9.9

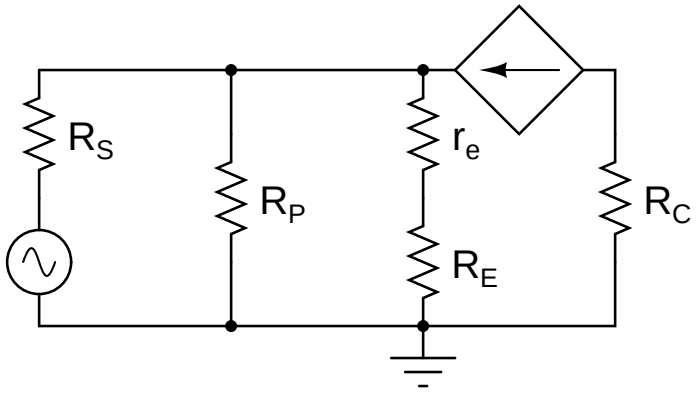
active: $v_{BE} = 0.7\text{V}$, $i_C = h_{FE} i_B$

KVL: $10\text{V} = 150\text{k}\Omega\text{i}_{\text{B1}} + 0.7\text{V} + 1\text{k}\Omega\text{i}_{\text{B1}}(1+100) \Rightarrow$: $\text{i}_{\text{B1}} = \frac{9.3\text{V}}{251\text{k}\Omega} = 37.1\mu\text{A} = \text{I}_{\text{BQ1}} \Rightarrow \text{I}_{\text{CQ1}} = 3.71\text{mA}$

KVL: $10\text{V} = 1\text{k}\Omega(3.7\text{mA} + \text{i}_{\text{B2}}) + 0.7\text{V} + 1\text{k}\Omega\text{i}_{\text{B2}}(1+100) \Rightarrow$: $\text{i}_{\text{B2}} = \frac{5.59\text{V}}{102\text{k}\Omega} = 54.8\mu\text{A} = \text{I}_{\text{BQ2}} \Rightarrow \text{I}_{\text{CQ2}} = 5.48\text{mA}$

KVL $\rightarrow V_{CEQ1} = 2.49\text{V} > 0.2\text{V}$ qed
KVL $\rightarrow V_{CEQ2} = 2.66\text{V} > 0.2\text{V}$ qed

9.13



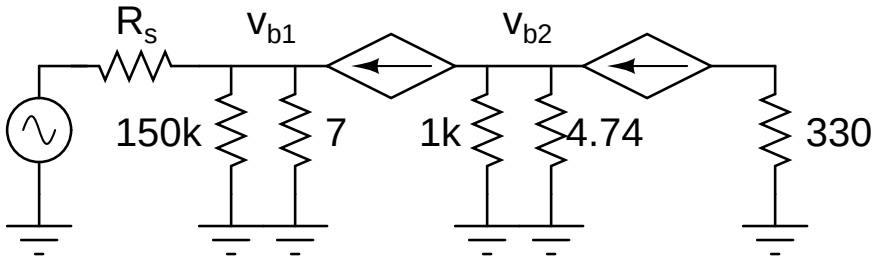
a.) $g_m = I_{CQ}/V_T = 1.18\text{mA}/26\text{mV} = 45.4\text{mMHO}$

b.) $r_e = V_T/I_{CQ} = 22\Omega$

c.) $R_P = R_1 R_2/(R_1 + R_2) = 9\text{k}\Omega$. $R_b = v_b/i_b$ and $v_b = (r_e + R_E)101 i_b \Rightarrow R_b = 103\text{k}\Omega$. R_{in} is now the parallel resistance of R_b and R_P: $R_{in} = 8.28\text{k}\Omega$

d.) With v_b as above and $v_c = -5\text{k}\Omega 100\text{i}_\text{b}$ we get: $A_v = v_c/v_b = -4.84$

9.18



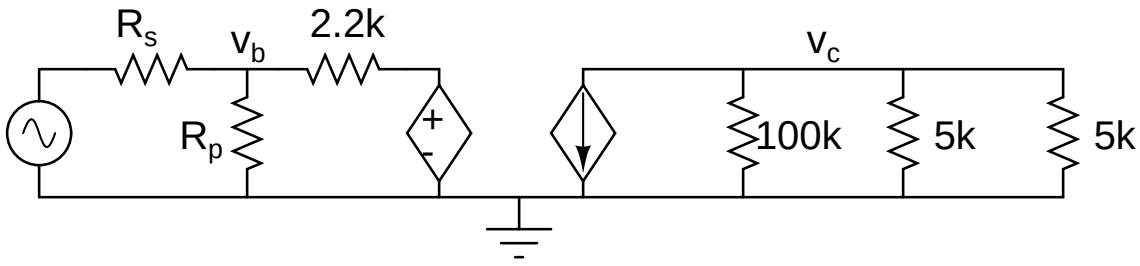
$I_{CQ1} = 3.71\text{mA} \Rightarrow r_{e1} = 7$ and $I_{CQ2} = 5.48\text{mA} \Rightarrow r_{e2} = 4.74$

a.) $v_{b1} = 7i_{b1}(1 + 100) \Rightarrow i_{b1} = v_{b1}/707$ and $v_{b2} = 4.74i_{b2}(1 + 100) \Rightarrow i_{b2} = v_{b2}/479$

$100i_{b1} + v_{b2}/1k + i_{b2} = 0 \Rightarrow v_{b2} = -45.8v_{b1}$ and $v_{c2} = -330(100i_{b2}) = -330(100)(v_{b2}/479) \Rightarrow v_{c2}/v_{b1} = 3160 = A_v$

b.) $i_{c2} = -v_{c2}/330$ and $i_{b2} = v_{b1}/707 \rightarrow i_{c2}/i_{b1} = -6770 = A_i$

9.22



$R_p = \frac{10k90k}{10k+90k} = 9k$ and $100k||5k||5k = 2.44k$

a.) $i_b = \frac{v_b - 10^{-4}v_c}{2.2k}$ and $100i_b + v_c/2.44k = 0 \Rightarrow i_b = -v_c/244k$

$-v_c/244k = (v_b - 10^{-4}v_c)/2.2k \Rightarrow v_c/v_b = 244/-2.176 = -112 = A_v$

b.) $R_b = v_b/i_b = 2.18k \rightarrow R_{in} = R_b||R_p = 1.75k$

c.) $i_L = v_c/5k \Rightarrow i_L/i_b = -48.8 = A_i$