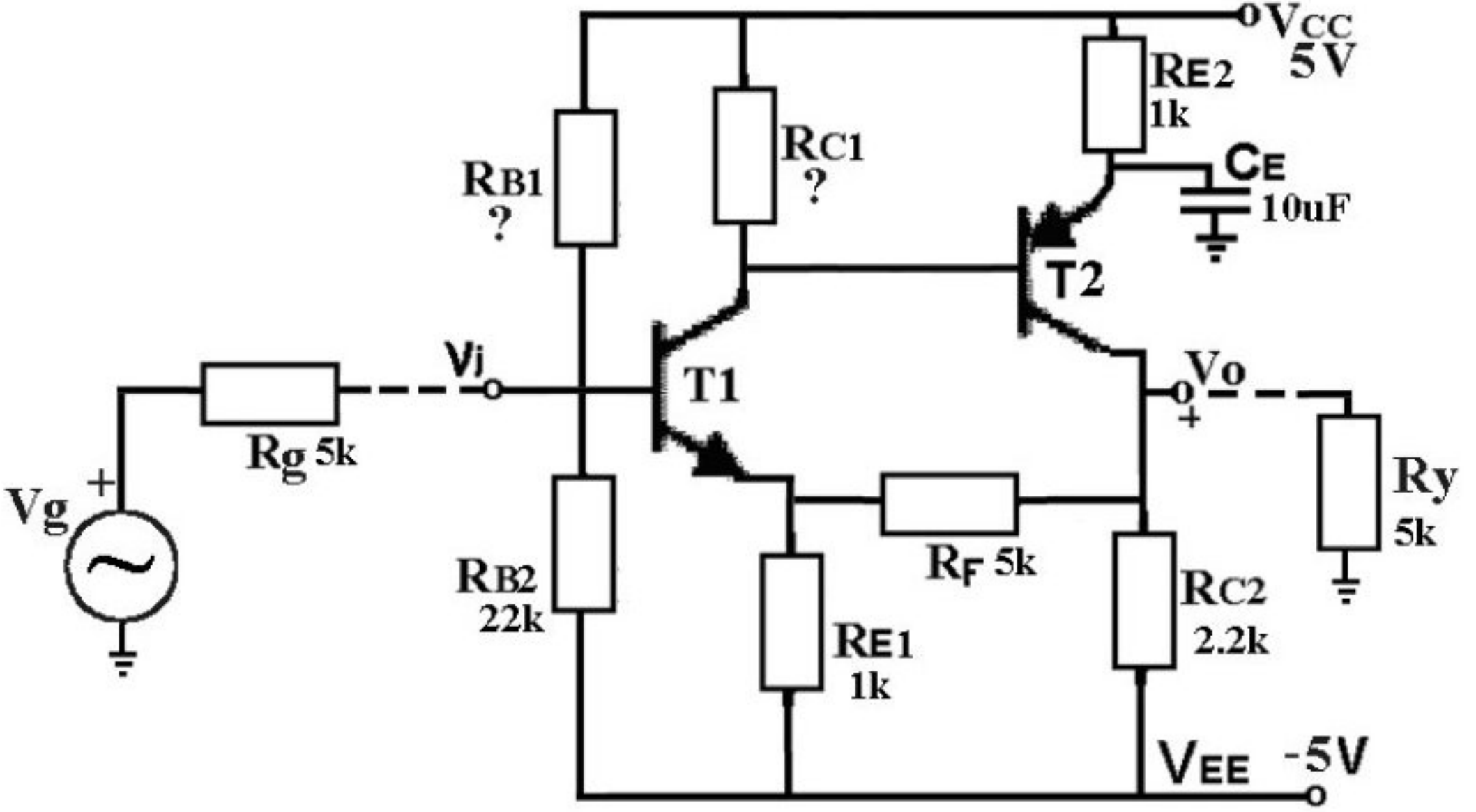


$|V_{BE}|=0.7V$, $\beta=100$, $V_T=25mV$

a) For DC **case** Vi=0 and Vo=0. Find R_{B1} and R_{C1}

b) Find Vo/Vg

c) rof=?

C-1-

a) $V_i = V_{B1} = 0 \Rightarrow V_{E1} = -0,7$, $V_O = 0$

$$I_{RE1} = \frac{-0,7-(-5)}{1k} = 4,3mA$$

$$I_{RF} = \frac{V_O - V_{E1}}{R_F} = \frac{0,7}{5k} = 0,14mA$$

$$I_{E1} = I_{RE1} - I_{RF} = \boxed{4,16mA \cong I_{C1}}$$

$$I_{C2} = \frac{V_O - (-5)}{2,2k} + I_{RF} = 2,27mA + 0,14mA$$

$$\boxed{I_{E2} \cong I_{C2} \cong 2,41mA}$$

$$V_{E2} = V_{CC} - I_{E2} \cdot R_{E2} = 2,59V$$

$$V_{C1} = V_{B2} = V_{E2} - 0,7 = 1,89V$$

$$V_{RC1} = V_{EE} - V_{E1} = 5 - 1,89 = 3,11V$$

$$I_{RC1} = I_{C1} + I_{B2} \cong I_{C1}$$

$$R_{C1} = \frac{V_{RC1}}{I_{RC1}} = \frac{3,11}{4,16m} \cong 750\Omega$$

$$I_{RB2} = \frac{V_{B1} - V_{EE}}{R_{B2}} = \frac{0-(-5)}{22k} \cong 0,227mA$$

$$I_{B1} = \frac{I_{C1}}{\beta} = 41,6\mu A$$

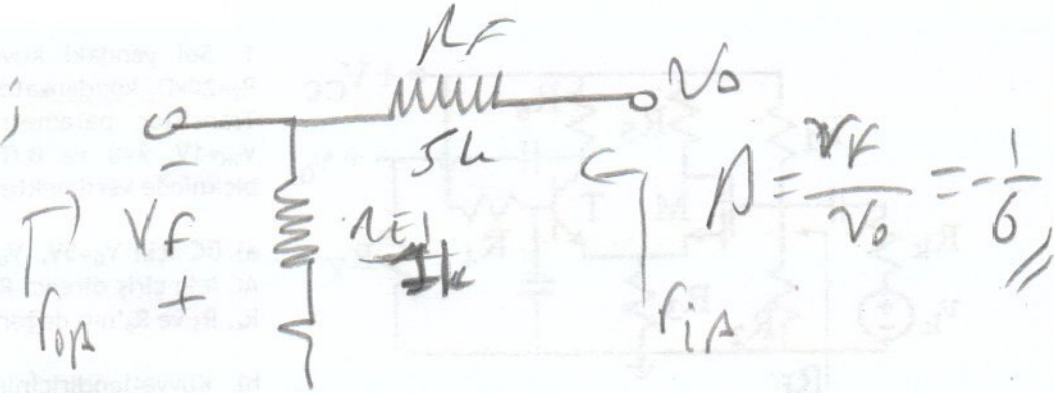
$$I_{RB1} = I_{RB2} + I_{B1} \cong 269\mu A$$

(in DC case $I_{RG} = 0$)

$$R_{B1} = \frac{V_{CC} - V_{B1}}{I_{RB1}} \cong \begin{matrix}1\\0,6\end{matrix} k\Omega$$

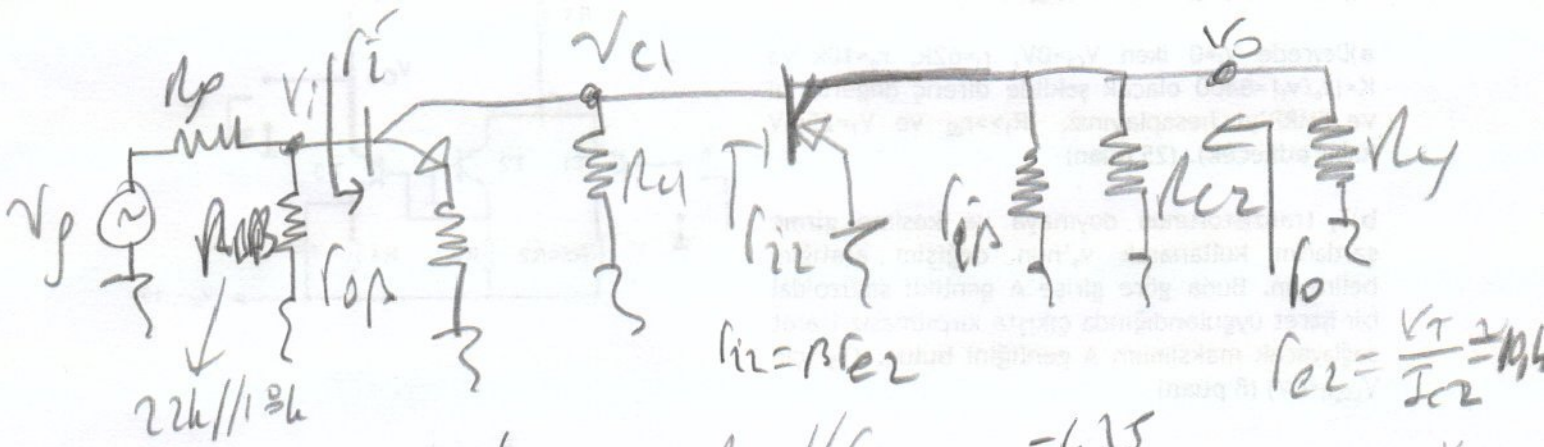
b) **input: voltage**
output: voltage

β network;



Loading effect of β

$r_{o\beta} = R_{E1} // R_F$ $\quad$ $r_{i\beta} = R_F + R_{E1}$



$$K_V = \frac{V_o}{V_i} = \frac{V_{C1}}{V_i}\cdot\frac{V_o}{V_{C1}} \qquad \frac{V_{C1}}{V_g} = \frac{-R_{C1}//r_{i2}}{r_{o\beta}+r_{e1}} = \frac{-435}{818+6} \cong -0,52$$

$$r_{e1} = \frac{V_T}{I_{C1}} \cong 6$$

$$\frac{V_o}{V_{C1}} = -\frac{r_{i\beta}//R_{C2}//R_L}{r_{e2}} = \frac{-1,21k}{10,4} \cong -117$$

$$K_V = \frac{V_o}{V_i} = -0,52 \times -117 = 61$$

$$K_{Vf} = \frac{K_V}{1-\beta K_V} = \frac{61}{1-(-\frac{1}{6})61} \cong 5,46$$

$$r_i' = \beta (r_{e1} + r_{o\beta}) \cong 84k$$

$$r_{if}' = (1-\beta K_V)\, r_i' = 938k$$

$$r_{if} = R_{DB} // r_{if}' \cong 9,9k //$$

$$\frac{V_1}{V_s} = \frac{r_{if}}{R_g + R_{if}} = \frac{9,9k}{14,9k} = 0,66$$

$$\frac{V_o}{V_s} = 0,66 \times K_{Vf} \cong 3,9 //$$

6) $$r_o \cong R_{C2} // r_{iA} \cong 1,6k$$

$$r_{of} = \frac{r_o}{1-\beta K_V}$$

$$r_{of} = \frac{1,6k}{1-(-\frac{1}{6})61} \cong \mathbf{140\Omega}$$