

EECS 140, Fall 91
Quiz 2
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OPEN BOOK: Present the essence of your solution for each problem on the front of a page. The back sides of the pages may be used for computations but will not be evaluated. Do not use blue books.

Problem #1

1. A two-stage amplifier is shown in Figure Q2.1. Values of the BJT parameters for the two devices are given in the figure.
 - a. For $V_A = \infty$ and $R_e = 0$, estimate the frequency response of the overall voltage gain, $A_v = v_o/v_s$.
 - b. How is the frequency response changed if $V_A = 100V$?
(Use approximations to arrive at a conclusion.)
 - c. How does the product of the low-frequency gain and the -3dB bandwidth change as R_e is increased from zero to 10ohms?

note: this problem refers to Figure Q2.1 which is a circuit diagram

Problem #2

2. A feedback amplifier is shown in Figure Q2.2. Bias levels and circuitry are assumed present to produce the specified collector currents, $I_c = 1mA$.
 - a. Establish whether the overall feedback is positive or negative.
 - b. With respect to the output node v_{o1} , what is the value of the open-loop gain, a_L ?
 - c. What is the value of the open-loop gain a_L with respect to the output node v_{o2} ?
 - d. Estimate the value of the output resistance seen from v_{o1} and from v_{o2} .

note: this problem refers to Figure Q2.2 which is a circuit diagram

Problem #3

3. A feedback amplifier is modeled as in Figure Q2.3.

- a. Sketch the locii of the natural frequencies of the closed-loop amplifier as the amplifier gain value, av_o , is increased from zero.
- b. For $R_f = 100k$, what value of av_o is required to achieve a maximally flat magnitude response for the closed-loop gain, $Av(s)$?
- c. If the value of av_o is fixed at -100, and if a_{Lo} is varied by changing R_f , what value of R_f is needed to achieve the MFM response?

note: this problem refers to Figure Q2.3 which is a circuit diagram

Problem #4

4. A simple MOS amplifier is shown in Figure Q2.4. The biasing elements provide drain currents of $ID = 0.1mA$. Device parameters include $W/L = 10$, $KP=40\mu A/v^2$, $LAMBDA=0$.

- a. For a 'following' measurement system passband of 2megHz, estimate the value of the minimum detectable signal with respect to v_s .
- b. If a feedback resistance, $R_f = 100k$, is ac-connected in a shunt-shunt arrangement without changing the bias state, how is the result of Part a changed?

note: this problem refers to Figure Q2.4 which is a circuit diagram

**Posted by HKN (Electrical Engineering and Computer Science Honor Society)
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