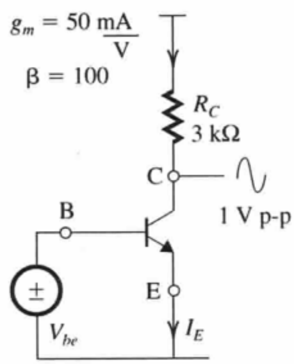
6.96



$g_m = 50$ mA / V

$\beta = 100$

$$r_\pi = \frac{\beta}{g_m} = \frac{100}{50} = 2\ \text{k}\Omega$$

$$\hat{V}_O = -g_m R_C \hat{V}_{be}$$

$$\therefore \hat{V}_{be} = -\frac{\hat{V}_O}{g_m R_C} = \frac{-1}{50 \times 3}(\text{V})$$

$= 6.7$ mV (PP)

$$i_b = \frac{\hat{V}_{be}}{r_\pi} = \frac{6.7\ \text{mV}}{2\ \text{k}\Omega}$$

$= 3.35\ \mu\text{A}(\text{P} - \text{P})$

6.107

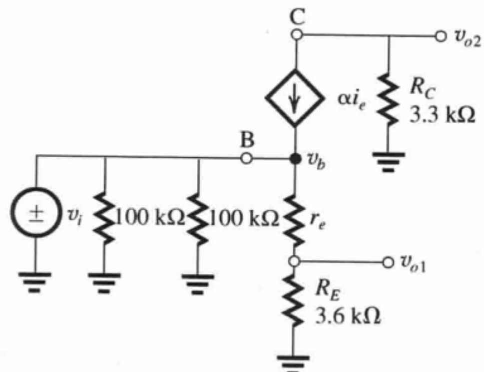
Refer to Fig P 6.107 For large β the DC base current will be ~0 Thus the DC vottage at the base can be found directly Using the voltage-divide rule

$$V_B = 5 \cdot \frac{100}{100 + 100} = 2.5 \text{ V}$$

if: $V_{BE} = 0.7$

$$V_E = 2.5 - 0.7 = 1.8 \text{ V}$$

$$\rightarrow I_E = \frac{1.8 \text{ V}}{3.6 \text{ k}\Omega} = 0.5 \text{ mA}$$



$$v_b = v_i$$

$$\rightarrow \frac{V_{O1}}{V_i} = \frac{R_E}{R_E + r_e}$$

Also:

$$i_e = \frac{v_b}{r_e + R_E} = \frac{v_i}{r_e + R_E}$$

and, $v_{o2} = -\alpha\, i_e \cdot R_C$

$$= -\frac{\alpha R_C v_i}{r_e + R_E}$$

Thus,

$$\frac{v_{O2}}{v_i} = -\frac{\alpha R_C}{R_E + r_e}$$

Substituting $r_e = \dfrac{V_T}{I_E} = 50\ \Omega$

and $R_E = 3.6 \text{ k}\Omega, R_C = 9.3 \text{ k}\Omega$

and $\alpha \approx 1$ gives

$$\frac{v_{O1}}{v_i} = \frac{3.6}{0.050 + 3.6} = .986 \text{ V / V}$$

$$\frac{v_{O2}}{v_i} = \frac{-3.3}{0.050 + 3.6} = -0.904 \text{ V / V}$$

If the node labeled v_{O2} is connected to ground:

$$R_E = 0$$

$$\frac{v_{o2}}{v_i} = -\frac{\alpha R_C}{r_e}$$