

ECE 202 (Fall 2007)
Homework No. 3
Due: Monday, 09/17/2007

(P.1) [20 pts.] An R-L-C circuit consists of a 5 ohm resistor, an 16 mH inductor, and a 5 μ F capacitor connected in series. The circuit is excited by a voltage source:

$$v_s(t) = 120 \cos(5000t - 50^\circ) \text{ V.}$$

- a) Draw and label the phasor domain equivalent circuit. (8 pts)
- b) Find the equivalent impedance, Z_{eq} , of the circuit in polar form. (2 pts)
- c) Find the current through the circuit in phasor form. (2 pts)
- d) Find the steady-state current, $i(t)$. (2 pts)
- e) What is the resonance frequency, f_0 , of this circuit? (6 pts)

(P.2) [30 pts.] For the circuit in Figure 1, find Z_{eq} (6 pts), $i_1(t)$, $i_2(t)$, $i_3(t)$, $v_2(t)$ and $v_3(t)$ (4 pts. each) using frequency (phasor) domain approaches. The circuit elements have the following values:

$$R_1 = 4 \Omega, R_2 = 8 \Omega, C = 250 \mu\text{F}, L = 6 \text{ mH}$$

The excitation source is: $v_s(t) = 24 \cos(1000t + 60^\circ) \text{ V}$

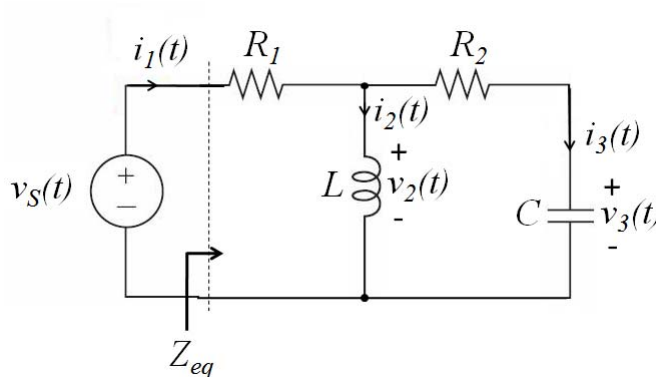


Figure 1 Circuit for Problem P.2

(P.3) [30 pts.] A general ac bridge circuit is shown in Figure 2. This bridge is *balanced* when no current flows through the ac meter (i.e., $V_2 = V_X$). If Z_1 is a 1-k Ω resistor, Z_2 is a 4.2-k Ω resistor, Z_3 is a parallel combination of a 1.5-M Ω resistor and a 12-pF capacitor, and $f = 2$ kHz, find: (a) a series components realization of Z_X , and (b) a parallel components realization for Z_X .

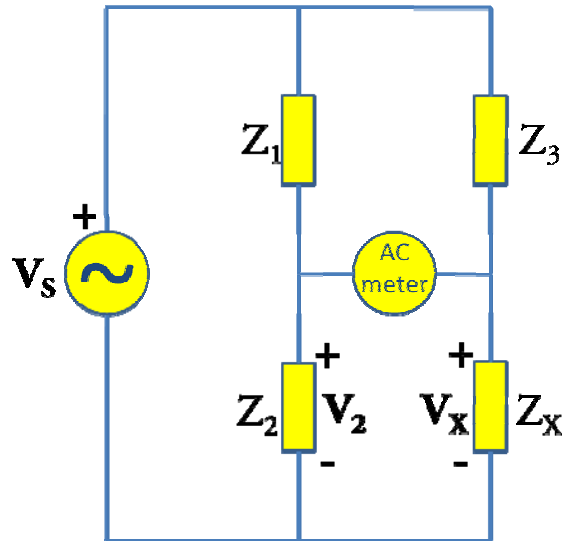


Figure 2. A general ac bridge circuit