

PROBLEM SET #7

Issued: Tuesday, March 10, 2009

Due: Tuesday, March 17, 2009, **5:00 p.m.** in the EE 140 homework box in 240 Cory

1. For the integrator in Figure PS7-1(i):

(a) Find the transfer function and sketch Bode plots if the amplifier is ideal.

(b) Find the transfer function and sketch Bode plots if $A(s) = \frac{A_0}{1 + \frac{s}{\omega_p}}$.

(c) If the amplifier offset is $V_{os} = 1mV$ calculate the value of R_f in Figure PS7-1(ii) such that $|V_{out}| = 0.5V$ when no input signal is applied.

(d) Repeat (b) with R_f included (as in Figure PS7-1(ii)).

$$R = 1k\Omega, C = 1nF, A_0 = 10^5, \omega_p = 10 \frac{rad}{s}$$

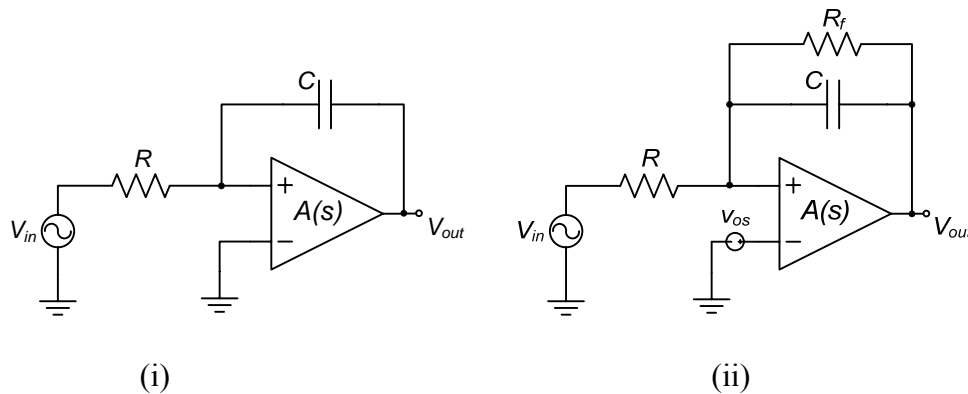


Figure PS7-1

2. Razavi, Chapter 9: Problem 9.2, except (d).

3. Razavi, Chapter 9: Problem 9.4, except (e).

4. Razavi, Chapter 9: Problem 9.18.

5. Calculate bias currents and the low frequency small-signal voltage gain for the CMOS op amp of Figure PS7-5. Use the the following parameters: $t_{ox}=8$ nm, $\mu_n=450$ cm²/VS, $L_d=0.09$ μ m, and assume that $X_d = 0.1$ μ m and $dX_d/V_{DS}= 0.04$ μ m/V for all the transistors at the operating point. Calculate the input common mode range assuming that the wells of M1 and M2 are connected to their common-source point. Calculate the low-frequency gain from each supply to the output. Check these calculations with SPICE simulation.

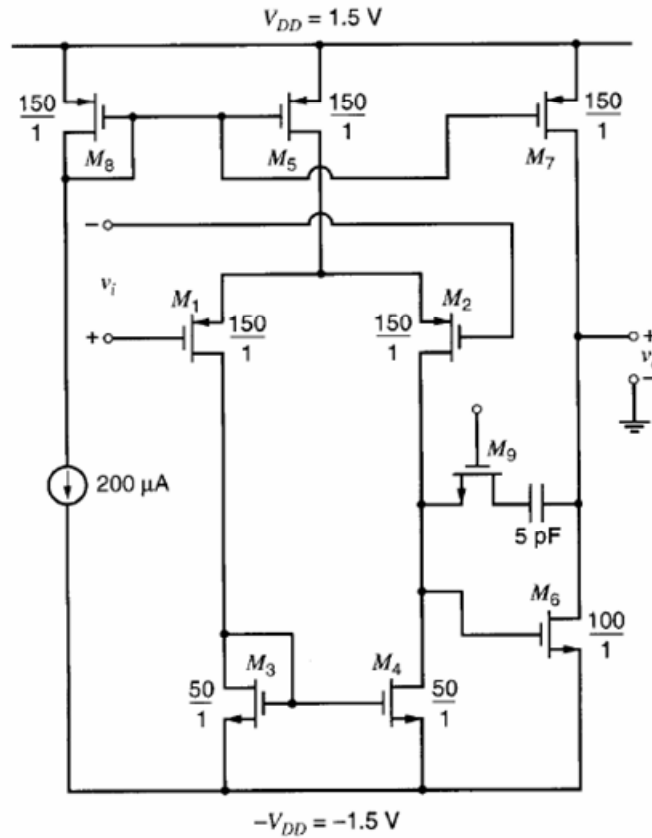


Figure PS7-5