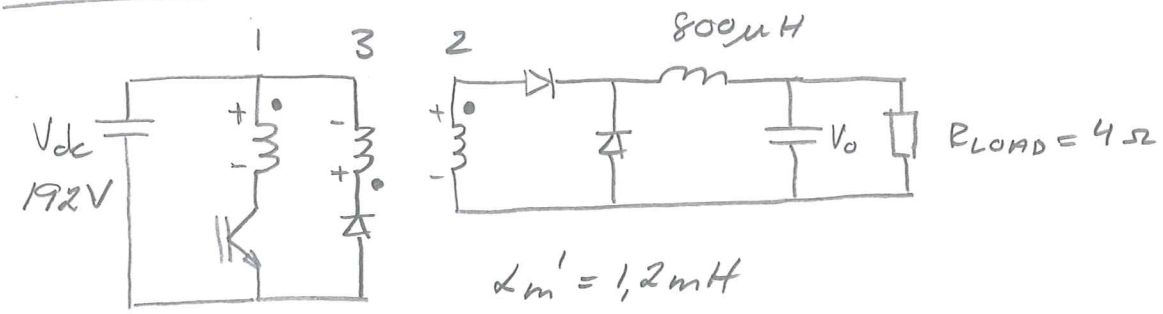
BWW Ex17.9 **Forwardomvandlare**



i) δ_{max} ?

I en forwardomvandlare är avmagnetiseringen begränsande, dvs trafon måste hinna avmagnetiseras innan nästa period.

$T = TILL$: $V_{dc} - L_m' \frac{\Delta i_m'}{\Delta t} = 0$

$T = FRÅN$: $V_{dc} + L_m''' \frac{\Delta i_m'''}{\Delta t} = 0 \Rightarrow V_{dc} + L_m' \left(\frac{N_3}{N_1}\right)^2 \frac{\Delta i_m' \left(\frac{N_1}{N_3}\right)}{\Delta t} = 0$

$$V_{dc} + L_m' \left(\frac{N_3}{N_1}\right) \frac{\Delta i_m'}{\Delta t} = 0$$

LIKHET: $\frac{V_{dc}}{L_m'} \cdot \delta_T \cdot T = \frac{V_{dc}}{L_m'} \left(\frac{N_1}{N_3}\right)(1-\delta) \cdot T$

$$\delta\left(1 + \frac{N_1}{N_3}\right) = \frac{N_1}{N_3} \Rightarrow \delta_{max} = \frac{N_1/N_3}{1 + N_1/N_3} = \frac{1}{\frac{N_3}{N_1} + 1} = \frac{1}{3+1} = \underline{0{,}25}$$

ii) $T = TILL$ $V_2 = \frac{N_2}{N_1} \cdot V_1 = 2\,V_{dc} = 2 \cdot 192 = 384\,V$

$T = FRÅN$ $V_2 = 0$ $\Rightarrow$

$V_o = \delta \cdot V_2 (T = TILL) = 0{,}25 \cdot 384 = 96\,V$

$\bar{I}_o = \frac{V_o}{R_{LOAD}} = \frac{96}{4} = 24\,A$

$P_{in} = P_{ut} \Rightarrow$

$\bar{I}_{in,LOAD} = \frac{V_o}{V_{dc}} \cdot \bar{I}_o = \frac{96}{192} \cdot 24 = 12\,A$

17.9

Magnetiseringsström:

$$\Delta i_m' = \frac{V_{dc}}{L_m'} \cdot t_T = \frac{192}{1{,}2\,mH} \cdot 0{,}25 \cdot 100\,\mu s = 4A$$

$$\bar{I}_{in} = \bar{I}_{in,LOAD} + \underbrace{\frac{\Delta i_m'}{2} \cdot \delta}_{\text{medel magnetiseringsström}} = 12 + \frac{4}{2} \cdot 0{,}25 = 12{,}5A$$

iii)

$$V_2 - L\frac{di_L}{dt} - V_0 = 0 \Rightarrow \Delta i_L = \frac{V_2 - V_0}{L} \cdot t_T =$$

$$= \frac{384 - 96}{800 \cdot 10^{-6}} \cdot 25 \cdot 10^{-6} = 9A$$

För sekundärströmmen gäller

$$\bar{i}_L = \bar{I}_0 = 24A$$

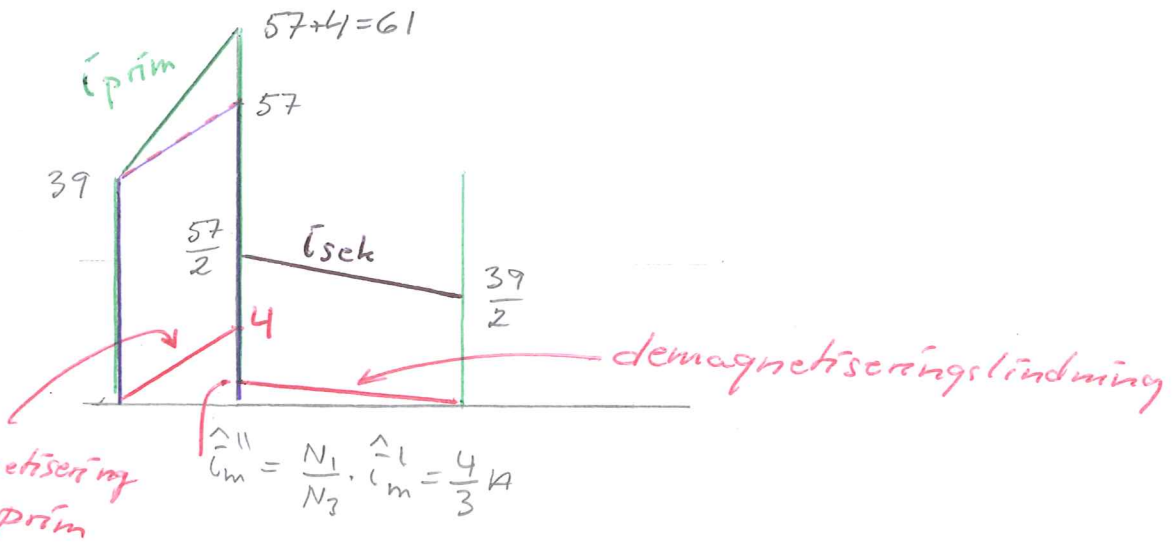
$$\hat{i}_L = \bar{i}_L + \frac{\Delta i_L}{2} = 24 + \frac{9}{2} = 28{,}5A$$

$$\check{i}_L = \bar{i}_L - \frac{\Delta i_L}{2} = 24 - \frac{9}{2} = 19{,}5$$

Omräknat till primärsidan

$$\hat{i}_L' = \hat{i}_L \frac{N_2}{N_1} = 28{,}5 \cdot 2 = 57A$$

$$\check{i}_L' = \check{i}_L \frac{N_2}{N_1} = 19{,}5 \cdot 2 = 39A$$



17.9

(c) $R_{crit} = ?$

T = TILL: $V_2 - L\frac{di_L}{dt} - V_0 = 0$

$$\Delta i_L = \frac{V_2 - V_0}{L} t_T$$

Gräns CCM/DCM:

$$\bar{I}_0 = \frac{\Delta i_L}{2} \Rightarrow \Delta i_L = 2\bar{I}_0$$

$$\frac{V_2 - V_0}{L} t_T = 2\bar{I}_0 = 2\frac{V_0}{R}$$

$$\frac{R}{L}(V_2 - V_0) t_T = 2V_0$$

$$R = \frac{V_0}{V_2 - V_0}\frac{2L}{t_T} = \{V_2 = 2 \cdot V_{dc}\} = \frac{96}{2 \cdot 192 - 96}\frac{2 \cdot 800 \cdot 10^{-6}}{25 \cdot 10^{-6}} =$$

$$= 21{,}3\,\Omega$$

$$L = \frac{V_2 - V_0}{V_0}\frac{R}{2} \cdot t_T = \{V_2 = 2 \cdot V_{dc}\} =$$

$$= \frac{384 - 96}{96}\frac{4}{2} \cdot 25 \cdot 10^{-6} = 150\,\mu H$$