Discussion 4A

The following sections of the textbook are useful for this discussion: 5.4, 5.5

1. Steady-State AC Node-Voltage Analysis (Hambley Example 5.6)

For this problem, assume you are told that the circuit in Figure 1 is in steady state.

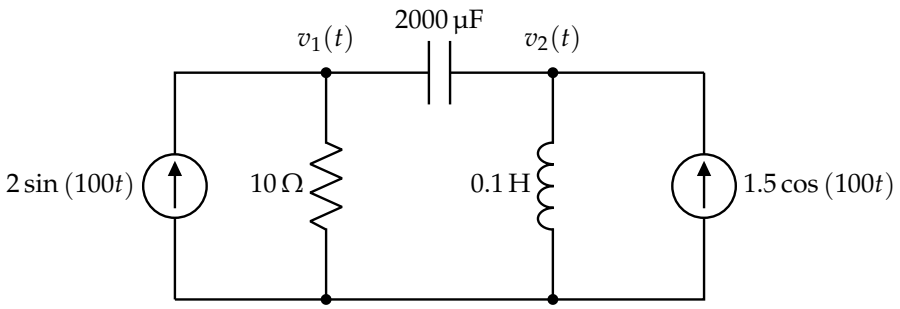


Figure 1

(a) **Redraw the given circuit in the phasor domain.** In other words, label the passive components with their impedances and sources with their phasor representation.

(b) **Set up a system of equations for $\mathbf{V_1}$ and $\mathbf{V_2}$ using node-voltage analysis.**

(c) **Using the systems of equations from part (b), solve for $v_1(t)$ in steady state.**

2. AC Power Calculations (Hambley Example 5.7)

Suppose you are given the circuit in Figure 2, where the phasor for current $i(t)$ is calculated to be $0.1414\angle 135^\circ$.

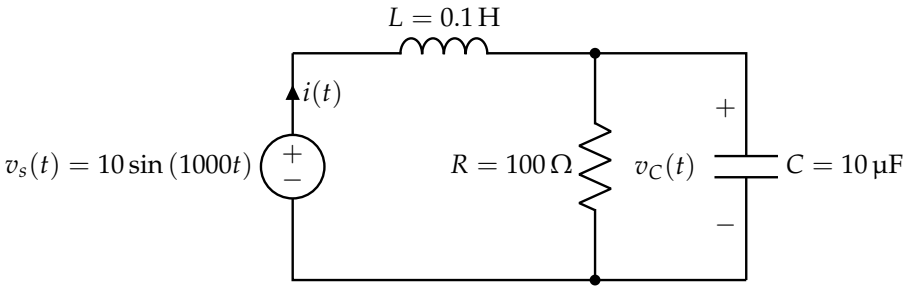


Figure 2: RLC Circuit

(a) **Compute the power and reactive power taken from the source in the circuit provided in Figure 2.**

(b) **Compute the power and reactive power delivered to each element in the circuit.** Assume you are given the computed currents in Figure 3.

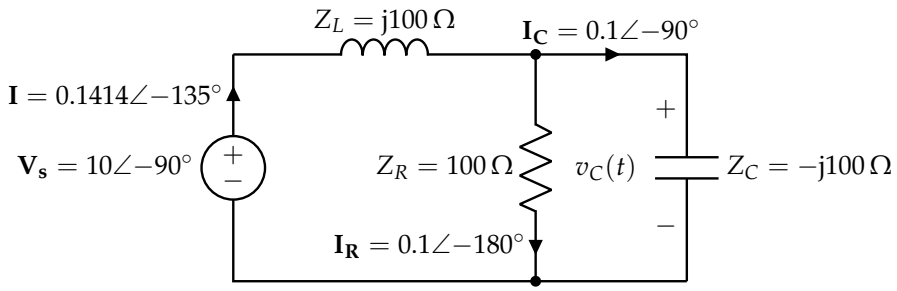
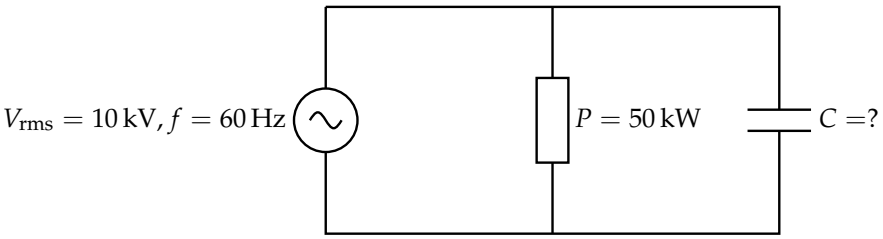


Figure 3: RLC Circuit

3. Power-Factor Correction (Hambley Example 5.9)

A 50 kW load operates from a 60 Hz 10 kV-rms line with a power factor of 60 percent lagging.



Compute the capacitance that must be placed in parallel with the load to achieve a 90 percent power factor.