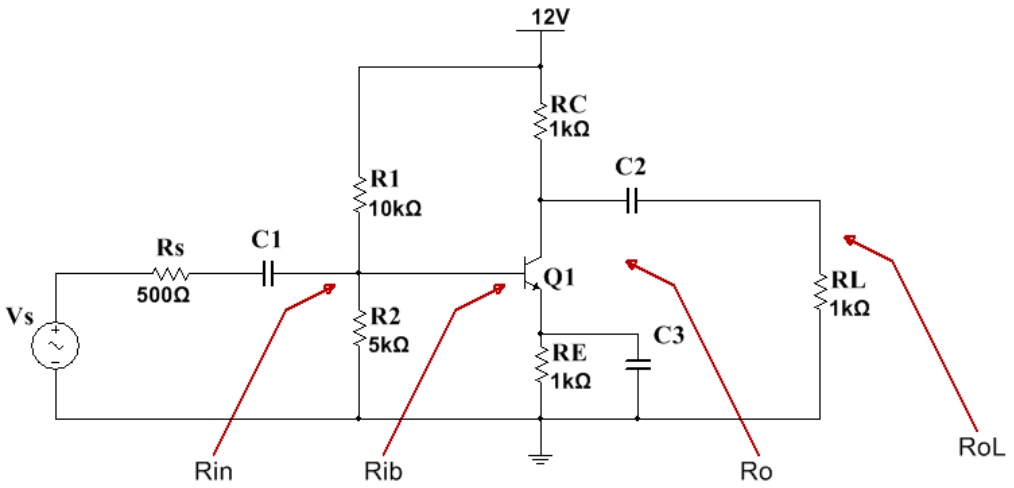
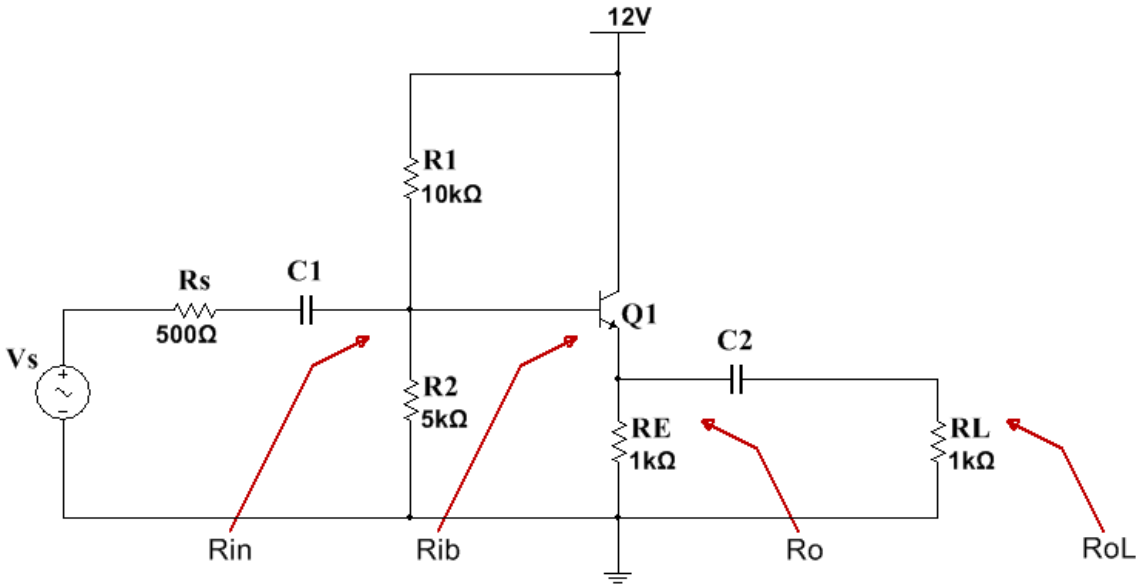
Assignment #2: Amplifier Circuits
ENEL469: Analog Electronics

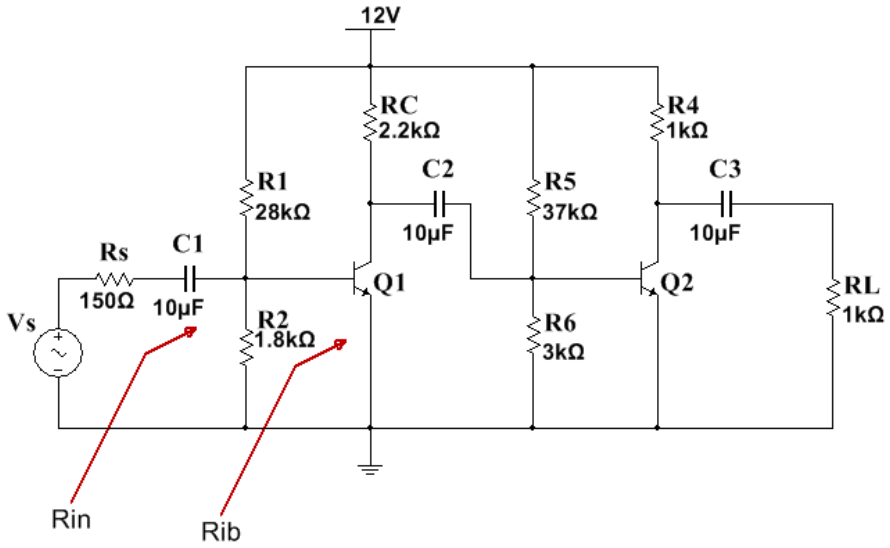
1. Consider the following common emitter amplifier circuit where $\beta = 70$, $V_{BE(ON)} = 0.7$ V, $V_A = 100$ V, $v_s = 10$ mV and $V_{CE(Sat)} = 0.2$ V. Determine: small-signal parameters ($r\pi$, r_e, r_0 and g_m), R_{in}, R_{ib}, R_0, R_{0L}, signal current in collector (i_c), signal voltage at collector (v_c). Use π model and do not ignore output resistance r_0. Assume that the capacitors are large enough for the signal frequency.



2. Consider the following common collector amplifier circuit where $\beta = 70$, $V_{BE(ON)} = 0.7$ V, $V_A = 100$ V, $v_s = 10$ mV and $V_{CE(Sat)} = 0.2$ V. Determine: the small-signal parameters ($r\pi$, r_e, r_0 and g_m), R_{in}, R_{ib}, R_0, R_{0L}, voltage across the load R_L. Use T model and do not ignore output resistance r_0. Assume that the capacitors are large enough for the signal frequency.



3. Consider the following two-stage common emitter amplifier circuit where the transistors are identical. Given that $\beta = 70$, $V_{BE(ON)} = 0.7$ V, $V_A = 100$ V, $v_s = 10$ mV and $V_{CE(Sat)} = 0.2$ V. Determine: small-signal parameters ($r\pi_1$, $r\pi_2$, r_{e1}, r_{e2}, r_{01} r_{02} and g_{m1}, g_{m2}), R_{in}, R_{ib}, signal currents flowing in both collectors (i_{c1}, i_{c2}) signal voltage at both collectors (v_{c1}, v_{c2}). Do not ignore output resistance r_0. Assume that the capacitors are large enough for the signal frequency.



4. Consider the following two-stage amplifier circuit where the transistors are identical. Given that $\beta = 70$, $V_{BE(ON)} = 0.7$ V, $V_A = 100$ V, $v_s = 10$ mV and $V_{CE(Sat)} = 0.2$ V. Determine: the voltage across load resistor RL and output resistance R_{0L} as indicated in the circuit below. Do not ignore output resistance r_0. Assume that the capacitors are large enough for the signal frequency.