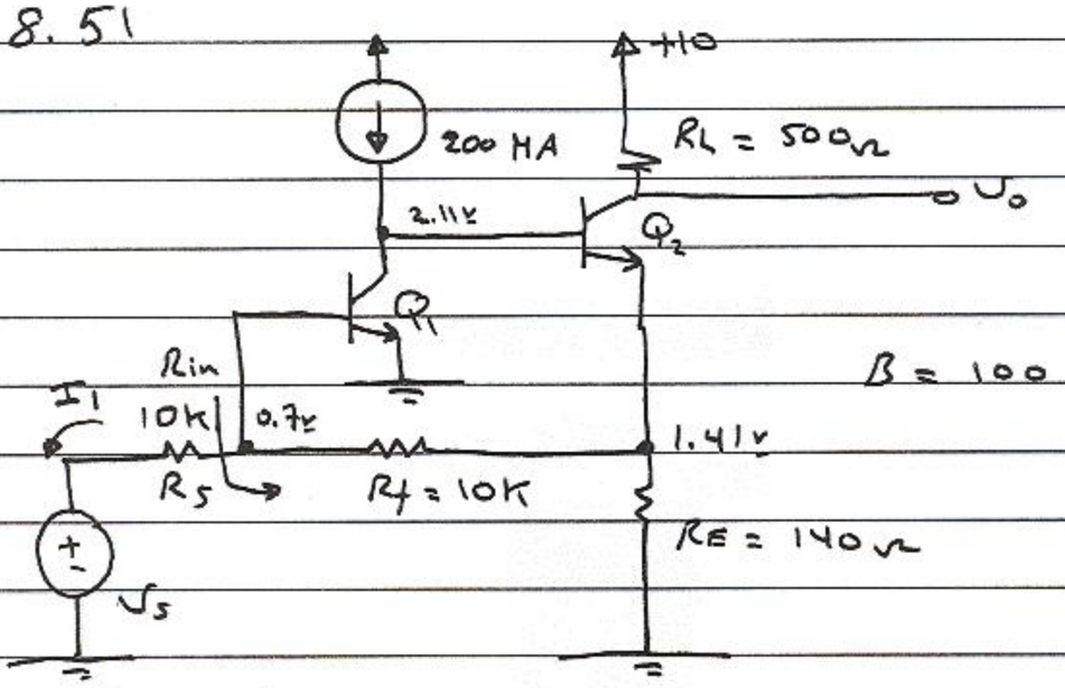
8.51



DC Analysis

$I_{B2} + I_{C1} = 200\,MA \quad ; \quad I_1 = \frac{0.7}{10K}$

$-0.14K\,(I_{E2} - I_{B1} - I_1) + 10K\,(I_{B1} + I_1) + 0.7 = 0$

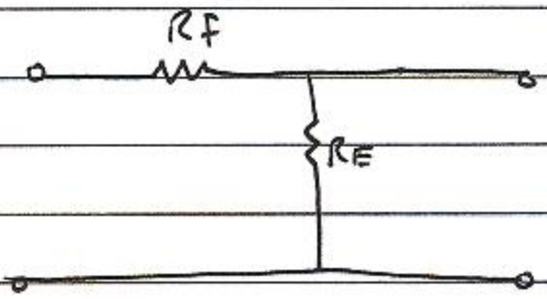
$I_{B2} = 0.1\,mA \quad \therefore I_{C2} = 10\,mA$

$I_{C1} = 0.1\,mA$

$V_{B1} = 0.7V \;,\; V_{E2} = 1.41\,V \;,\; V_{B2} = V_{C1} = 2.11\,V$

ac analysis

shunt - series feedback

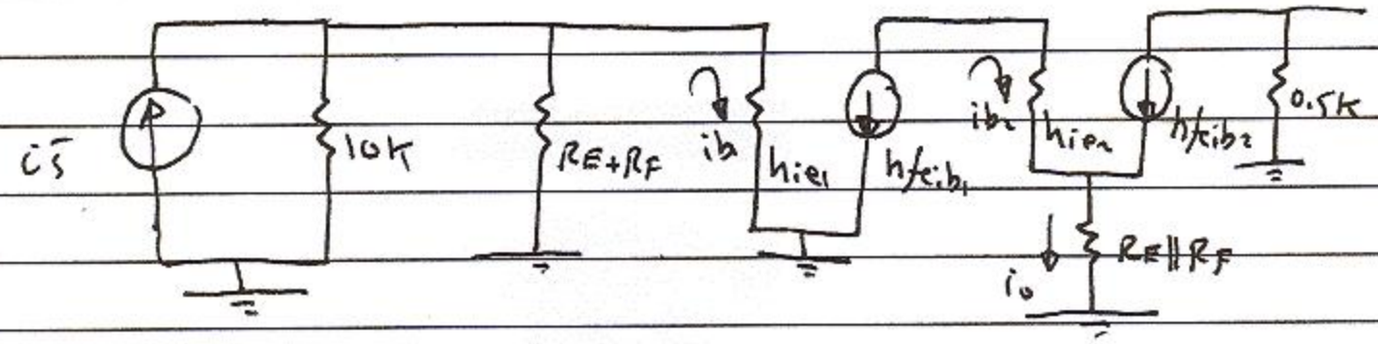


$g_{11} = \frac{1}{R_E + R_f}$

$g_{22} = R_E \| R_E$

$g_{12} = \beta = \frac{-R_E}{R_E + R_f} = -0.0138$

To find $A = \frac{i_o}{i_s}$



$$i_o = i_{e2} = (1+h_{fe})\, i_{b2} = (1+h_{fe})(-h_{fe} i_{b1})$$

$$i_{b1} = i_s \frac{10K \| 10.14K}{10K \| 10.14K + h_{ie1}} i_s$$

$$h_{ie1} = h_{fe} \frac{V_T}{I_{C1}} = 25.69K$$

$$A = \frac{i_o}{i_s} = -1629.2 \quad , \quad AB = 22.49$$

$$A_f = \frac{i_o}{i_s} = -69.4$$

$$A_{vs} = \frac{v_o}{v_s} = \left(\frac{i_o}{i_s}\right)\left(\frac{v_o}{i_o}\right)\left(\frac{i_s}{v_s}\right)$$

$$= (A_f)(-0.5K)\left(\frac{1}{10K}\right)$$

$$A_{vs} = +3.47$$

$$Z_{if} = \frac{R_i}{1+AB} \; ; \quad R_i = (10K \| 10.14K \| 25.69K) = 4.2K$$

$$Z_{if} = 172.8\,\Omega = R_{in} \| R_s \rightarrow R_i = 175.8\,\Omega$$