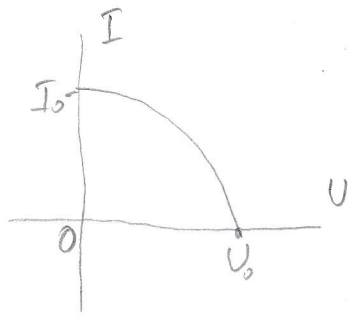
TE-20190123

① 

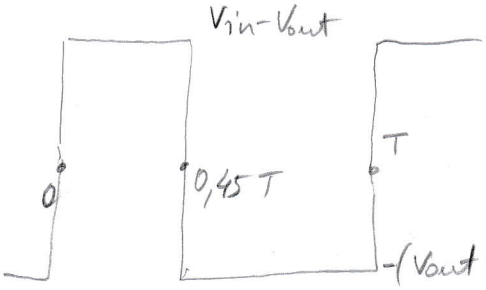
$I = I_0 - kU^3$

$(I=0,\ U=U_0) \Rightarrow 0 = 25 - k\cdot 20^3 \Rightarrow k = \frac{25}{20^3} = 3{,}125\cdot 10^{-3}$

$P = U\cdot I = U\cdot(I_0 - kU^3) = UI_0 - kU^4$

$\frac{dP}{dU} = 0 = I_0 - 4kU_Q^3 \Rightarrow U_Q^3 = \frac{I_0}{4k} = 2000$

$U_Q = \sqrt[3]{2000} = 12{,}6\ V$; $I_Q = 25 - 0{,}003125\cdot 12{,}6^3 = 18{,}75\ A$

② 

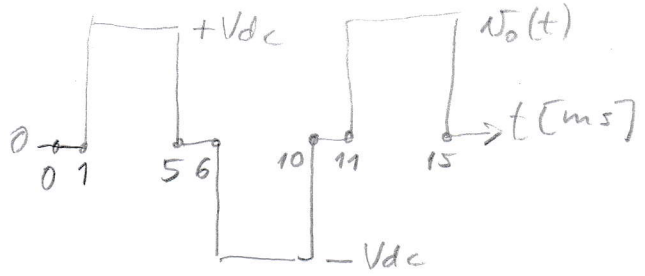
$\int_0^T v_L\,dt = 0$

$(V_{in}-V_{out})\cdot 0{,}45 = (V_{out}+V_D)(1-0{,}45)$

$V_{in}=12\ V,\ V_{out}=5\ V.$

$(12-5)0{,}45 = (5+V_D)0{,}55 \Rightarrow 5+V_D = 7\cdot\frac{0{,}45}{0{,}55} \Rightarrow V_D = 7\cdot\frac{0{,}45}{0{,}55} - 5$

$V_D = 5{,}73 - 5 = 0{,}73\ V$

③ 

$V_p = Vdc = 100\ V$

$V_{eff} = \sqrt{\frac{1}{T}\int_0^T v^2(t)\,dt}$

$= \sqrt{\frac{1}{T}\left(0^2\cdot 1m + 100^2\cdot 4m + 0^2\cdot 1m + 100^2\cdot 4m\right)}$

$= \sqrt{\frac{1}{10m}\left(0 + 100^2\cdot 4m + 0 + 100^2\cdot 4m\right)} = \sqrt{\frac{8}{10}\,100^2}$

$V_{eff} = 89{,}4\ V$