Homework 8 Due Thursday, Apr 4th, 2013 (In Class)

Problem 6.71

In the common-base circuit shown in Figure P6.71, the transistor is a 2N2907A, with a nominal dc current gain of $\beta = 80$. (a) Determine I_{CQ} and V_{ECQ}. (b) Using the h-parameters (assuming $h_{re} = 0$), determine the range in small-signal voltage gain $A_v = v_o/v_s$. (c) Determine the range in input and output resistances R_i and R_o.

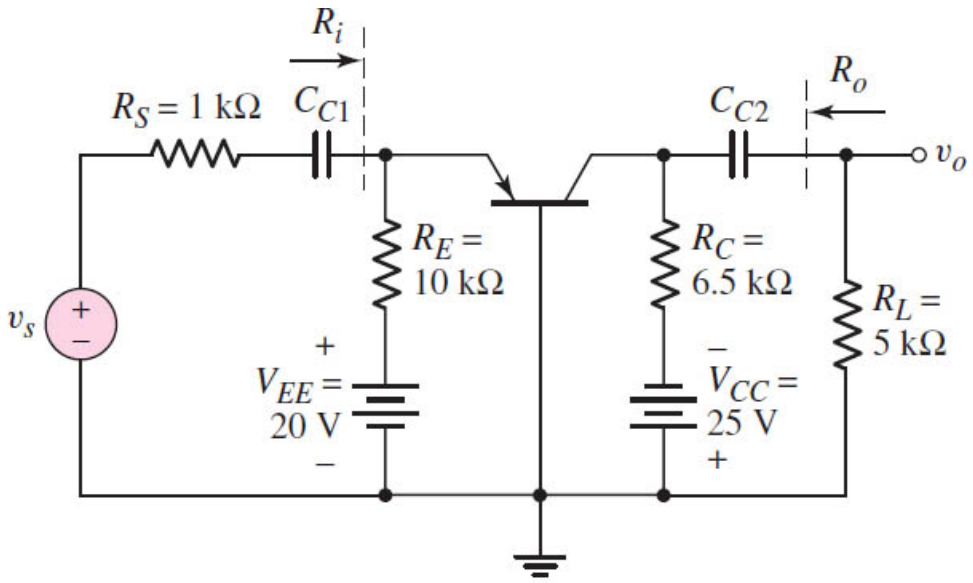

Figure P6.71

Problem 6.73

Consider the ac equivalent circuit in Figure P6.73. The transistor parameters are $\beta_1 = 120$, $\beta_2 = 80$, $V_{A1} = V_{A2} = \infty$, and $I_{CQ1} = I_{CQ2} = 1$ mA. (a) Find the small-signal voltage gain $A_{v1} = V_{o1}/V_i$. (b) Determine the small-signal voltage gain $A_{v2} = V_{o2}/V_{o1}$. (c) Find the overall small-signal voltage gain $A_v = V_{o2}/V_i$.

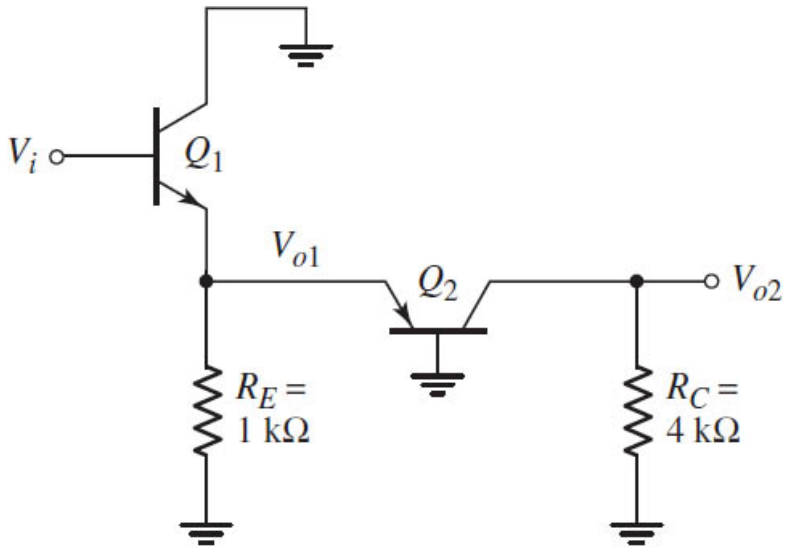

Figure P6.73

Problem 6.77

The transistor parameters for the circuit in Figure P6.77 are $\beta_1 = 120$, $\beta_2 = 80$, $V_{BE1}(on) = V_{BE2}(on) = 0.7$ V, and $V_{A1} = V_{A2} = \infty$. (a) Determine the quiescent collector current in each transistor. (b) Find the small-signal voltage gain $A_\upsilon = \upsilon_o / \upsilon_s$. (c) Determine the input and output resistances R_{ib} and R_o.

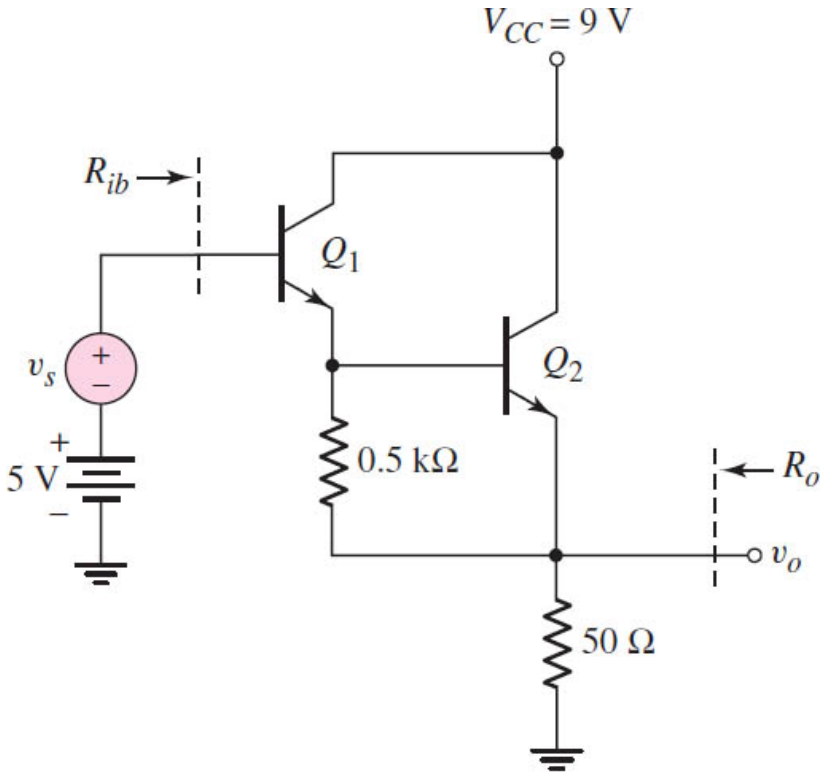

Figure P6.77

Problem 7.5

Consider the circuit shown in Figure P7.5. (a) What is the value of the voltage transfer function V_o/V_i at very low frequencies? (b) Determine the voltage transfer function at very high frequencies. (c) Derive the expression for the voltage transfer function $T(s) = V_o(s)/V_i(s)$. Put the expression in the form $T(s) = K(1 + s\tau_A)/(1 + s\tau_B)$. What are the values of K, τ_A, and τ_B?

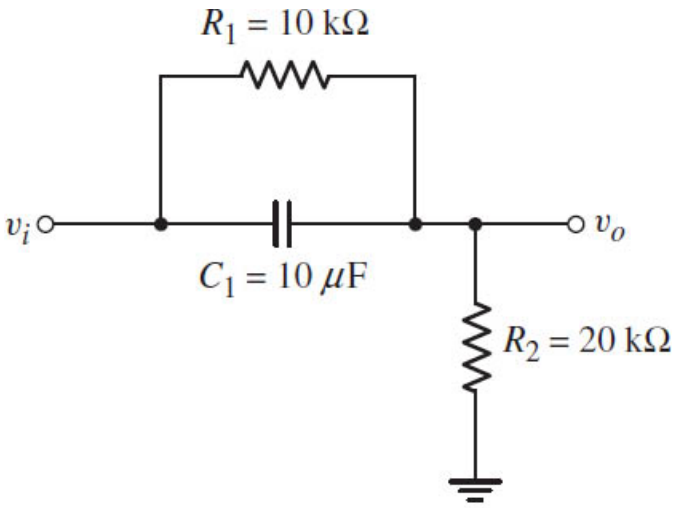

Figure P7.5

Problem 7.7

A voltage transfer function is given by $T(f) = 1/(1 + jf / f_T)^3$. (a) Show that the actual response at $f = f_T$ is approximately 9 dB below the maximum value. What is the phase angle at this frequency? (b) What is the slope of the magnitude plot for $f >> f_T$? What is the phase angle in this frequency range?