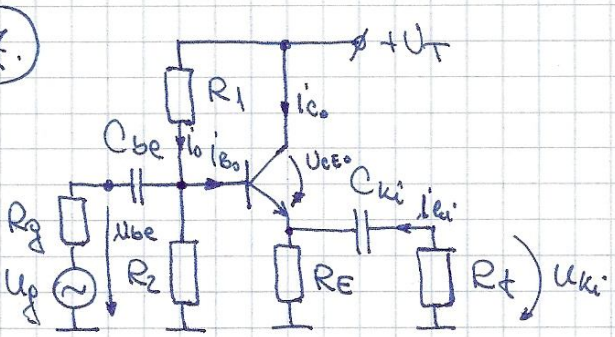
(7.)



$U_T = 12V$ $R_1 = R_2 = 47k\Omega$

$R_E = 3{,}3k\Omega$ $R_t = 1k\Omega$

$R_g = 2k\Omega$ $u_g = 100\mu V$

$h_{11e} = 10k$ $h_{21e} = 260$

$h_{22e} = 20\mu S$ $f_a = 1kHz$

$i_{B_0} \approx 0$ $h_{12e} \approx 0$

a.) $U_T = (i_0 + i_{B_0}) \cdot R_1 + i_0 \cdot R_2 \approx i_0 \cdot (R_1 + R_2)$

$$U_{B_0} = \frac{U_T}{R_1 + R_2} \cdot R_2 = \frac{U_T}{2} = \frac{12V}{2} = 6V$$

$$U_{E_0} = U_{B_0} - U_{BE_0} \approx U_{B_0} - 0{,}6V = 5{,}4V$$

$$i_{E_0} = \frac{U_{E_0}}{R_E} \approx 1{,}64\mu A \approx i_{C_0}$$

$$U_{CE_0} = U_T - U_{E_0} = 12V - 5{,}4V = 6{,}6V$$

A tranzisztor munkapontja: $M(i_{C_0} = 1{,}64\mu A;\ U_{CE_0} = 6{,}6V)$

b.) A feszültségerősítés:

$$A_u = \frac{\frac{h_{21e}}{h_{11e}}\left(\frac{1}{h_{22e}} \times R_E \times R_t\right)}{1 + \frac{h_{21e}}{h_{11e}}\left(\frac{1}{h_{22e}} \times R_E \times R_t\right)} = \frac{\frac{260}{10k}\left(50k \times 3{,}3k \times 1k\right)}{1 + \frac{260}{10k}\left(50k \times 3{,}3k \times 1k\right)} =$$

$$\approx \frac{26 \cdot 0{,}756}{1 + 26 \cdot 0{,}756} = \frac{19{,}68}{20{,}68} \approx 0{,}95$$

$$r_{be} = R_1 \times R_2 \times \left[h_{11e} + h_{21e}\left(R_E \times R_t\right)\right] = 47k \times 47k \times \left[10k + 260\left(3{,}3k \times 1k\right)\right] =$$

$$\approx 23{,}5k \times \left[10k + 196{,}6k\right] \approx 21{,}1k\Omega$$

Az áramerősítés:

$$A_i = A_u \cdot \frac{r_{be}}{R_t} = 0{,}95 \cdot \frac{21{,}1k}{1k} \approx 20$$

A teljesítményerősítés:

$$A_p = A_u \cdot A_i = 0{,}95 \cdot 20 = 19$$

c.) $r_{be} = \underline{21{,}1\,k\Omega}$

$$r_{ki} = \frac{1}{h_{22e}} \times R_E \times \left(\frac{h_{11} + R_g \times R_1 \times R_2}{h_{21e}} \right) =$$

$$= 50k \times 3{,}3k \times \left(\frac{10k + 2k \times 47k \times 47k}{260} \right) = 3{,}1k \times \left(\frac{10k + 1{,}84k}{260} \right) \approx \underline{45\,\Omega}$$

d.)

$$C_{be} = \frac{1}{2\pi \cdot f_g (R_g + r_{be})} = \frac{1}{2\pi \cdot 10^3\,Hz\,(2 + 21{,}1)k} \approx \underline{6{,}9\,nF}$$

$$C_{ki} = \frac{1}{2\pi \cdot f_g (r_{ki} + R_t)} = \frac{1}{2 \cdot \pi \cdot 10^3\,Hz\,(45\,\Omega + 1k)} \approx \underline{152\,nF}$$

e.)

$$u_{ki} = A_u \cdot u_{be} = A_u \cdot u_g \frac{r_{be}}{r_{be} + R_g} =$$

$$= 0{,}95 \cdot 100\,mV \cdot \frac{21{,}1k}{21{,}1k + 2k} = 95\,mV \cdot 0{,}91 \approx \underline{86{,}7\,mV}$$

$$i_{ki} = \frac{u_{ki}}{R_t} = \frac{86{,}7\,mV}{1k} = \underline{86{,}7\,\mu A}$$