Homework 10

Sanjay Krishna: University of New Mexico

Problem 7.31

Consider the circuit shown in Figure P7.30. The time constant associated with C_{C2} is a factor of 100 larger than the time constant associated with C_{C1}. (a) Determine C_{C1} such that the −3 dB frequency associated with this capacitor is 20 Hz. (b) Find C_{C2}.

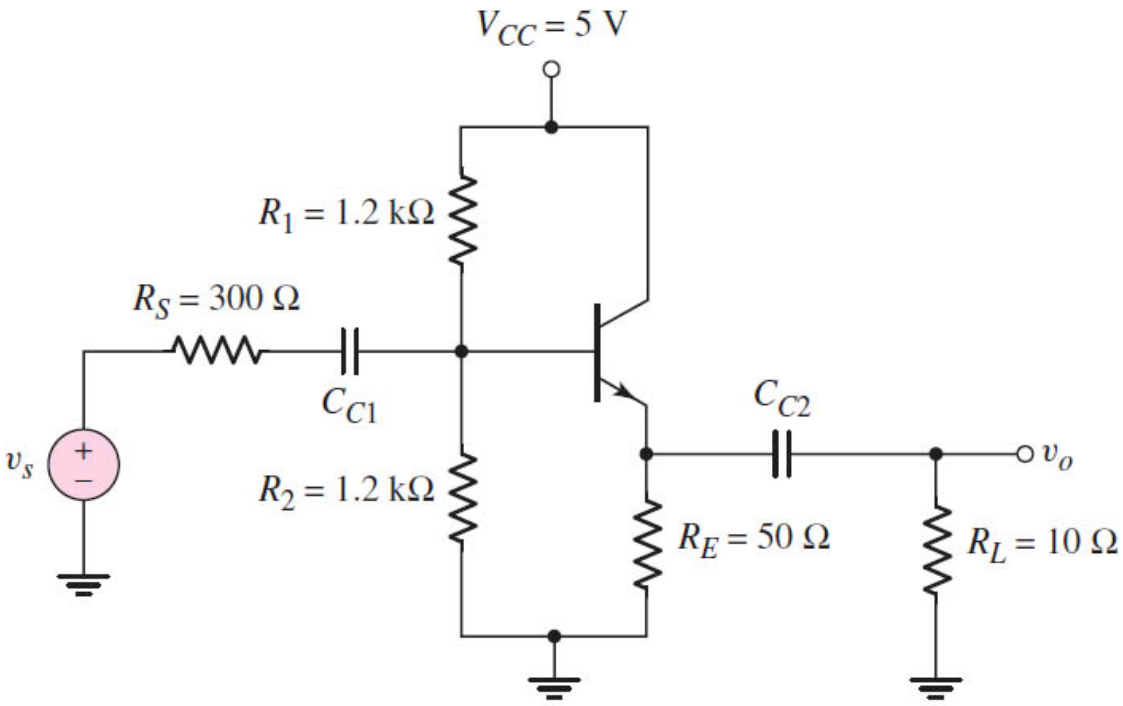

Figure P7.30

Problem 7.41

In the common-source amplifier in Figure 7.25(a) in the text, a source bypass capacitor is to be added between the source terminal and ground potential. The circuit parameters are $R_S = 3.2\ \text{k}\Omega$, $R_D = 10\ \text{k}\Omega$, $R_L = 20\ \text{k}\Omega$, and $C_L = 10$ pF. The transistor parameters are $V_{TP} = -2$ V, $K_P = 0.25\ \text{mA/V}^2$, and $\lambda = 0$. (a) Derive the small-signal voltage gain expression, as a function of *s*, that describes the circuit behavior in the high-frequency range. (b) What is the expression for the time constant associated with the upper 3-dB frequency? (c) Determine the time constant, upper 3-dB frequency, and small-signal midband voltage gain.

Problem 7.49

Consider the circuit in Figure P7.49. Calculate the impedance seen by the signal source V_i at (a) $f = 1$ kHz, (b) $f = 10$ kHz, (c) $f = 100$ kHz, and (d) $f = 1$ MHz.

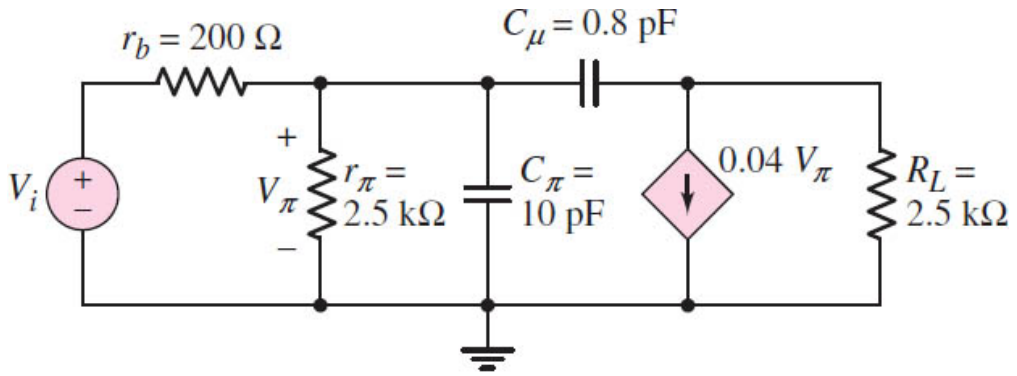

Figure P7.49

Problem 7.59

A common-source equivalent circuit is shown in Figure P7.59. The transistor transconductance is g_m = 3 mA/V. (a) Calculate the equivalent Miller capacitance. (b) Determine the upper 3 dB frequency for the small-signal voltage gain.

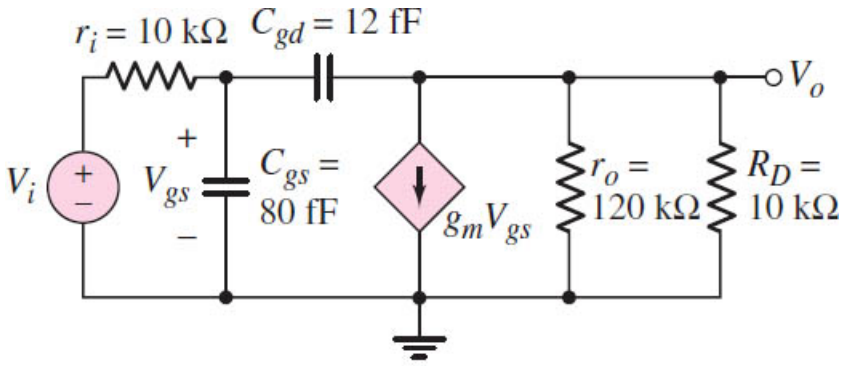

Figure P7.59

Problem 7.63

For the FET circuit in Figure P7.63, the transistor parameters are: K_n = 1 mA/V^2, V_{TN} = 2 V, λ = 0, C_{gs} = 50 fF, and C_{gd} = 8 fF. (a) Draw the simplified high-frequency equivalent circuit. (b) Calculate the equivalent Miller capacitance. (c) Determine the upper 3 dB frequency for the small-signal voltage gain and find the midband voltage gain.

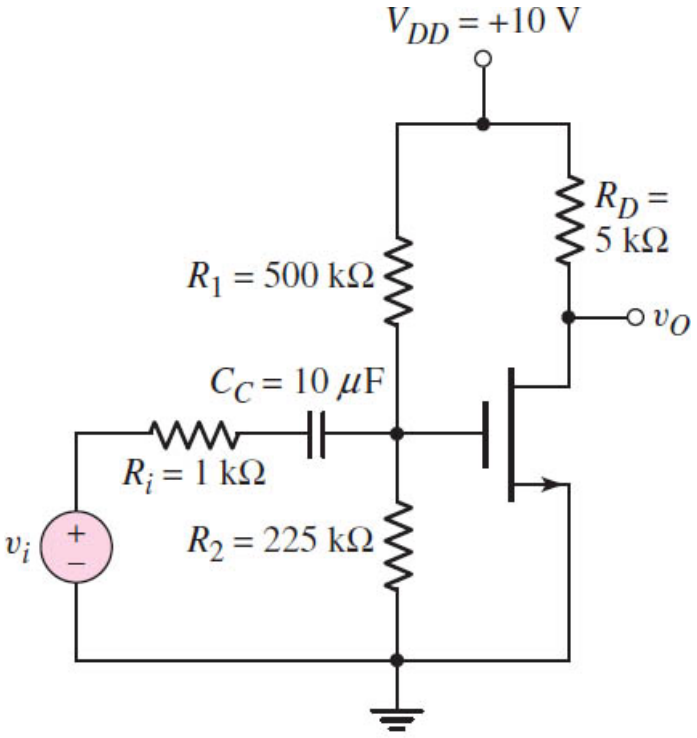

Figure P7.63