TE-20150903

① $V_o = \overline{|V_s|} - 2 \cdot 1{,}5 - 1$ [V]

$V_{seff} = \frac{N_s}{N_p} \cdot 400$ ← V_{peff}

$$\overline{|V_s|} = \frac{1}{T/2}\int_0^{T/2} v_s(t)\,dt = \frac{2}{T}\int_0^{T/2} V_{sm}\sin\omega t\,dt = \frac{V_{seff}\cdot\sqrt{2}\cdot 2}{\pi}$$

$$V_o = \frac{V_{seff}\sqrt{2}\cdot 2}{\pi} - 4\,; \qquad V_{seff} = (V_o + 4)\frac{\pi}{2\sqrt{2}}\,;$$

$$V_{seffmin} = (V_{omax} + 4)\frac{\pi}{2\sqrt{2}} = (9+4)\cdot\frac{\pi}{2\sqrt{2}} = \underline{14{,}44\ V}$$

$$N_{smin} = V_{seffmin}\cdot\frac{N_p}{400} = 14{,}44\cdot\frac{150}{400} = 5{,}4 \approx \underline{6}$$

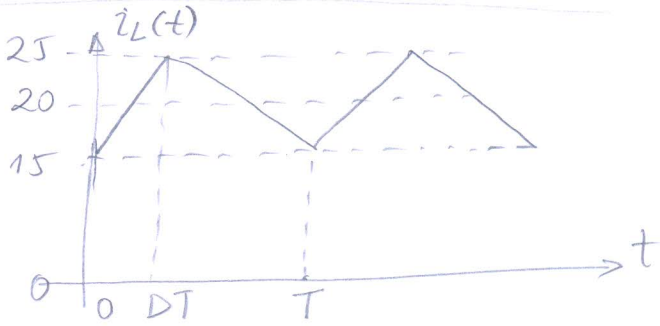
② $D = \frac{V_{out}}{V_{in}} = \frac{15}{50} = 0{,}3 = 30\%$.

$$\Delta I_L = \frac{V_{out}\cdot D}{f\cdot L} \Rightarrow L = \frac{V_{out}\cdot(1-D)}{f\cdot\Delta I_L} = \frac{15\cdot 0{,}7}{70\cdot 10^3\cdot 10} = \underline{15\,\mu H}$$

$$f_r = \frac{1}{2\pi\sqrt{LC}} \Rightarrow C = \frac{1}{4\pi^2 f_r^2\cdot L} = \frac{1}{4\pi^2\cdot(1{,}5\cdot 10^3)^2\cdot 15\cdot 10^{-6}} = \underline{750\,\mu F}$$

③ $P_D = (1-D)\,V_D\cdot I_o$

$P_D = 0{,}7\cdot 0{,}8\cdot 20 = \underline{11{,}2\ W}$



$$P_Q = \frac{1}{T}\int_0^{DT}\left(15 + \frac{10}{DT}t\right)^2 R_{DSon}\,dt$$

$$P_Q = \frac{1}{T}\int_0^{DT}\left(15^2 + \frac{300}{DT}t + \frac{100}{D^2T^2}t^2\right)R_{DSon}\,dt.$$

$$P_Q = \frac{R_{DSon}}{T}\left[15^2\cdot DT + \frac{300}{DT}\cdot\frac{(DT)^2}{2} + \frac{100}{D^2T^2}\cdot\frac{(DT)^3}{3}\right]$$

$$P_Q = 70\cdot 10^3\cdot 6\cdot 10^{-3}\left[15^2\cdot 0{,}3\,\frac{1}{70\cdot 10^3} + \frac{300\cdot 0{,}3}{2\cdot 70\cdot 10^3} + \frac{100}{3}\cdot\frac{0{,}3}{70\cdot 10^3}\right]$$

$$P_Q = 420\left[964\cdot 10^{-6} + 643\cdot 10^{-6} + 143\cdot 10^{-6}\right]$$

$$P_Q = \underline{0{,}735\ W}$$