Instructions, notes, and hints:

Provide the details of all solutions, including important intermediate steps. You will not receive credit if you do not show your work.

Some problems might be solvable (or must be solved) using good engineering approximations or assumptions. In those cases, your answer might differ from the posted answer by a fairly large margin. Given typical device variations and component tolerances, that amount of discrepancy is often reasonable. If you justify any approximations you make, you will be given full credit for such answers.

Prob. 9.11: The value for the input resistance $R_{in}$ applies in the mid-band frequency range.

Prob. 9.12: The poles associated with $C_{C1}$ and $C_{C2}$ each contribute 5% of the value of $f_L$, and the pole associated with $C_E$ contributes 90%.

Prob. 9.15: a) The gain expression should be in the form

$$A(s) = A_M F_L(s),$$

where $A_M$ (which is not a function of $s = j\omega$) is the mid-band gain, and $F_L(s)$ is a function with a peak magnitude of unity that describes the low-frequency response. b) The “factor” is a symbolic expression that is a function of $R_e$.

Prob. 9.34: Capacitance $C_L$ might be part of the load (realistic loads are rarely purely resistive), the drain-to-source capacitance $C_{ds}$ of the MOSFET, or a combination of both.

Prob. 9.42: At relatively high bias currents, $C_π >> C_μ$.

Assignment:


1. Prove that a gain roll-off of 6 dB per octave is quantitatively the same as 20 dB per decade.

2. In an amplifier whose high-frequency roll-off is due to multiple high-frequency poles but no zeroes, the gain at frequencies well above all of the pole frequencies rolls off as $1/f^n$, where $n$ is an integer. For an amplifier with three high-frequency poles, what is $n$? You must show your work to receive any credit for this problem.