



$$U_T = 12V \quad R_1 = 220k\Omega \quad R_2 = 33k\Omega$$

$$R_E = 1k\Omega \quad R_t = 10k\Omega \quad C = 5nF \quad L = 200\mu H$$

$$Q = 100 \quad h_{ie} = 5k \quad h_{21e} = 200 \quad h_{22e} = 25kS$$

$$i_B \approx 0 \quad h_{12e} \approx 0$$

$$a.) \quad U_{B0} = \frac{U_T}{R_1 + R_2} \cdot R_2 = \frac{12V}{220k + 33k} \cdot 33k \approx 1,57V$$

$$U_{E0} \approx U_{B0} - 0,6V = 1,57V - 0,6V = 0,97V$$

$$i_{E0} = \frac{U_{E0}}{R_E} = \frac{0,97V}{1k} \approx 1mA \approx i_{C0}$$

$$U_{CE0} \approx U_T - U_{E0} = 12V - 0,97V \approx 11V$$

ATransistor munkepunktje:  $M(i_{C0} = 1mA; U_{CE0} = 11V)$

$$b.) \quad f_0 = \frac{1}{2\pi\sqrt{L \cdot C}} = \frac{1}{2 \cdot \pi \cdot \sqrt{200 \cdot 10^{-6}H \cdot 5 \cdot 10^{-9}F}} = \frac{1}{2 \cdot \pi \cdot \sqrt{10^{-12}H \cdot F}} \approx 160kHz$$

$$c.) \quad Q_0 = \frac{R_V}{X_L} = \frac{X_L}{r_V} = \frac{2\pi \cdot f_0 \cdot L}{r_V} \Rightarrow r_V = \frac{2\pi \cdot f_0 \cdot L}{Q_0} = \frac{2\pi \cdot 160kHz \cdot 200 \cdot 10^{-6}}{100} \approx 2\Omega$$

$$R_V = r_V \cdot Q^2 = 2 \cdot 10^4 = 20k\Omega$$

$$d.) \quad A_u = -\frac{h_{21e}}{h_{11e}} \left( \frac{1}{h_{22e}} \times R_V \times R_t \right) = -\frac{200}{5k} (40k \times 20k \times 10k) = -\frac{200}{5k} \cdot 5,7k = -228$$

$$A_i = A_u \cdot \frac{r_{be}}{R_t} = A_u \cdot \frac{h_{11e} \times R_1 \times R_2}{R_t} = -228 \cdot \frac{5k \times 220k \times 33k}{10k} \approx -228 \cdot \frac{4,3k}{10k} = -98$$

$$e.) \quad r_{be} = 4,3k\Omega$$

$$r_{ki} = \frac{1}{h_{22e}} \times R_V = 40k \times 20k \approx 13,3k\Omega$$

$$f.) \quad Q = \frac{R_V}{X_L}; \quad Q_t = \frac{R_e}{X_L}$$

$$B_0 = \frac{f_0}{Q} = \frac{160kHz}{100} = 1,6kHz$$

$$B_t = \frac{f_0}{Q_t} = \frac{f_0}{\frac{R_e}{X_L}} = \frac{f_0 \cdot X_L}{R_e} = \frac{f_0}{R_e} \cdot \frac{R_V}{Q} = B_0 \cdot \frac{R_V}{R_e}$$

$$B_t = 1,6kHz \cdot \frac{20k}{5,7k} \approx 5,6kHz$$

$$R_e = \frac{1}{h_{22e}} \times R_V \times R_t = 5,7k\Omega$$