Homework 9 Due Thursday, Apr 11th, 2013 (In Class)

Problem 7.17

For the common-emitter circuit in Figure P7.17, the transistor parameters are: $\beta = 100$, $V_{BE}(\text{on}) = 0.7$ V, and $V_A = \infty$. (a) Calculate the lower corner frequency. (b) Determine the midband voltage gain. (c) Sketch the Bode plot of the voltage gain magnitude.

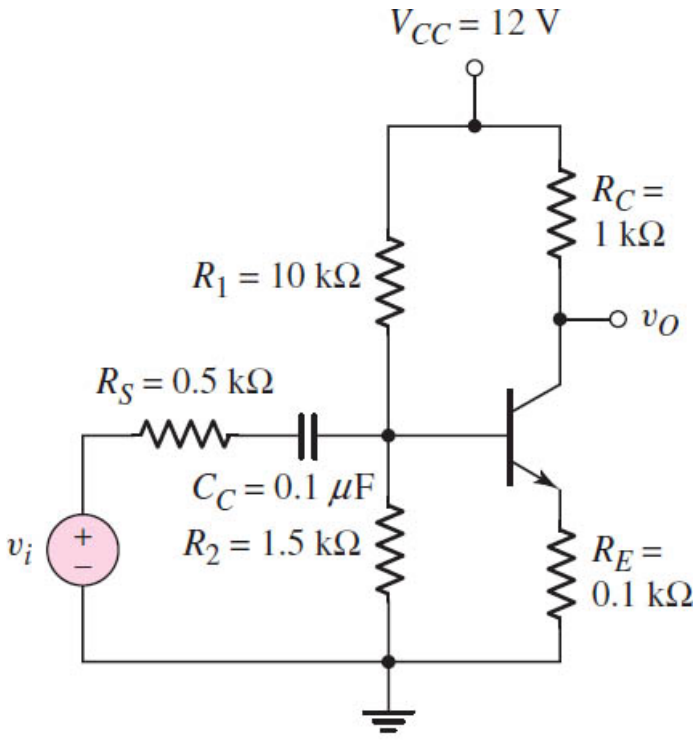

Figure P7.17

Problem 7.21

For the circuit in Figure P7.21, the transistor parameters are $\beta = 120$, $V_{BE}(on) = 0.7$ V, and $V_A = 50$ V. (a) Design a bias-stable circuit such that $I_{EQ} = 1.5$ mA. (b) Using the results of part (a), find the small-signal midband voltage gain. (c) Determine the output resistance R_o. (d) What is the lower 3-dB corner frequency?

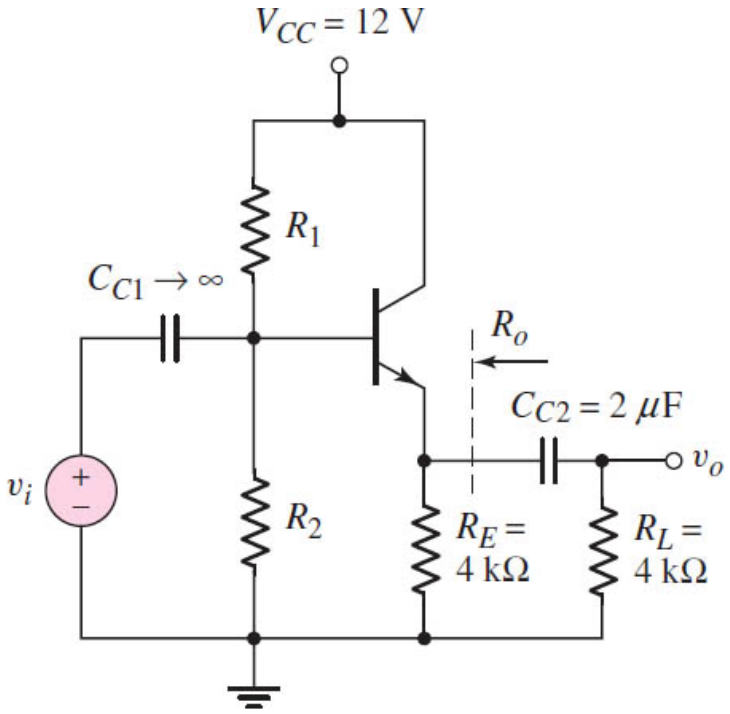

Figure P7.21

Problem 7.23

Consider the circuit shown in Figure P7.23. (a) Write the transfer function $T(s) = V_o(s)/V_i(s)$. Assume $\lambda = 0$ for the transistor. (b) Determine the expression for the time constant associated with the input portion of the circuit. (c) Determine the expression for the time constant associated with the output portion of the circuit.

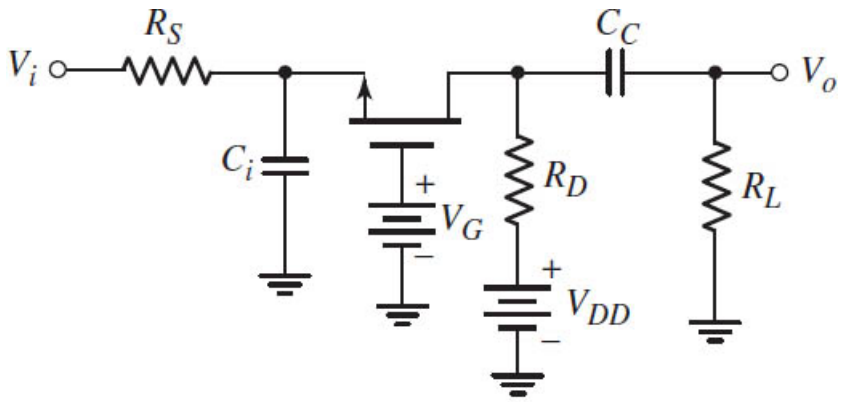

Figure P7.23

Problem 7.29

Reconsider the circuit in Figure P7.28. The transistor parameters are $\beta = 120$, $V_{BE}(on) = 0.7$ V, and $V_A = \infty$. The circuit parameters are $V^+ = 3.3$ V and $R_S = 100\,\Omega$. (a) Find R_B and R_E such that $I_{EQ} = 0.25$ mA and $V_{CEQ} = 1.8$ V. (b) Using the results of part (a), find the value of C_C such that $f_L = 20$ Hz. (c) Determine the midband voltage gain.

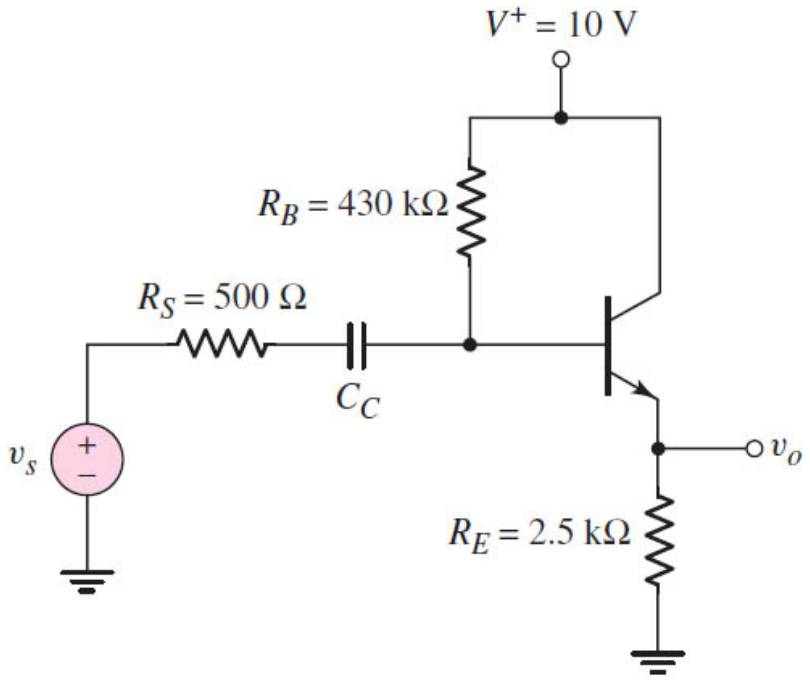

Figure P7.28

Problem 7.39

For the circuit in Figure P7.39, the transistor parameters are: K_n = 0.5 mA/V^2, V_{TN} = 2 V, and λ = 0. Determine the maximum value of C_L such that the bandwidth is at least B_W = 5 MHz. State any approximations or assumptions that you make. What is the magnitude of the small-signal midband voltage gain? Verify the results with a computer simulation.

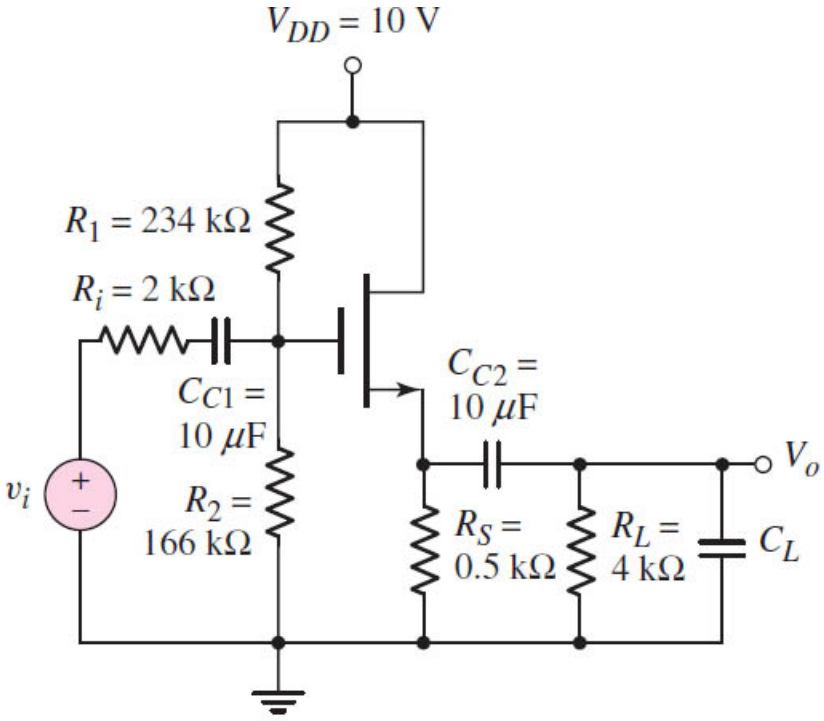

Figure P7.39