EE140/240A Problem Set 10

sashank@berkeley.edu

Due: Apr 26, 2024

You will compute answers symbolically for all the problems in this problem set. In all problems with transistors, assume that the transistors are in saturation.

Problem 1. 5+1+4 points Assume that the op-amp in Fig. 1 is a voltage controlled voltage source with gain A and output resistance r_o. Using 2-port

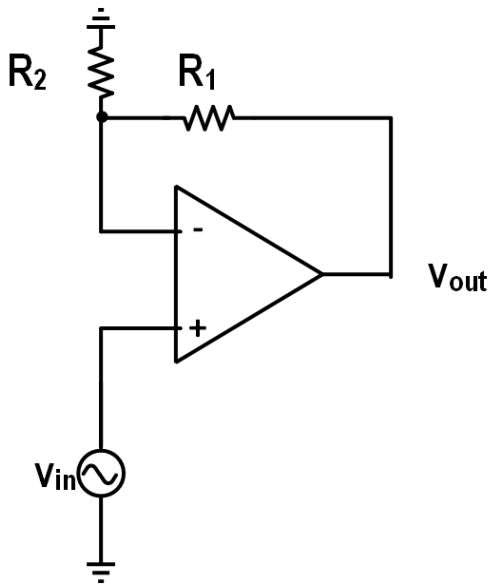

Figure 1: Problem 1

feedback techniques, compute the following

(a) Type of feedback, loop gain and closed loop gain

(b) Closed-loop input resistance

(c) Closed-loop output resistance

Problem 2. 5+1+4 points Assume that the op-amp in Fig. 2 is a voltage controlled voltage source with gain A and output resistance r_o.

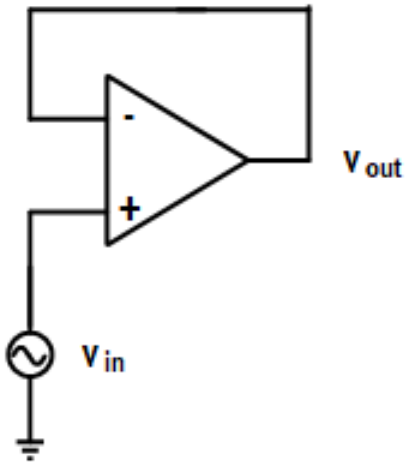

Figure 2: Problem 2

Using 2-port feedback techniques, compute the following

(a) Type of feedback, loop gain and closed loop gain

(b) Closed-loop input resistance

(c) Closed-loop output resistance

Problem 3. 5+1+4 points

Consider the source follower shown in Fig. 3. Using 2-port feedback techniques, compute the following

(a) Type of feedback, loop gain and closed loop gain

(b) Closed-loop input resistance

(c) Closed-loop output resistance

Give your answers in terms of g_ms and r_os of the respective transistors.

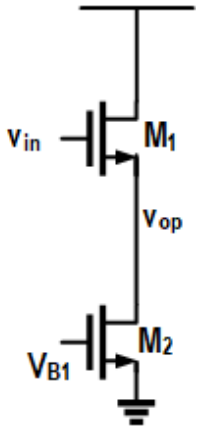

Figure 3: Problem 3

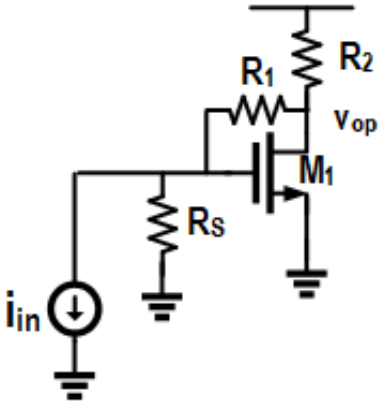

Figure 4: Problem 4

Problem 4. 4+2+4 points Consider the circuit shown in Fig. 4. Using 2-port feedback techniques, compute the following

(a) Type of feedback, loop gain and closed loop gain

(b) Closed-loop input resistance

(c) Closed-loop output resistance

Give your answers in terms of g_ms of the respective transistors and the resistors. Neglect channel-length modulation for this part.

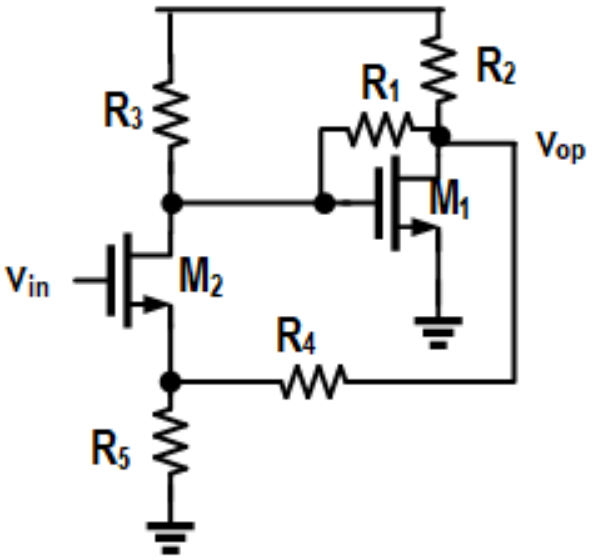

Figure 5: Problem 5

Problem 5. 5+1+4 points Consider the circuit shown in Fig. 5. Using 2-port feedback techniques, compute the following

(a) Type of feedback, loop gain and closed loop gain

(b) Closed-loop input resistance

(c) Closed-loop output resistance

Give your answers in terms of g_ms of the respective transistors and the resistors. Neglect channel-length modulation for this part.