EHB 335E HW#2

Due: 15 November 2020 @ 22 o'clock – No late homework will be accepted.

1) Consider the amplifier below. Assume that C_1 and C_2 are coupling capacitors, and C_3 is a by-pass capacitor. Assume that $V_A < \infty$.
   a. Using the short-circuit time constant method, find an expression for the lower corner frequency (−3 dB frequency).
   b. Find the mid-band voltage gain expression.
   c. Using the Miller approximation, derive the expressions for the high-frequency poles. Consider C_π and C_μ of the transistor.
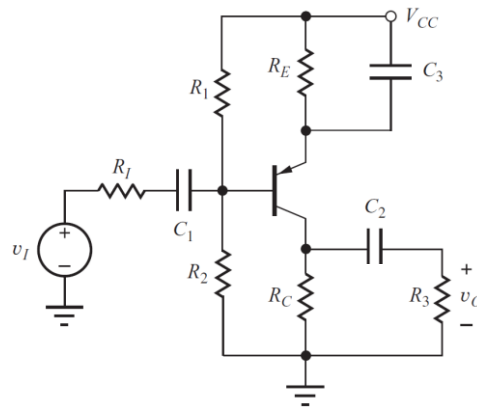
2) A manufacturing error caused a parasitic resistance to appear in series with the source of M_1, as shown in the figure below left. Assuming $\lambda > 0$ and neglecting other capacitances, determine the input and output poles of the circuit. Assume that both capacitors create high-frequency poles.
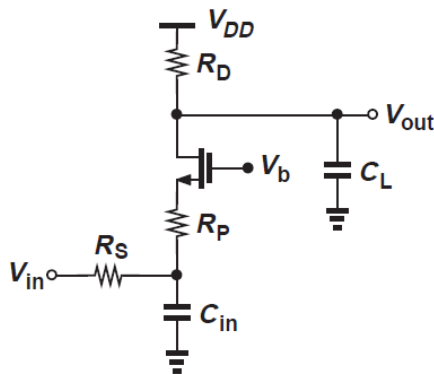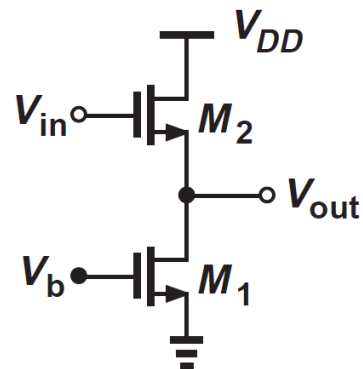

Figure of Question 2   Figure of Question 3

3) By using the open-circuit time constant method, determine the upper corner frequency (−3 dB frequency) of the amplifier in the figure above right. Assume that $\lambda > 0$.

4) The amplifier below must drive a load capacitance of 200 fF. Use 2N2222 npn transistor in LTSpice. No need for hand calculations; please provide just the outcomes of LTSPICE/PSPICE simulations.
   a. Select the input DC level to obtain an output DC level of 1.3 V.
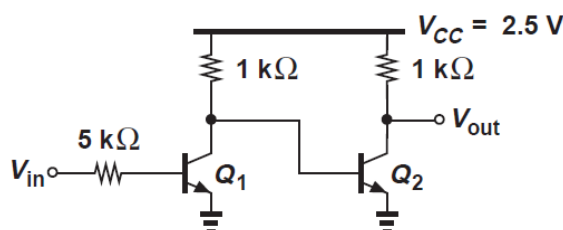   b. Plot the frequency response and find the low-frequency gain and the −3 dB bandwidth from the simulation results.

Figure of Question 4