EE2210 Electric Circuits **Fall 2021**

Homework 5 (Lecture 11-12)
Total points: 100

Please write down clearly the calculation/thinking process of each question. Unit is needed when applicable.

Due: Jan. 4th (Wed), 10:00am (in EECS room 518)

1. Consider the circuit in Figure 1.
   (a) Write expressions for $H(j\omega) = V_o/V_i$, its magnitude $|H(j\omega)|$, and its phase angle $\angle H(j\omega)$, as a function of ω. (15%)
   (b) Plot the frequency response of $H(j\omega)$. (15%)

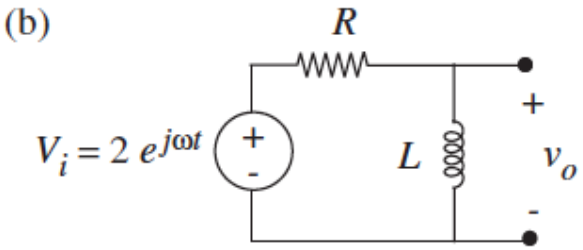

Figure 1.

2. The circuit shown in Figure 2 has an input voltage $V_{in}(t) = V_1\cos(120\pi t)$. Assume L = 500 mH, C = 80 μF, and R = 50 Ω. Compute the transfer function $H(s) = V_o(s)/V_{in}(s)$. (15%)

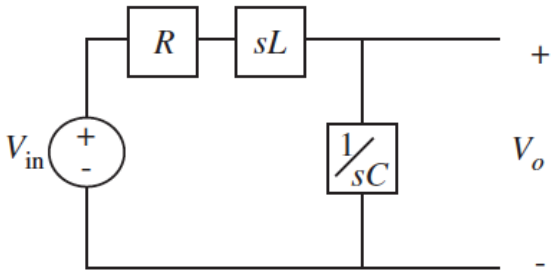

Figure 2.

3. Consider the circuit in Figure 3.
   (a) Assume the input v_i = 10*cos(100t + 45°). Derive the complete response of v_o, including the transient and steady-state response. (15%)
   (b) Derive the expression for the voltage transfer function $H(j\omega) = \frac{V_O}{V_i}$. (10%)
   (c) At what frequency will the magnitude of $H(j\omega)$ be maximum? (10%)
   (d) What is the maximum value of the magnitude of $H(j\omega)$? (10%)
   (e) Plot the frequency response of $H(j\omega)$. (10%)

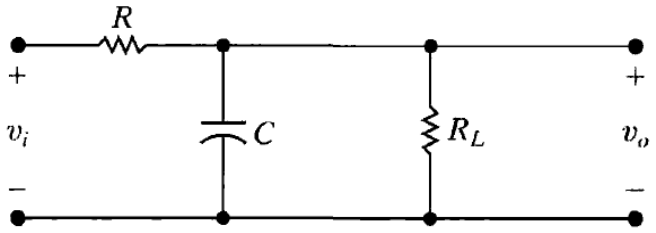

Figure 3.

4. The impedance $Z(j\omega)$ of the network shown in Figure 4 is found to be 2 kΩ and is purely real for all frequencies. The value of the inductor is 1 mH as shown. What are the values of R and C? (10%)

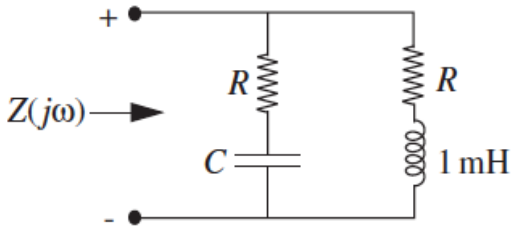

Figure 4.