Spring 2004; E4215: Analog Filter Synthesis and Design; HW1

Nagendra Krishnapura (nkrishna@vitesse.com)

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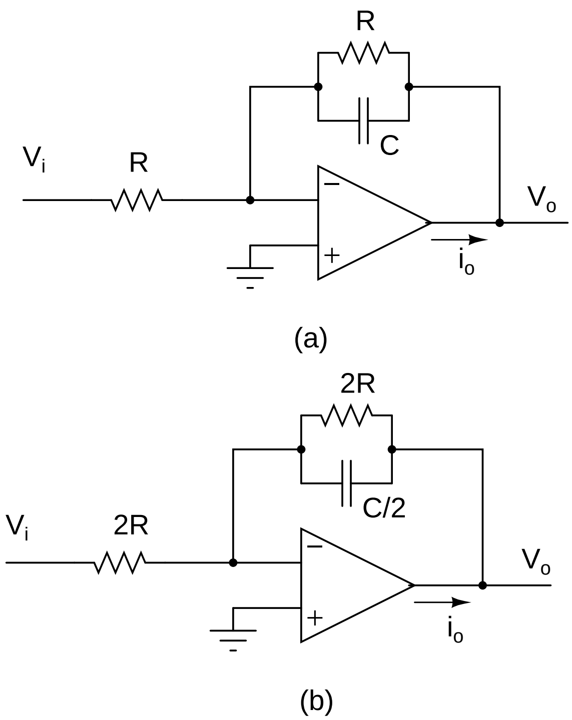

Figure 1:

1. (5 pts.) For the circuits in Fig. 1(a) and Fig. 1(b), evaluate the transfer function $H(s) = V_o(s)/V_i(s)$, and the impulse response $h(t)$ corresponding to $H(s)$. Approximately sketch the magnitude and phase of $H(s)$ (Bode Plot). What is the difference between the two circuits?

2. (5 pts.) In the circuits in Fig. 1(a) and Fig. 1(b), evaluate the current $i_o(t)$ driven from the opamp when the input $v_i(t) = 1\mathrm{V}\cos(t/RC)$. What is the difference between the two circuits?

3. (5 pts.) Evaluate the transfer function $H(s) = V_o(s)/V_i(s)$ in Fig. 2. Calculate the dc gain, poles and zeros of $H(s)$.

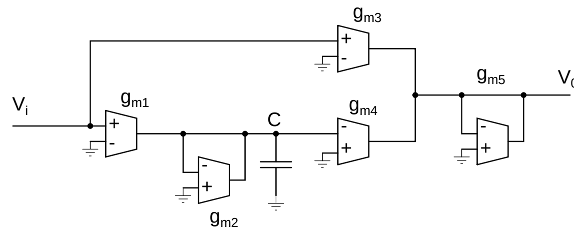

Figure 2:

4. (5 pts.) Write the expressions for the transfer function $H(s) = V_o(s)/V_i(s)$ for the circuits in Fig. 3(a) and Fig. 3(b). Sketch the Bode plots assuming $R_1C_1 = 4R_2C_2$.

5. (5 pts.) The circuit in Fig. 3(b) is driven by a pulse with an amplitude 1V and lasting T seconds (Fig. 3(c)). Assuming $T = R_1C_1$, sketch the intermediate voltage $v_x(t)$. Sketch the output voltage $v_o(t)$ assuming that $R_2C_2 = R_1C_1$.

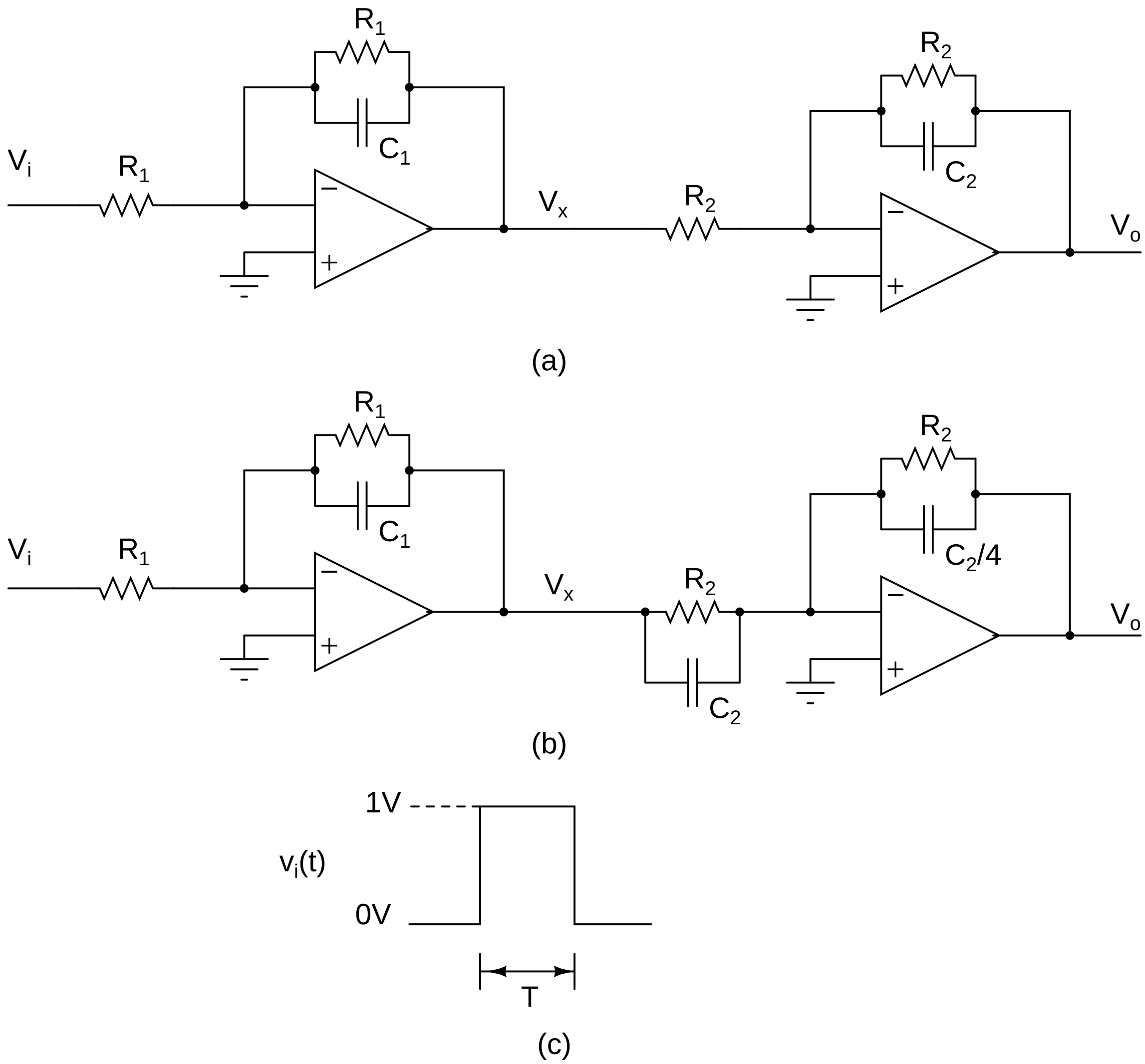

Figure 3: