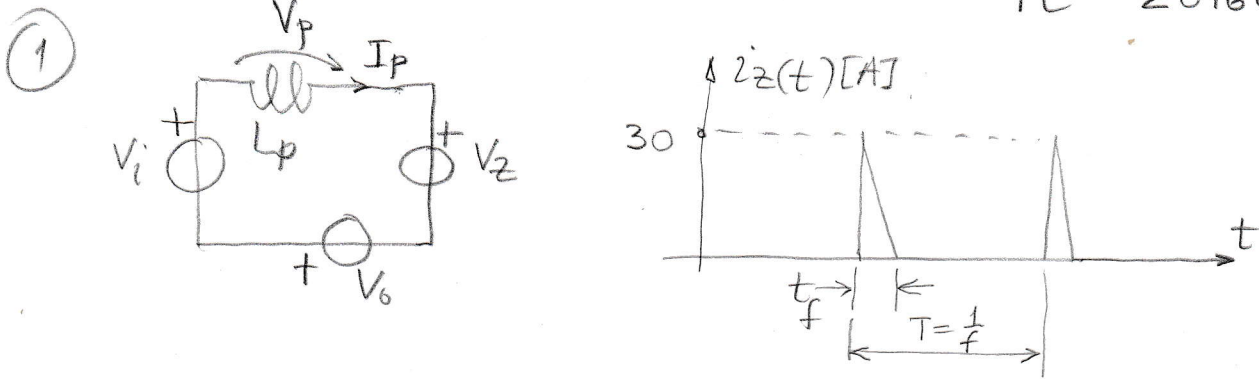




$$I_{Qmax} = \frac{\int_{t_f} V_p(t) dt}{L_p} = \frac{V_z - V_o - V_i}{L_p} \Rightarrow t_f = \frac{I_{Qmax} \cdot L_p}{V_z - V_o - V_i}$$

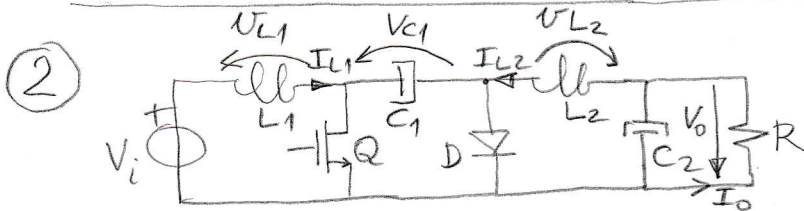
$$t_f = \frac{30 \cdot 500 \cdot 10^{-9}}{100 - 20 - 24} = 268 \text{ ns.}$$

$$P_{Zmax} = I_{Qmax} \cdot V_z = 30 \cdot 100 = 3 \text{ kW.}$$

$$\bar{P}_z = W_z \cdot f_s; \quad W_z = \int_0^{t_f} i_z(t) \cdot V_z(t) dt = \int_0^{t_f} i_z(t) \cdot 100 dt$$

$$W_z = 100 \cdot t_f \cdot \frac{I_{Qmax}}{2} = 100 \cdot 268 \cdot 10^{-9} \cdot \frac{30}{2} = 402 \mu\text{J.}$$

$$\bar{P}_z = 402 \cdot 10^{-6} \cdot 30 \cdot 10^3 = 12 \text{ W}$$



$$a) V_i D = (V_{C1a} + V_D - V_i)(1-D) \Rightarrow V_i D = V_{C1a} + V_D - V_i - V_{C1a} D - V_D D + V_i D$$

$$-V_{C1a}(1-D) = V_D(1-D) - V_i$$

$$V_{C1a} = \frac{V_i}{1-D} - V_D = \frac{12}{0.5} - 1 = 23 \text{ V.}$$

$$(V_{C1a} - V_{oa}) D = (V_{oa} + V_D)(1-D)$$

$$V_{C1a} D - V_{oa} D = V_{oa} + V_D - V_{oa} D - V_D D$$

$$V_{C1a} = \frac{V_{oa} + V_D(1-D)}{D} = \frac{V_{oa} + 0.5 \cdot 1}{0.5} = 2V_{oa} + 1$$

$$23 = 2V_{oa} + 1 \Rightarrow V_{oa} = \frac{22}{2} = 11 \text{ V.}$$

$$b) [V_i - (I_{L1} + I_{L2}) \cdot r_{DSon}] D = (V_{C1b} + V_D - V_i)(1-D)$$

$$V_i D - (I_{L1} + I_{L2}) r_{DSon} D = V_{C1b} + V_D - V_i - V_{C1b} D - V_D D + V_i D$$

$$V_{C1b} = \frac{V_i - (1-D) V_D - (I_{L1} + I_{L2}) \cdot r_{DSon}}{1-D}$$

$$[V_{C1b} - V_{ob} - (I_{L1} + I_{L2}) r_{DSon}] D = (V_{ob} + V_D)(1-D)$$

$$V_{C1b} D - V_{ob} D - (I_{L1} + I_{L2}) r_{DSon} D = V_{ob} + V_D - V_{ob} D - V_D D$$

$$V_{C1b} = \frac{V_{ob} + V_D(1-D) + r_{DSon}(I_{L1} + I_{L2})D}{D}$$

$$I_{L2} = I_o = 25A.$$

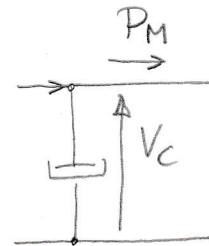
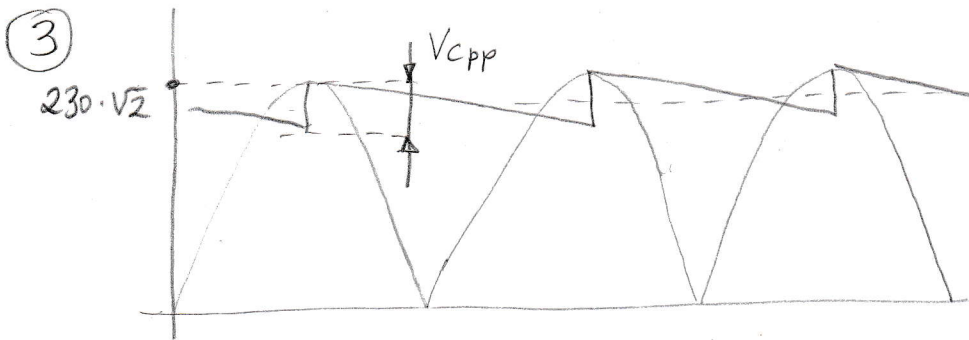
$$DI_{L2} = (1-D)I_{L1} \Rightarrow I_{L1} = \frac{DI_{L2}}{1-D} = 25A$$

$$\frac{V_i - (1-D)V_D - (I_{L1} + I_{L2}) \cdot r_{DSon}}{1-D} = \frac{V_{ob} + V_D(1-D) + r_{DSon}(I_{L1} + I_{L2})D}{D}$$

$$\frac{12 - (1-0,5) \cdot 1 - (25+25) \cdot 5 \cdot 10^{-3}}{1-0,5} = \frac{V_{ob} + 1(1-0,5) + 5 \cdot 10^{-3}(25+25) \cdot 0,5}{0,5}$$

$$22,9 = \frac{V_{ob} + 0,75}{0,5}$$

$$V_{ob} = 22,9 \cdot 0,5 - 0,75 = 10,7V$$



$$P_E = \frac{P_M}{\eta} = \frac{200}{0,75} = 267W.$$

$$W_E = P_E \cdot \frac{T}{2} = 267 \cdot 10 \cdot 10^{-3} = 2,67J$$

$$W_E = \frac{1}{2}C(V_{Cmax}^2 - V_{Cmin}^2)$$

$$V_{Cmax} = 230 \cdot \sqrt{2} = 325V$$

$$V_{Cmin} = V_{Cmax} - V_{C_{pp}} = 275V$$

$$C = \frac{2W_E}{V_{Cmax}^2 - V_{Cmin}^2} = \frac{2 \cdot 2,67}{325^2 - 275^2} = 177\mu F$$