

ANALOG SYSTEMS : PROBLEM SET 6

Problem 1

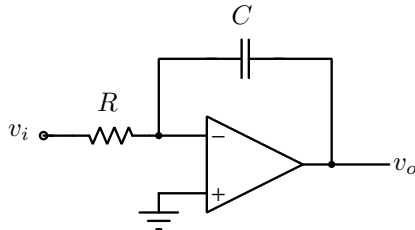


Figure 1: Circuit for Problem 1.

Fig. 1 shows an integrator. The opamp is ideal. The capacitor is initially uncharged. $v_i = \sin(\omega_o t)u(t)$, where $\omega_o = 1/RC$ and $u(t)$ is the unit step function. Draw to scale, on the same graph, v_i and v_o . Repeat with $v_i = \cos(\omega_o t)u(t)$.

Problem 2

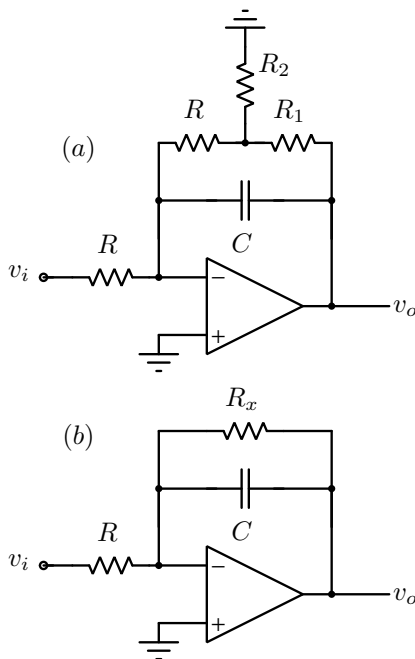


Figure 2: Circuit for Problem 2.

All opamps are ideal in Fig. 2. Determine the dc gain and 3-dB bandwidth of the circuit of Fig. 2(a). What R_x should be chosen in the circuit of Fig. 2(b) to obtain the same transfer function?

Evaluate R_x in the limiting case when $R_1, R_2 \ll R$. What might be the utility of the T-network in Fig. 2(a)?

Problem 3

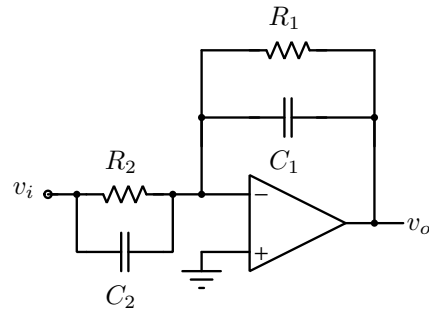


Figure 3: Circuit for Problem 3.

Determine the transfer function of the circuit of Fig. 3. Sketch a Bode plot.

Problem 4

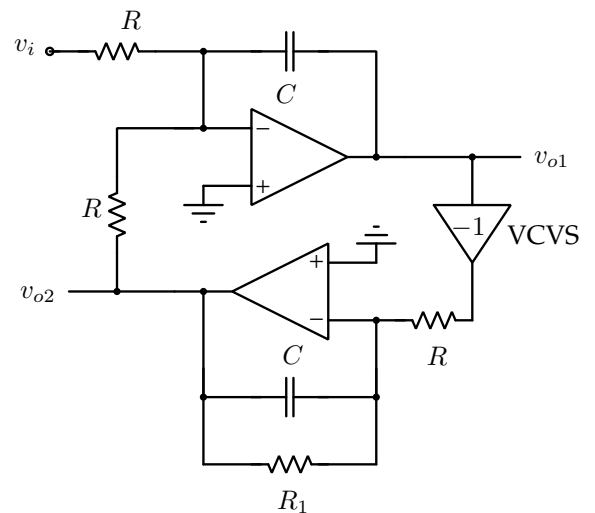


Figure 4: Circuit for Problem 4.

The opamps are ideal. Determine the transfer functions from the v_i to v_{o1} and v_{o2} .

Problem 5

The opamps are ideal. The initial conditions are marked. Plot the waveforms v_{o1} and v_{o2} .

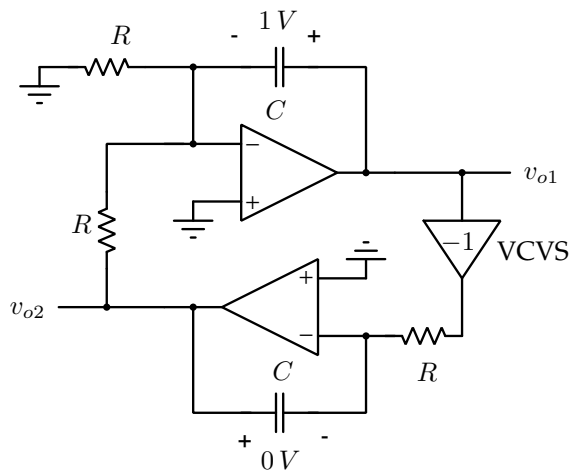


Figure 5: Circuit for Problem 5.

Problem 6

Consider the integrator of Fig. 1. The opamp is not ideal, but has a frequency dependent gain determined by GB/s , where GB denotes its gain-bandwidth product. Determine the integrator's transfer function, when a nonideal opamp is used.

Problem 7

Use the results of Problem 6 to evaluate the transfer function of the circuit of Fig. 4 when the opamps have a finite gain-bandwidth product. The VCVS can be assumed to be ideal.