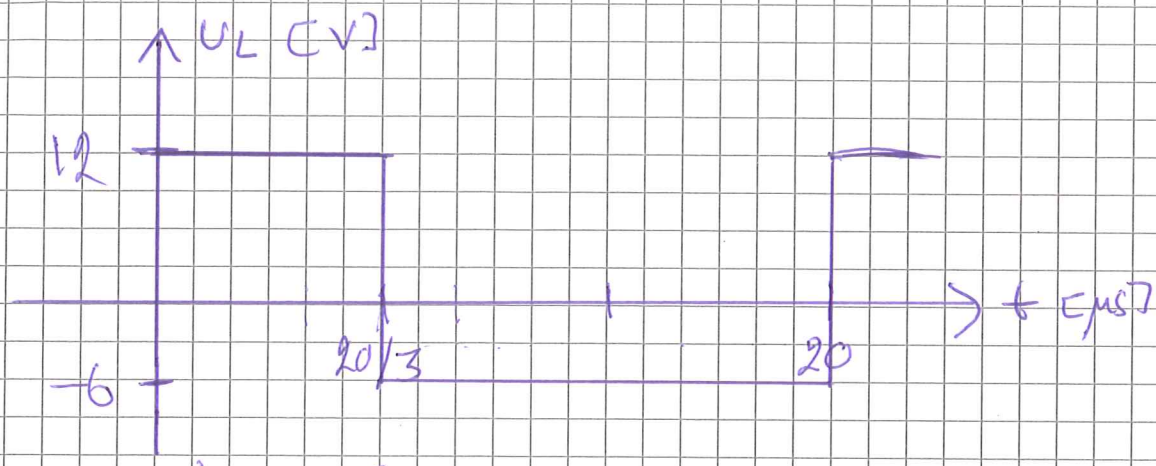
$\underline{\Delta i_L = ?}$

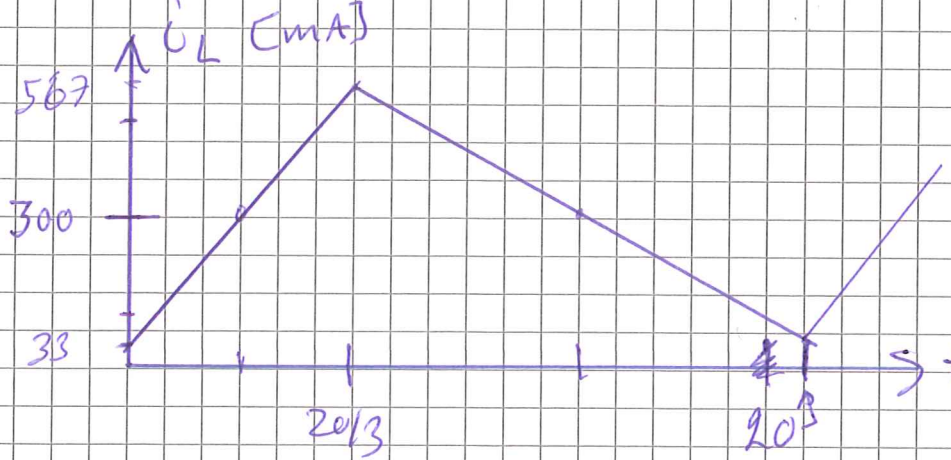
tex. TILL-läge $\Rightarrow U_L = L\frac{di}{dt}$ ger $\Delta i_L = \frac{U_L \cdot \Delta t}{L} \approx 0{,}533 \text{ A}$

$$\Delta t = \delta \cdot T = \delta \cdot \frac{1}{f_{switch}}$$

$\therefore$ U_L varierar mellan DC-nivåerna $+12$ V & -6 V

i_L —"— linjärt kring $i_{L,medel}$ med $\pm \frac{\Delta i_L}{2}$





min i_L = 33 mA

max i_L = 567 mA

---

(5) a) Ur graf: $U_{DSQ} = U_{DS,medel} = \underline{5\ V}$

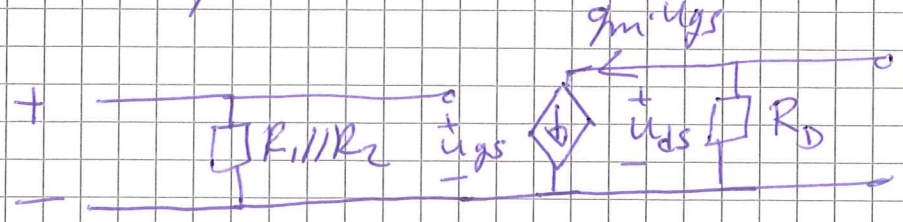
$V_{DD} - U_{DSQ} - R_D I_{DSQ} = 0 \Rightarrow I_{DSQ} = \frac{5}{82} \simeq 0{,}061\ A$

$= \underline{61\ mA}$

$U_{GSQ} = \frac{R_2}{R_1 + R_2} \cdot V_{DD} \simeq 2{,}8421 \simeq \underline{2{,}84\ V}$

b) Ur graf: $u_{DS} = U_{DSQ} + u_{ds} \Rightarrow \hat{u}_{ds} = 0{,}4\ V$

Småsignalschema:



$\Rightarrow u_{ut} = u_{ds}$

$\Rightarrow \quad \hat{u}_{ut} = \hat{u}_{ds} = 0{,}4\ V$

$\hat{u}_{ut} = |A_u| \cdot \hat{u}_{in} \Rightarrow |A_u| = \frac{0{,}4}{0{,}02} = 20$

Men $|A_u| = g_m \cdot R_D \Rightarrow g_m \approx 0{,}2439$

$$g_m = \left.\frac{dI_D}{dU_{GS}}\right|_{vilopunkt} = k \cdot (U_{GSQ} - U_T) = \sqrt{2k I_{DSQ}}$$

$$\Rightarrow k = \frac{g_m^2}{2 I_{DQ}} \approx 0{,}4878\ A/V^2 = \underline{\underline{490\ mA/V^2}}$$

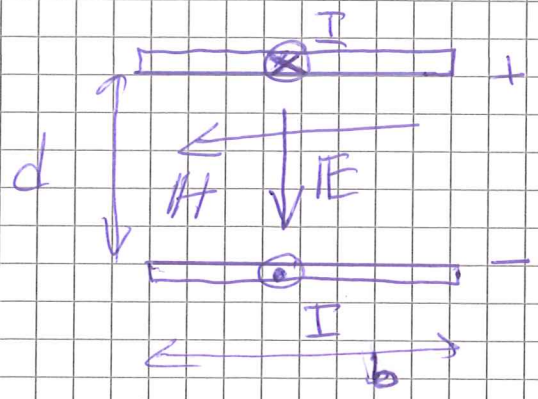
$$U_T \approx 2{,}342 = \underline{\underline{2{,}34\ V}}$$

c) R_L ändlig $\Rightarrow |A_u| = g_m \cdot \frac{R_D \cdot R_L}{R_D + R_L}$

$R_L = R_D \Rightarrow |A_u|$ halveras $\Rightarrow \hat{u}_{ut} = \underline{\underline{0{,}2\ V}}$

d) Se lab. 2. !

6) a)



vy är i plattledn.

$|E| = \frac{U}{d} = 3300$ V/m, $|H| = \frac{I}{b} = 2$ A/m

$|S| = |E||H| = \underline{\underline{6600}}$ W/m² (i området mellan ledarna)

↑

$E \perp H$

Riktn. för S: $\times$ (ty $E \times H$)

b) $|S| \approx 0$ utom för plattledn.

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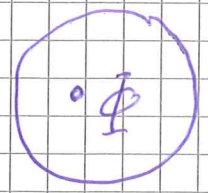
7) a)



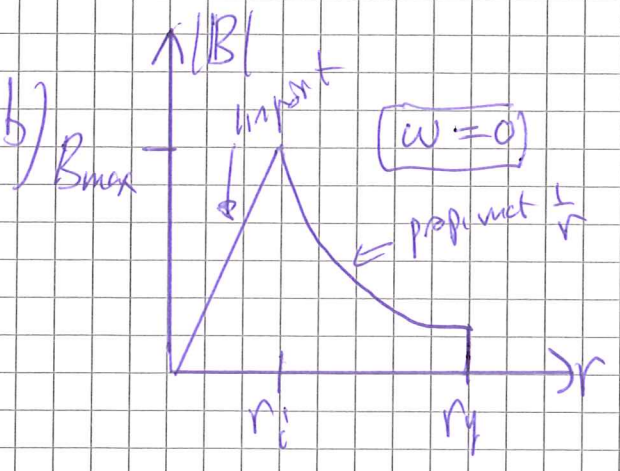
Φ ökar $\Rightarrow \Delta\Phi$ ⊙ $\Rightarrow -\Delta\Phi$ ⊗ $\Rightarrow i_{ind}$ ↻

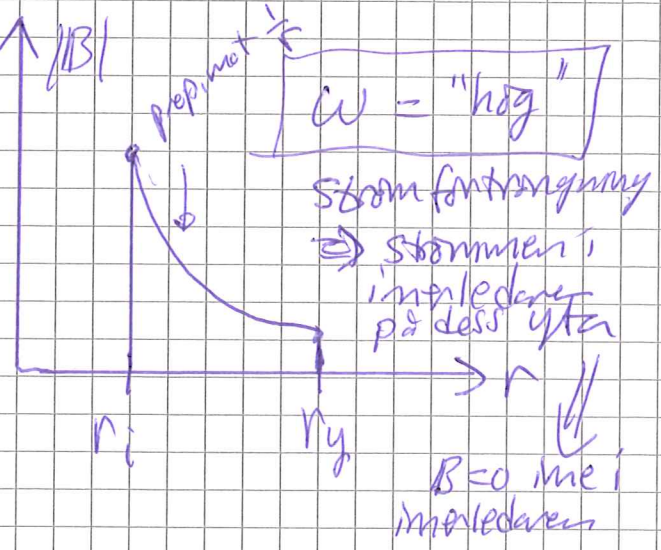
$i_{ind} = \frac{U_{ind}}{R} = \frac{N}{R}\frac{d\Phi}{dt} = \underline{\underline{0,05}}$ A

cirkulationsriktningen $\Rightarrow |E|$ runt omkretsen $= U_{ind} \Rightarrow |E| = 0,8$ V/m

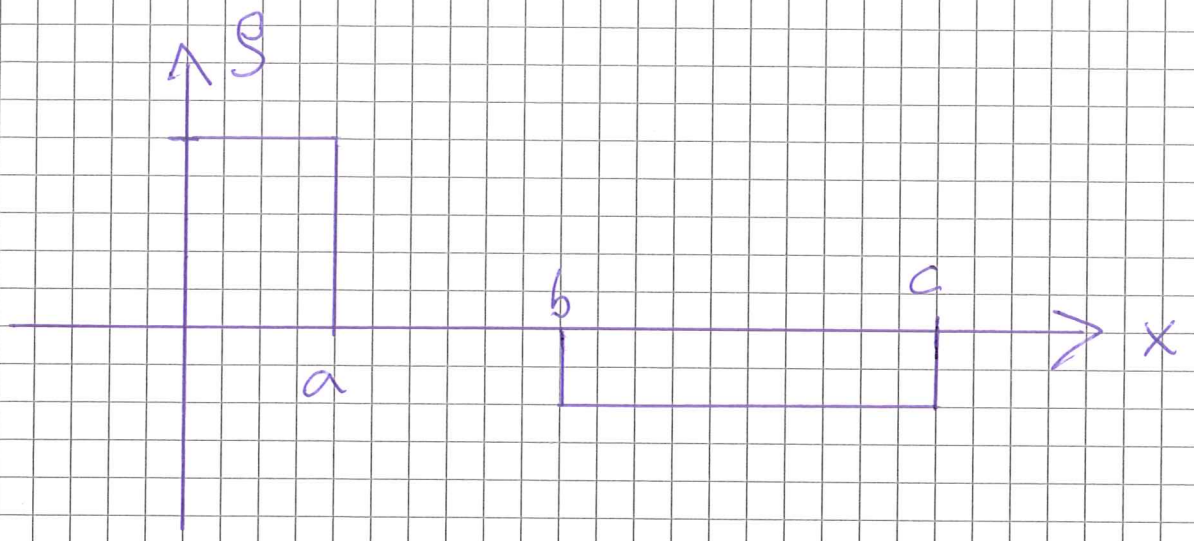
E samriktad med i_{ind}.

b)





(8)

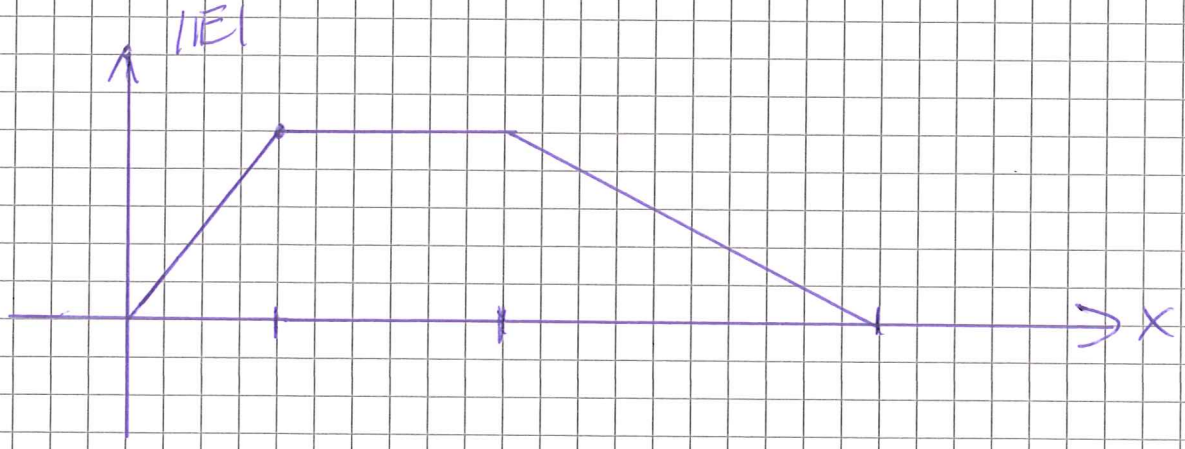


Placera en "Gausslåda" med ena sidan vid $x=0$ och den andra "utdragbar" längs x-axeln

$\Rightarrow$ $0 \leq x \leq a$: Q innesluten ökar linjärt med $x \Rightarrow |E|$ ökar

$a < x < b$: —"— ändras inte $\Rightarrow |E| =$ konstant

$b \leq x \leq c$: —"— minskar linjärt med $x \Rightarrow |E|$ avtar



Riktn. för E : $\rightarrow$ (by positiv laddn. $0<x<a$
neg. —"— $b<x<c$)

b) V ökar vid förflyttning motsatt E $\Rightarrow$

V (Potentialen) V_{max} inträffar vid $x=0$.