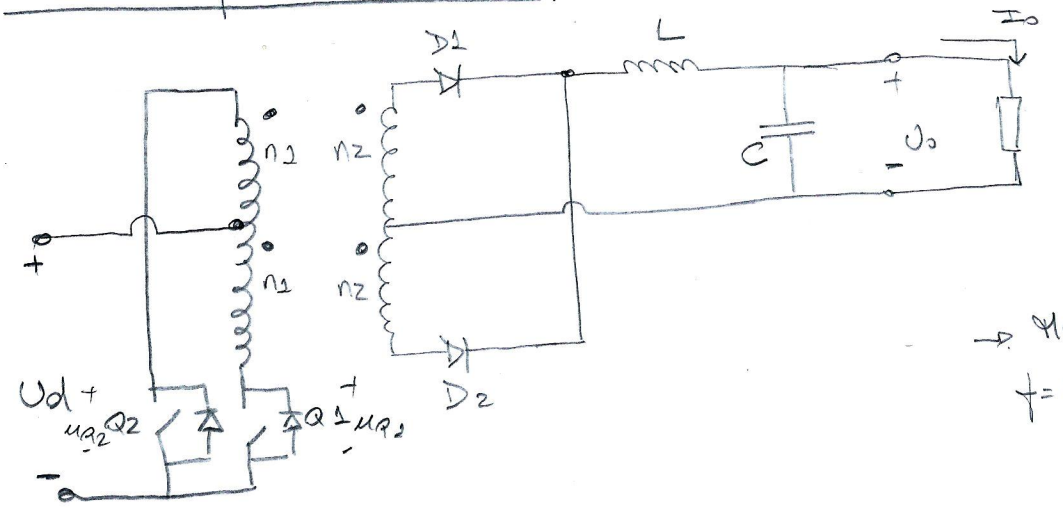
Solución problema 1



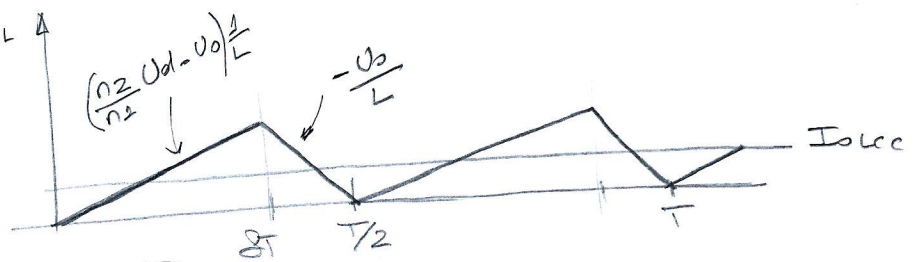
$I_{omáx} = 20A$.
$V_o = 65V$.
$V_{dmín} = 42V$.
$L = 150\mu H$
$\Delta V_o \leq 1\% V_o$
→ MCC ↔ $I_o \geq 2A$.
$f = 20kHz$
$\delta_{máx} = 0,45$

a) $\frac{n_1}{n_2}$ en MCC: $\frac{V_o}{V_d} = \frac{2n_2}{n_1} \cdot \delta$

⇒ para utilizar δ máximo: $\delta_{máx} \rightarrow V_d = V_{dmín}$.

$$\Rightarrow \frac{n_1}{n_2} = \frac{2\,\delta_{máx}\,V_{dmín}}{V_o} = \frac{2 \cdot 0,45 \cdot 42}{65} \Rightarrow \boxed{\frac{n_1}{n_2} = 0,582}$$

b)



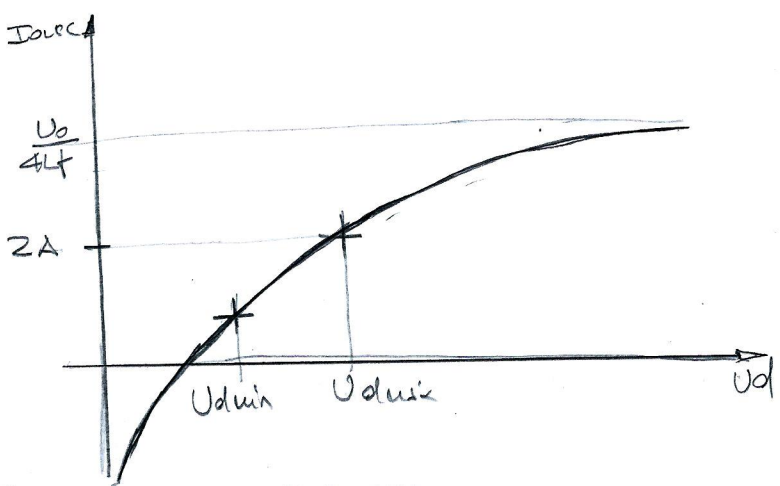
$$I_{o_{Lcc}} = \frac{2}{T}\int_0^{T/2} i_L(t)\,dt = \frac{2}{T} \cdot \frac{1}{2} \cdot \left(\frac{n_2}{n_1}V_d - V_o\right)\frac{\delta T}{L} \cdot \frac{T}{2}$$

$$I_{o_{Lcc}} = \left(\frac{n_2}{n_1}V_d - V_o\right)\frac{\delta T}{2L}$$

A saber, ya: $\frac{V_o}{V_d} = \frac{2n_2}{n_1} \cdot \delta \Rightarrow \delta = \frac{n_1}{2n_2}\frac{V_o}{V_d}$

$$\Rightarrow I_{o_{Lcc}} = \left(\frac{n_2}{n_1}V_d - V_o\right) \cdot \frac{n_1}{2n_2}\frac{V_o}{V_d}\frac{1}{2Lf} = \left(V_o - \frac{n_1}{n_2}\frac{V_o^2}{V_d}\right)\frac{1}{4Lf}$$

$$I_{o_{Lcc}} = \left(V_o - \frac{n_1}{n_2}\frac{V_o^2}{V_d}\right) \cdot \frac{1}{4Lf}$$



Solución problema 1 (cont.)

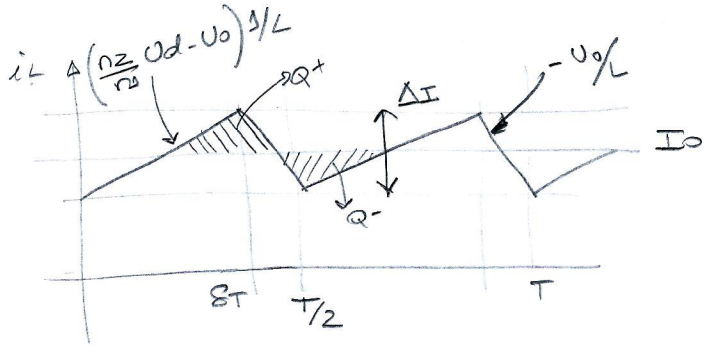
$$I_{OLCC} = \left(U_O - \frac{n_1}{n_2}\frac{U_O^2}{U_{dmáx}}\right)\cdot\frac{1}{4Lf} = 2A$$

$$U_O - \frac{n_1}{n_2}\frac{U_O^2}{U_{dmáx}} = 8Lf \rightarrow \frac{n_2}{n_1}\frac{U_{dmáx}}{U_O^2} = \frac{1}{U_O - 8Lf}$$

$$U_{dmáx} = \frac{n_1}{n_2}\cdot\frac{U_O^2}{U_O - 8Lf} = \frac{0{,}582\cdot 65^2}{65 - 8\cdot 150\times10^{-6}\cdot 20\times10^3}$$

$$\boxed{U_{dmáx} \cong 60V}$$

c) $\Delta U_O \leq 0{,}01\cdot U_O = 0{,}65V$



$$\Delta U_O = \frac{Q^+}{C} = \frac{Q^-}{C}$$

$$Q^+ = \frac{1}{2}\cdot\frac{T}{4}\cdot\frac{\Delta I}{2} = \frac{\Delta I}{16\cdot f}$$

$$\Delta I = \frac{U_O}{L}\left(\frac{T}{2} - \delta T\right)$$

$\Delta I_{máx} \rightarrow \delta = \delta_{mín}$: $\delta_{mín} = \frac{1}{2}\frac{n_1}{n_2}\cdot\frac{U_O}{U_{dmáx}} = \frac{0{,}582\cdot 65}{2\cdot 60} = 0{,}315$

$$\Delta I_{máx} = \frac{65\,(0{,}5 - 0{,}315)}{150\times10^{-6}\cdot 20\times10^3} \Rightarrow \Delta I_{máx} = 4A$$

$$C = \frac{\Delta I}{16\cdot f\cdot\Delta U_O} = \frac{4}{16\cdot 20\times10^3\cdot 0{,}65} \Rightarrow \boxed{C = 19\mu F}$$

de la tabla: $C = 22\mu F$ $ESR = 1{,}222\Omega \Rightarrow \Delta U_O \cong ESR\cdot\Delta I \cong 5V$ X

$\Rightarrow ESR \leq \frac{\Delta U_O}{\Delta I} = \frac{0{,}65}{4} = 0{,}163\Omega \Rightarrow$ podría poner uno de $\boxed{C = 220\mu F}$

$ESR = 0{,}099\Omega$

$I_o = 20A$

$V_d = 48V \Rightarrow \delta = \frac{0,582 \cdot 65}{2.48} = 0,394$

$\Delta I = \frac{65\,(0,5 - 0,394)}{150\times10^{-6} \cdot 20\times10^{3}} = 2,3A$

$\Rightarrow i_{Lmáx} = I_o + \frac{\Delta I}{2} = 21,15A$

$i_{Lmín} = I_o - \frac{\Delta I}{2} = 18,85A$

$i_{Qmáx} = \frac{n_2}{n_1} i_{Lmáx} = 36,3A.$

$i_{Qmín} = \frac{n_2}{n_1} i_{Lmín} = 32,4A.$