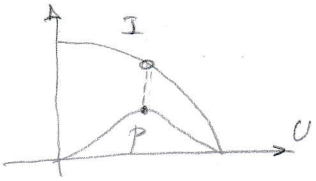
TE – 20190116

1 $I = I_0 - kU^2$; $\left.\begin{matrix} I = I_0 \\ U = 0 \end{matrix}\right\}$ $\left.\begin{matrix} I = 0 \\ U = U_0 = 30\,V \end{matrix}\right\} 0 = 10 - k \cdot 30^2 \Rightarrow k = \frac{10}{30^2} = 0{,}0111$

$P = I \cdot U = (I_0 - kU^2) \cdot U = I_0 U - kU^3$

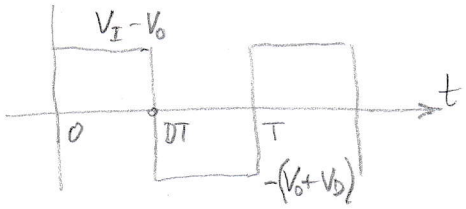
$\frac{dP}{dU} = I_0 - 3kU^2 = 0 \Rightarrow U_Q^2 = \frac{I_0}{3k} \Rightarrow U_Q = \sqrt{\frac{I_0}{3k}} = \sqrt{\frac{10}{3 \cdot 0{,}0111}} = 17{,}32\,V$

$I_Q = I_0 - kU_Q^2 = 10 - 0{,}0111 \cdot 17{,}32^2 = 6{,}67\,A$



$P_Q = U_Q \cdot I_Q = 17{,}32 \cdot 6{,}67 = 115{,}5\,W$

2



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

$(V_I - V_0)D - (V_0 + V_D)(1-D) = 0$

$V_I D - V_0 D - V_0 + DV_0 - V_D + DV_D = 0$

$V_I D - V_0 + V_D(D-1) = 0 \Rightarrow V_0 = V_I D - (1-D)V_D$

$V_0 = 0{,}5 \cdot 12 - (1-0{,}5) \cdot 1 = 5{,}5\,V$

$V_0' = V_0 \cdot 0{,}95 = 5{,}225\,V$

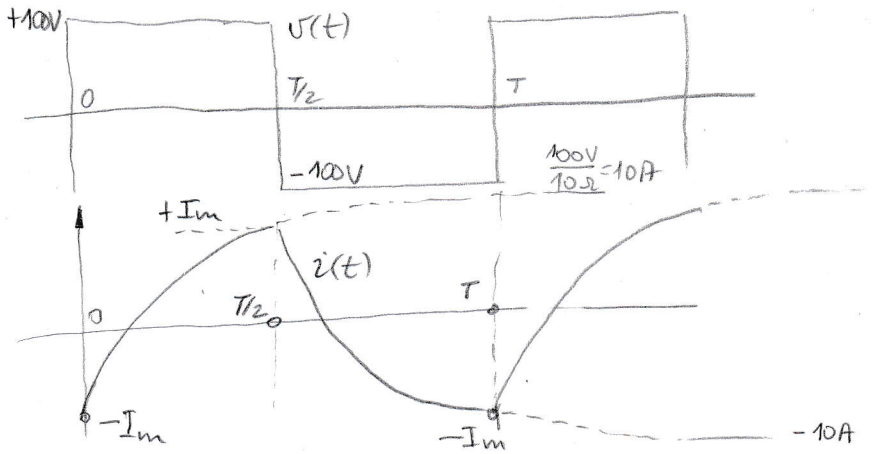
$(V_I - V_0' - r_{DSon} \cdot 20)D - (V_0' + V_D)(1-D) = 0$

$(12 - 5{,}225 - r_{DSon} \cdot 20) \cdot 0{,}5 - (5{,}225 + 1)(1 - 0{,}5) = 0$

$(12 - 5{,}225) \cdot 0{,}5 - (5{,}225 + 1)(1 - 0{,}5) = r_{DSon} \cdot 20 \cdot 0{,}5$

$r_{DSon} = \frac{(12 - 5{,}225) \cdot 0{,}5 - (5{,}225 + 1) \cdot 0{,}5}{10} = 27{,}5\,m\Omega$

3



$i_L(t) = i_L(\infty) + [-I_m - 10]\,e^{-\frac{t}{\tau}}$, $0 < t < T/2$; $i_L(0) = -I_m$

$i_L(T/2) = I_m$

$I_m = 10 + [-I_m - 10] \cdot e^{-(T/2)/\tau}$; $\frac{T}{2} = \frac{1}{2f} = 10\,ms$; $\tau = \frac{L}{R} = \frac{40m}{10} = 4\,ms$; $\frac{T}{2\tau} = 2{,}5$;

$I_m = 10 + [-I_m - 10]\,e^{-2{,}5} = 10 + [-I_m - 10] \cdot 0{,}0821$

$I_m(1 + 0{,}0821) = 10 - 0{,}821 \Rightarrow I_m = 8{,}48\,A$