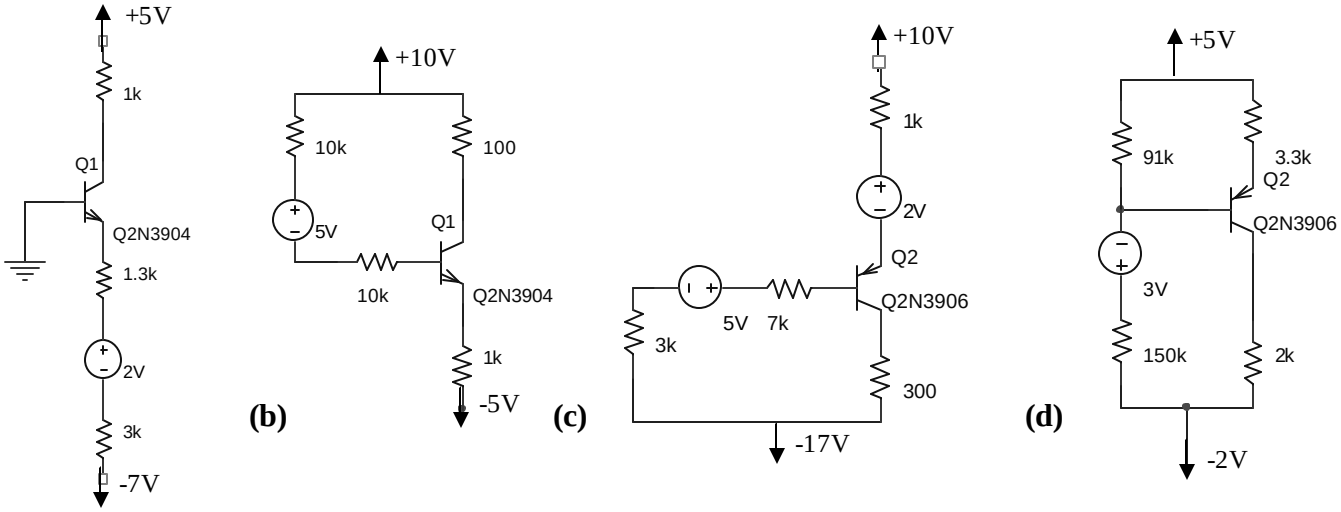
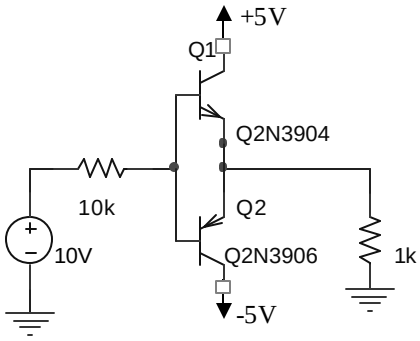
ECE2280 **Homework #7** **Spring 2007**

1. Use $|V_{BE}|=0.7$, $\beta=100$. Find voltages at all nodes and currents through all branches. *(worth 4 problems)*



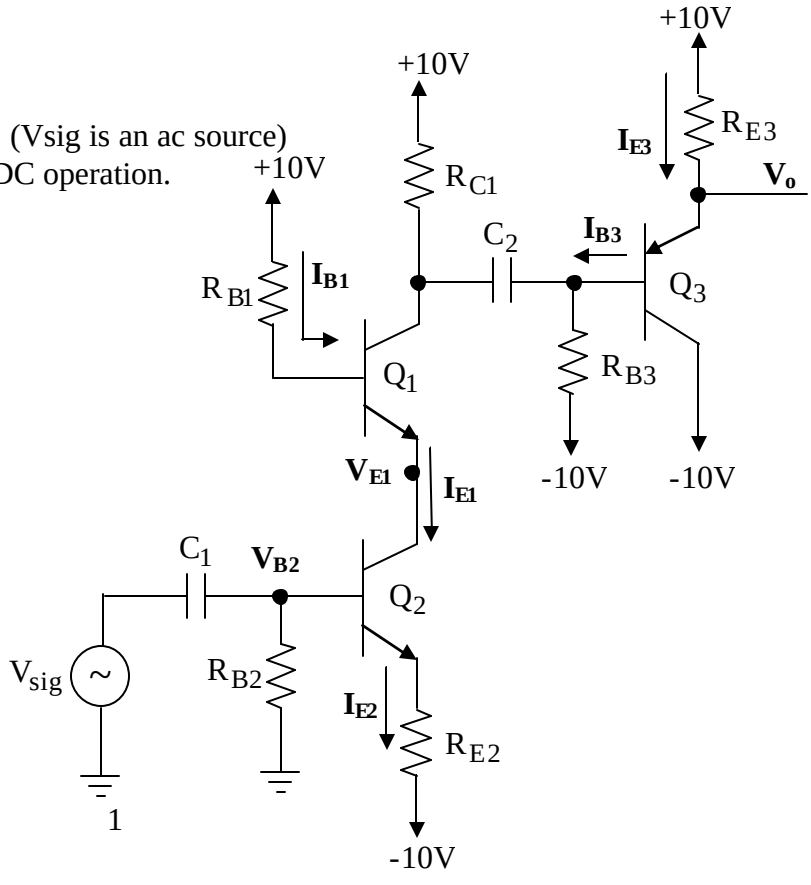
2. Use $|V_{BE}|=0.7$, $\beta=100$. Find voltages at all nodes and the currents through all branches.



3. Assume active operation for all transistors. (Vsig is an ac source)
Assume that the capacitors act as an open for DC operation.

(a) Find the symbolic equations for the DC values for I_{E1}, I_{E2}, I_{B1}, I_{E3}, I_{B3}, V_o, V_{E1}

(b) Draw the hybrid-π or model-T AC circuit



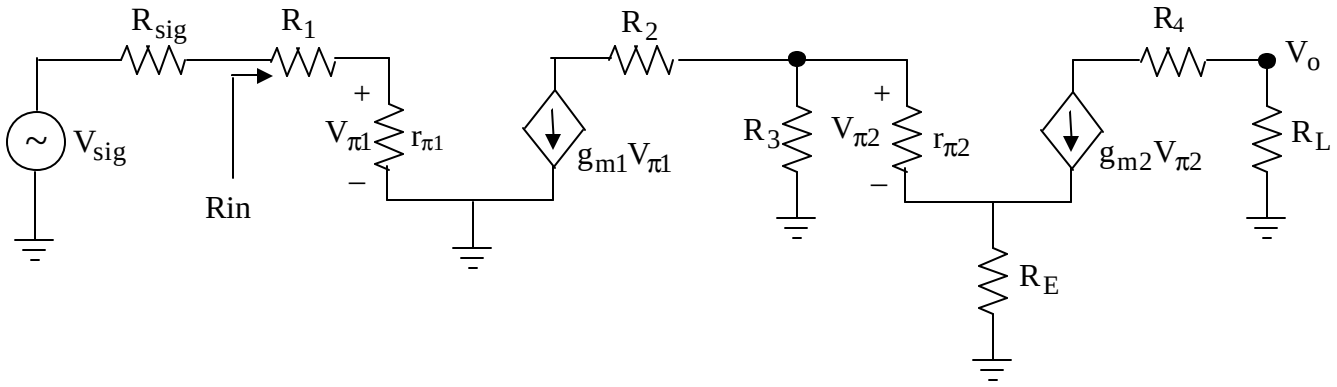
4. Use $|V_{BE}|$=0.7, β=20, V_T=25mV (Vsig is an ac source), ignore r_o.

This small-signal model circuit is shown below. It was found through a DC analysis that **I_{C1}=1mA and I_{C2}=2mA**.

(a) Find the ac parameters, $r_{\pi 1}$ and gm_2

(b) Find a symbolic equation for the input resistance, R_{in}. (Ignore the AC input source and Rsig, include R1)

(c) Find a symbolic expression for the overall gain, $\frac{Vo}{Vsig}$.



5. Use $|V_{BE}|$=0.7, β=100, V_T=25mV (Vs is an ac source), ignore r_o. This small-signal model comes from a circuit that has 2 transistors Q1 and Q2 denoted below as subscripts 1 and 2. It was found that I_{E1}=2.525m and I_{E2}=1.2625m. Find R_{in}(ignore Vs and 10Ω), R_{out}(ignore R_L), and midband gain, Vo/Vs.