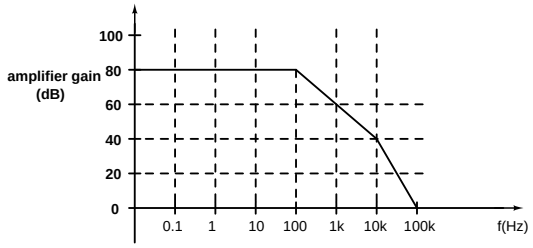
INEL 4202 Fall 2012 - Partial Exam 2 - Practice problems

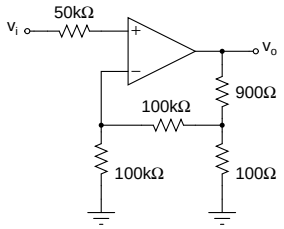
1. Shown below is the frequency response for the voltage gain of a non-feedback amplifier. Determine the approximate value of the feedback network's β that will yield a phase margin of 60 degrees.



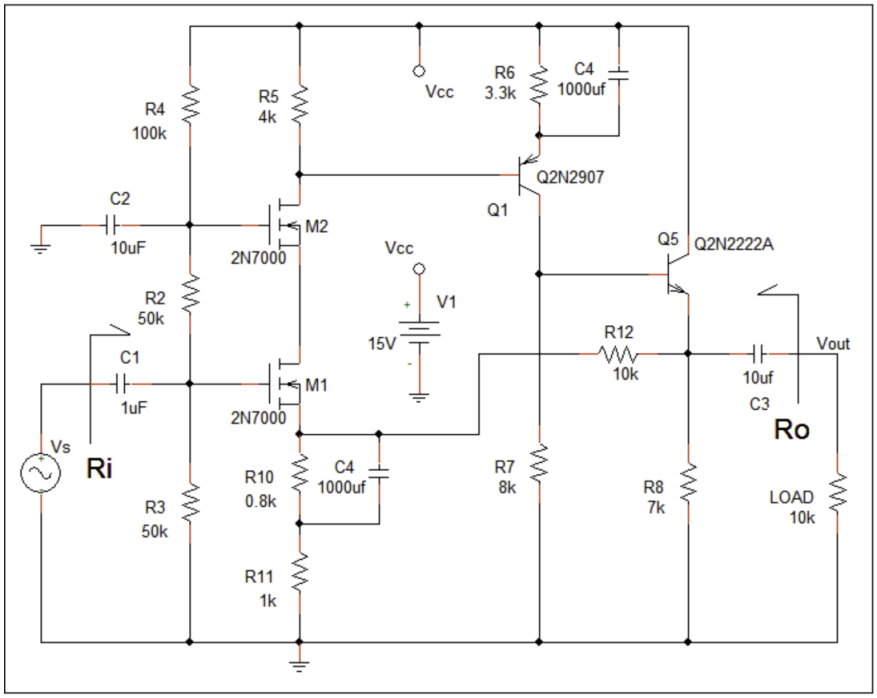
2. In the amplifier shown below, voltage-sampling, voltage-mixing feedback is employed. The active element is an opamp, for which the open-loop gain is 10^5, the output resistance is $r_O = 1k\Omega$, and the input resistance is $r_d = 100k\Omega$.

   a) Find the feedback network's β, R_{11} and R_{22}.

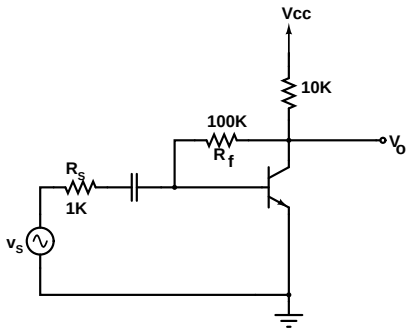
   b) Use feedback theory to find the feedback amplifier's voltage gain A_{vf}, input resistance R_{if} and output resistance R_{of}.



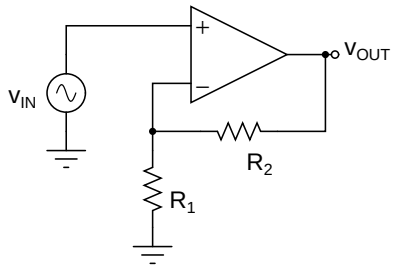
3. Determine the voltage gain $A_v = v_{out}/v_s$, $R_i = v_s/i_s$, and R_o (as shown). Assume all $C_s = \infty$ and the following parameters: MOSFETs - $g_m = 2mA/v$, $r_{ds} = \infty$; BJTs - $\beta = h_{fe} = 200$, $r_\pi = 4.5k\Omega$ and $r_o = \infty$.



4. In the following amplifier, voltage-sampling, current-mixing feedback is used. Find the feedback amplifier transresistance, R_{mf}. Assume that the capacitor is a short circuit at the operating frequency. Use $h_{fe} = 100$ and $r_\pi = 2k\Omega$.



5. In the following amplifier, the opamp has an open-loop d.c. gain of 10^4 and 4 poles at 1MHz, 10MHz, 10MHz and 200MHz. Find the smallest ratio R_2/R_1 for which the amplifier is stable.



6. For a current-mixing feedback amplifier, $R_{if} = 110\Omega$, $R_{of} = 26k\Omega$, $A_f = 20$, and $\omega_{L,f} = 10rad/s$. For the associated non-feedback amplifier, $R_o = 2k\Omega$ and $\omega_H = 10^4 rad/s$.

   a) Find the non-feedback amplifier R_i, A and ω_L.

   b) What's the feedback's network β?

7. A feedback amplifier displays a transresistance gain $R_{Mf} = 10^5\Omega$, $R_{if} = 10\Omega$ and $R_{of} = 10\Omega$. The feedback type is voltage-sampling, current-mixing with $\beta = 0.9\times10^{-5}$. The source's Thevenin resistance is $R_s = v_s/i_s = 1k\Omega$ and $R_L = v_o/i_o = 2k\Omega$.

   a) Determine the current and voltage gains, $A_{vf} = v_o/v_s$ and $A_{if} = i_o/i_s$ respectively, of the feedback amplifier.

   b) Find the transresistance gain $R_M = v_o/i_s$, input resistance R_i and output resistance R_o of the non-feedback amplifier.

   c) Determine the current and voltage gains of the non-feedback amplifier.