

$$Z_m = 250 \Omega$$

$$R_L = 1474$$

$$R_X = 10 \Omega$$

$$A_v = 10$$

$$V_T = 25,85 \text{ mV}$$

$$B_{DC} = (30 \text{ mA}, 175)$$

$$V_{CC} = 12$$

$$V_{AF} = 74.04 \text{ V}$$

$$Z_m = R_{\pi} \parallel R_B$$

$$Z_{out} = R_O \parallel R_C$$

$$|A_v| = \frac{R_L}{Z_m} \cdot |A_i|$$

$$|A_i| = \frac{Z_{out}}{Z_{out} + R_L} \cdot B_{AC} \cdot \frac{R_B}{R_B + Z_m}$$

$$\cancel{R_{\pi} \parallel R_B = 250 \Omega}$$

$$R_{\pi} \parallel R_B = 250 \Omega$$

$$r_{\pi} = \frac{\beta_{AC}}{G_M}$$

$$G_M = \frac{I_C}{V_T}$$

$$R_O = \frac{V_{CE} + V_{AF}}{I_C}$$

$$|A_v| = \frac{R_L}{Z_m} \cdot |A_i| = 10$$

$$\cancel{R_{\pi}} R_{\pi} > 250 \Omega \rightarrow$$

$$\frac{\beta_{AC} V_T}{I_C} > 250 \rightarrow \frac{\beta_{AC}}{I_C} > \frac{250}{V_T}$$

$$\frac{I_C}{\beta_{AC}} < 103,4 \text{ mA}$$

$$\cancel{\frac{I_C}{\beta_{AC}}} \frac{I_C}{\beta_{AC}} < \frac{V_T}{250}$$

$$57 \text{ mA} < 103,4 \text{ mA}$$

$$I_C = 10 \text{ mA}$$

$$\beta_{AC} = 175$$

$$R_{\pi} = \frac{\beta_{AC} V_T}{I_C} = 449,79 \Omega$$

$$R_B = \frac{250 \cdot 449,79}{449,79 - 250} = 562,89$$

$$G_M = \frac{I_C}{V_T} = \frac{10 \cdot 10^{-3}}{25,85} = 0,3868 \text{ A/V}$$

$$R_O = \frac{6 + 74.04}{10 \cdot 10^{-3}} = 8004$$

$$|A_v| = G_M \cdot (R_O \parallel R_C \parallel R_L) = 10$$

$$R_C = \frac{\frac{|A_v|}{G_M} (R_O \parallel R_L)}{(R_O \parallel R_L) - \frac{A_v}{G_M}} = 26,40$$

$$P_E = 570,32$$

$$\frac{I_C}{I_{C0}} = 1,986$$

$$\cancel{17,6} \quad \cancel{26,4} \quad (10 \cdot 10^{-3})$$

$$\frac{I_c}{\beta_{AC}} < \frac{V_T}{R_{AC}} = \frac{25,85 \cdot 10^{-3} \text{ V}}{250 \Omega} = 103,4 \mu\text{A}$$

$$\beta_{AC} = 176$$

$$I_c = 18 \mu\text{A}$$

$$I_c = 18 \mu\text{A} \quad 12 \text{ mA}$$

$$\beta_{AC} = 176 \quad 175$$

$$\left(\frac{18 \mu\text{A}}{12 \text{ mA}} \right) \left(\frac{176}{175} \right)$$

$$R_T = \frac{\beta_{AC} \cdot V_T}{I_c} = 376,97 \Omega$$

$$A_v = 10$$

$$R_B = \frac{250 \cdot 376,97}{376,97 - 250} = 742,24$$

$$\beta_T = \frac{12 \text{ mA}}{V_T} = 0,4642$$

$$R_D = 6670 \Omega$$

$$R_C = \left(\frac{10}{0,4642} \right) \left(6670 \parallel 1474 \right) = 21,93 \Omega$$

$$\frac{(6670 \parallel R_C) - \frac{10}{\beta_T}}$$

$$R_E = 475,35$$

$$I_c = 15 \text{ mA} \quad \beta_{AC} = 175$$

$$R_B = \frac{(250 \cdot (301,58))}{301,58 - 250} = 1461,65 \Omega$$

$$R_T = 301,58 \Omega$$

$$\beta_T = 0,580 \cdot A/V$$

$$R_D = 5336 \Omega$$

$$R_C = 17,50$$

$$R_E = 380,32 \Omega$$

$$\sum \frac{I_c}{I_{c0}} = 4,84$$

$$I_B = \frac{I_c}{\beta} = 85,71 \mu\text{A}$$

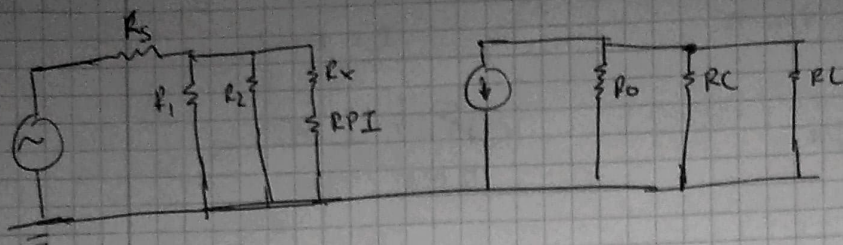
$$V_B = 1461,63 \cdot (85,71 \times 10^{-6}) + 0,7 + (380,32) (85,71 \times 10^{-6} + 15 \times 10^{-3})$$

$$V_B = 6,56 \text{ V}$$

$$R_B = \frac{R_1 \cdot R_2}{R_1 + R_2} = 1461,63$$

$$R_2 = 3219,44$$

$$\frac{V_B}{V_{CC}} = 0,546 \cdot R_1 = 2660 \Omega$$



$$Z_{in} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_E || R_{PI}}} = 250 \Omega$$

$$R_C = \frac{V_{CC} - V_{CE}}{I_C} = \frac{10 - 6}{0.015} = 266.67 \Omega$$

$$S_{I_{CQ}} = 1 + \frac{R_B}{R_E} = 6 \rightarrow \frac{R_B}{R_E} = 5 \rightarrow R_B = 5 R_E$$

$$R_E = \frac{V_{CC} - V_E - R_C I_C}{\frac{\beta + 1}{\beta} I_C}$$

$$R_B = 5 \left(\frac{6 - R_C I_C}{\frac{\beta + 1}{\beta} I_C} \right)$$

$$V_B = R_B \cdot I_B + V_{BE} + R_E (I_B + I_C)$$

$$I_B = \frac{I_C}{\beta}$$

$$R_O = \frac{V_{CC} - V_{AF}}{I_C}$$

$$\frac{V_B}{V_{CC}} = \frac{R_2}{R_1 + R_2}$$

$$R_1 = \frac{R_B}{\theta}$$

$$R_2 = \frac{R_B}{1 - \theta}$$

$$\frac{I_C}{80.04} + \frac{1}{1474} = \frac{1474 I_C + 80.04}{117978.96}$$

$$R_C = \frac{10}{\left(\frac{I_C}{25.85 \times 10^{-3}} \right) \left(\frac{1}{\left(\frac{6 + 74.04}{I_C} \right) + \frac{1}{1474}} \right)}$$

$$\frac{117978.96}{1474 I_C + 80.04}$$

$$R_C = \left(\frac{0.2585}{I_C} \right) \left(\frac{117978.96}{1474 I_C + 80.04} \right) I_C$$

$$Z_{in} = \frac{1}{\frac{1}{\frac{R_B}{\theta}} + \frac{1}{\frac{R_B}{1 - \theta}} + \frac{1}{10 + \frac{\beta + 1}{\beta} I_C}} = 250 \Omega$$

$$R_B = \left[30 - (1.2925) \left(\frac{117978.96}{1474 I_C + 80.04} \right) \right] \left(\frac{117978.96}{1474 I_C + 80.04} \right) - \left(\frac{0.2585}{I_C} \right) I_C$$

$$\begin{aligned} \beta &= 115 & R_B &= 1901.66 \Omega \\ I_C &= 15 \text{ mA} & R_E &= 380.33 \Omega \\ & & R_C &= 17.49 \Omega \end{aligned}$$

$$\Theta = \frac{R_B \cdot \frac{I_C}{\beta} + 0,7 + R_E \left(\frac{I_C}{\beta} + I_C \right)}{12} = 0,550$$

$$V_B = 6,60$$

$$R_B = \frac{12 R_E \left(\frac{I_C}{\beta} + I_C \right) + 0,7}{\frac{I_C}{\beta}}$$

$$\frac{I_C}{\beta} = \frac{I_C (\beta + 1)}{\beta}$$

$$R_1 = \frac{1901,66}{0,550} = 3457,56$$

$$R_2 = \frac{1901,66}{1 - 0,550} = 4225,91$$

$$R_0 = \frac{4004}{5} = 5336 \Omega$$

$$R_{PI} = 282,84$$

$$294,16$$

V_B

$$R_{PI} = 277$$

R_{PI}

$$15 \text{ mA}, 175$$

$$I_C = 15 \text{ mA}$$

$$\beta = 175$$

$$\Theta = 0,3853$$

$$V_B = 4,62 \text{ V}$$

$$250 = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{10 + \frac{\beta \cdot V_T}{I_C}}}$$

$$250 = \frac{1}{\frac{1}{600} + \frac{1}{110 + \frac{\beta (25,85 \times 10^{-3})}{I_C}}}$$

$$I = 250 \left(\frac{1}{600} + \frac{I_C}{I_C 10 + \beta (25,85 \times 10^{-3})} \right)$$

$$R_B = 1264,8849$$

$$I = \frac{250}{\frac{600}{\beta}} + \frac{250 I_C}{10 I_C + \beta 25,85 \times 10^{-3}}$$

$$R_E = 252,97$$

$$0,5833 = \frac{250 I_C}{10 I_C + \beta 25,85 \times 10^{-3}}$$

$$R_C = 1749 \Omega$$

$$V_E = 7,92$$

$$5,833 I_C + 0,01508 \beta = 250 I_C$$

$$0,01508 \beta = 244,167 I_C$$

$$\beta = 16191,44 I_C$$

$$R_1 = 3282,85$$

$$R_2 = 2057$$