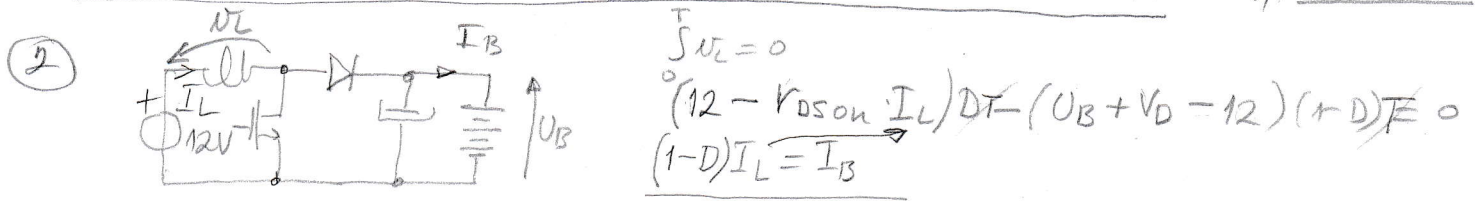


① $P = \overline{p(t)} = \frac{1}{T} \int_0^T ESR \cdot i_L^2(t) dt = \frac{2}{T} \int_0^{T/2} ESR \cdot \left(\frac{I_M}{T/2} \cdot t \right)^2 dt$ TE-20160127

$$P = \left(\frac{2}{T} \right)^3 I_M^2 \cdot ESR \int_0^{T/2} t^2 dt = \left(\frac{2}{T} \right)^3 I_M^2 \cdot ESR \cdot \frac{t^3}{3} \Big|_0^{T/2} = ESR \cdot \frac{I_M^2}{3}$$

$$P = 0,1 \cdot \frac{15^2}{3} = 7,5 W ; P = 0,1 I_{DC}^2 \Rightarrow I_{DC} = \sqrt{\frac{P}{0,1}} = \sqrt{\frac{7,5}{0,1}} = 8,66 A$$



$$(12 - r_{DSon} \frac{I_B}{1-D}) \cdot D - (U_B + V_D - 12)(1-D) = 0 \quad / \cdot (1-D)$$

$$12(1-D)D - r_{DSon} \cdot I_B D - (U_B + V_D - 12)(1-D)^2 = 0$$

$$12D - 12D^2 - 0,5 \cdot D - (28 + 1 - 12)(1-2D+D^2) = 0$$

$$(-12 - 17)D^2 + (12 - 0,5 + 34)D + (-17) = 0$$

$$29D^2 - 45,5D + 17 = 0$$

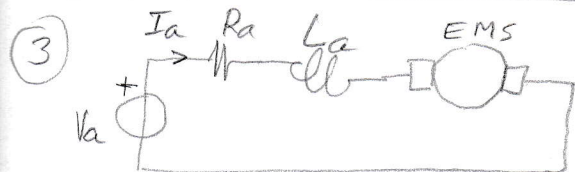
$$r_{DSon} = 0, V_D = 0$$

$$U_B = \frac{1}{1-D_0} 12 \Rightarrow 1-D_0 = \frac{12}{U_B} ; D_0 = 1 - \frac{12}{U_B} = 1 - \frac{12}{28} = 0,571$$

$$D_{1,2} = \frac{+45,5 \pm \sqrt{45,5^2 + 4 \cdot 17 \cdot 29}}{2 \cdot 29}$$

$$D_{1,2} = \frac{45,5 \pm 9,91}{58}$$

$$D_1 = 0,955 ; D_2 = 0,613$$



$$V_a = 50 \cdot 0,7 - 50 \cdot 0,3 = 50 \cdot 0,4 = 20V$$

$$V_a = R_a I_a + EMS = R_a I_a + k n$$

$$V_{a1} = I_{a1} R_a + k \cdot n_1 \Rightarrow 20 = 0 \cdot R_a + k \cdot 2500 \Rightarrow k = \frac{20}{2500} = 8 \cdot 10^{-3}$$

$$V_{a1} = I_{a2} \cdot R_a + k n_2 \Rightarrow 20 = 10 \cdot R_a + k \cdot 2000 = 10R_a + 8 \cdot 10^{-3} \cdot 2000$$

$$V_{a2} = I_{a2} R_a + k n_1 \quad 20 = 10R_a + 16 \Rightarrow 10R_a = 4 ; R_a = \frac{4}{10} = 0,4 \Omega$$

$$V_{a2} = 10 \cdot 0,4 + 0,008 \cdot 2500 = 4 + 20 = 24 V$$

$$V_{a2} = 50 \cdot D_2 - 50(1-D_2) = 50(2D_2 - 1) = 24V$$

$$2D_2 - 1 = \frac{24}{50} \Rightarrow 2D_2 = 1 + \frac{24}{50} ; D_2 = \frac{1 + \frac{24}{50}}{2} = 0,74 = 74\%$$