

E4215: Analog Filter Synthesis and Design: HW1

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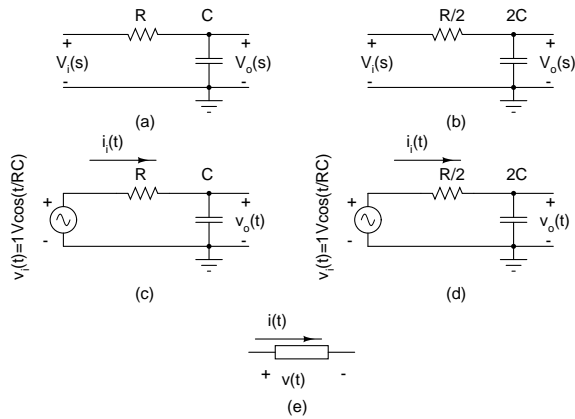


Figure 1:

- (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?
- (5 pts.) In the circuits in Fig. 1(c) and Fig. 1(d), evaluate the current $i_i(t)$ through the input voltage source. Evaluate the average power dissipated in the voltage source and the resistor. What is the difference between the two circuits?
Note: Average power dissipated in an element with a voltage $v(t)$ across it and a current $i(t)$ through it (see Fig. 1(e)) is given by

$$P = \frac{1}{T} \int_0^T v(t)i(t)dt$$

- (5 pts.) Write the expressions for the transfer function $H(s) = V_o(s)/V_i(s)$ for the circuits in

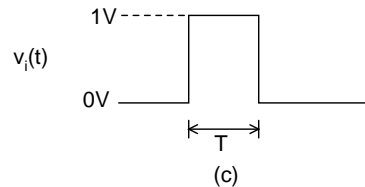
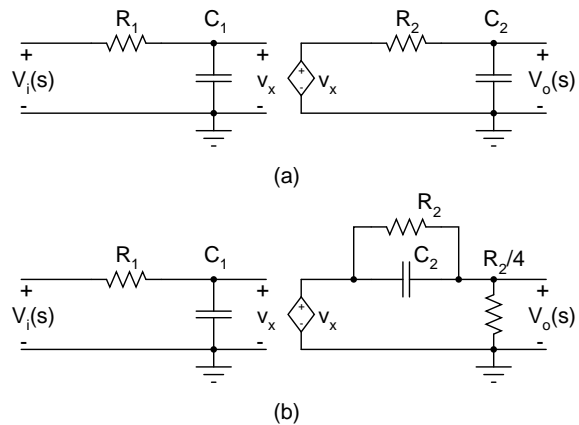


Figure 2:

- Fig. 2(a) and Fig. 2(b). Sketch the Bode plots assuming $R_1C_1 = 4R_2C_2$.
- (5 pts.) The circuit in Fig. 2(b) is driven by a pulse with an amplitude 1V and lasting T seconds (Fig. 2(c)). Assuming $T = R_1C_1$, sketch the intermediate voltage $v_x(t)$. Sketch the output voltage $v_o(t)$ assuming that $R_2C_2 = R_1C_1$.