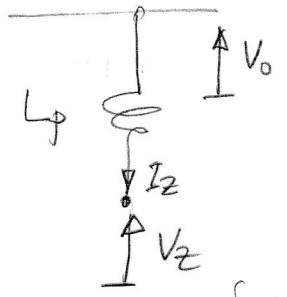
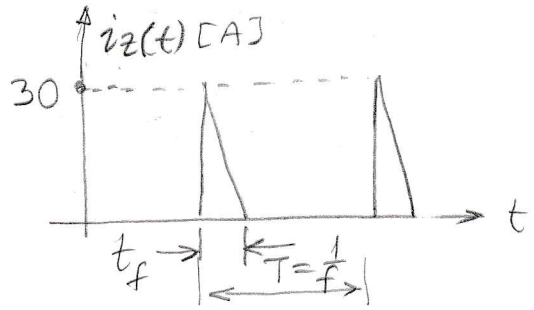
(1)




$$I_{Qmax} = \frac{\int_{t_f} v_p\,dt}{L_p} = \frac{(V_z - V_o)\cdot t_f}{L_p} \Rightarrow t_f = \frac{I_{Qmax}\cdot L_p}{V_z - V_o}$$

$$t_f = \frac{30\cdot 500\cdot 10^{-9}}{100-50} = \underline{300\,ns};$$

$$P_{zmax} = I_{Qmax}\cdot V_z = 30\cdot 100 = \underline{3\,kW};$$

$$\overline{P_z} = W_z\cdot f_s; \quad W_z = \int_0^{t_f} i_z(t)\cdot v_z(t)\,dt = \int_0^{t_f} i_z(t)\cdot 100\,dt$$

$$W_z = 100\cdot t_f\cdot \frac{I_{Qmax}}{2} = 100\cdot 300\cdot 10^{-9}\cdot \frac{30}{2} = \underline{450\,\mu J}.$$

$$\overline{P_z} = 450\cdot 10^{-6}\cdot 30\cdot 10^{3} = \underline{13{,}5\,W}.$$

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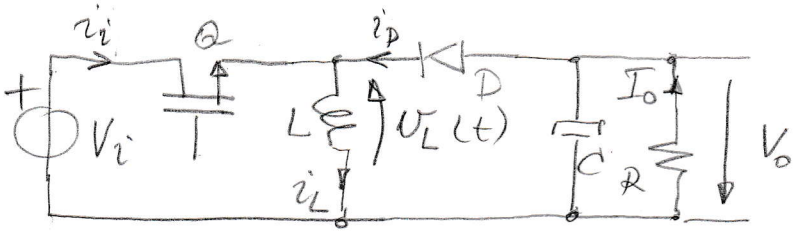
(2)




a) $V_i\,DT = (V_{oa} + V_D)(1-D)T;$

$12\cdot 0{,}5 = (V_{oa}+1)\cdot 0{,}5;$

$12 = V_{oa}+1 \Rightarrow \underline{V_{oa} = 11\,V}.$

b) $(V_i - I_i\,r_{DSon})\,DT = (V_{ob} + V_D)(1-D)T$

$i_i(t) = i_L(t) \quad 0<t<DT;$

$i_D(t) = i_L(t) \quad DT<t<T;$

$I_o = \overline{i_D(t)} = I_L\cdot(1-D) \Rightarrow I_L = \frac{I_o}{1-D} = \frac{I_o}{1-0{,}5} = 2I_o$

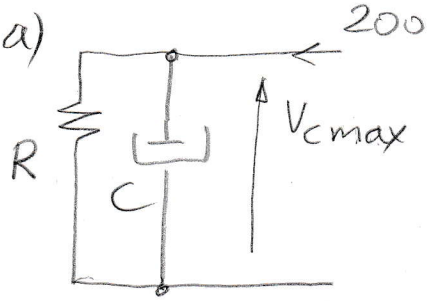
$(V_i - I_L\,r_{DSon})DT = (V_{ob}+V_D)(1-D)T$

$V_{ob} = V_{oa}\cdot 0{,}97 = 11\cdot 0{,}97 = 10{,}67;$

$$r_{DSon} = \frac{V_i + V_{ob} + V_D}{I_L} = \frac{V_i + V_{ob} + V_D}{2I_o} = \frac{12 - 10{,}67 - 1}{50}$$

$$r_{DSon} = \frac{0{,}33}{50} = \underline{6{,}6\,m\Omega}$$

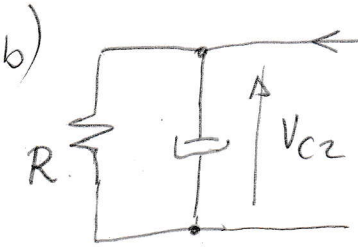
(3) a)




$P_{R1} = P_{GF1}$

$P_{R1} = \frac{V_{cmax}^2}{R} \Rightarrow R = \frac{V_{cmax}^2}{P_{R1}} = \underline{1250\,\Omega}$

b)




$P_{R2} = P_{GF2}$

$P_{R2} = \frac{V_{C2}^2}{R} \Rightarrow V_{C2} = \sqrt{P_{R2} \cdot R_2} = \underline{353\,V}$

$V_{C2} < 230 \cdot \sqrt{2}$ !