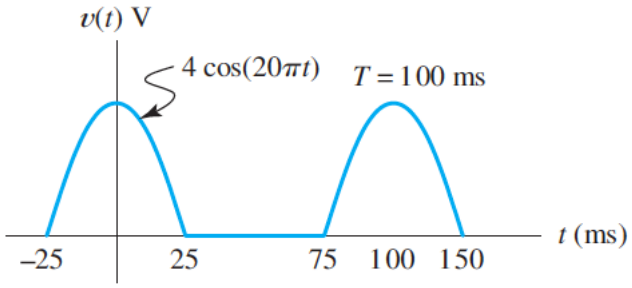
ECE100
Homework-6

Total Points: 100

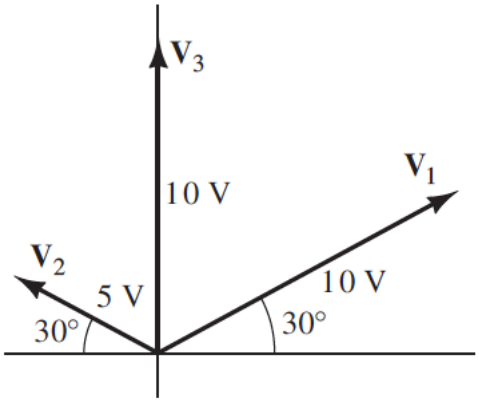
Submit your work in a pdf file electronically in the CCLE website before May 9th 11:59 pm. Late homework will not get credit!

1. A current i(t) = 10 cos(2000πt) flows through a 100 Ω resistance. Sketch i(t) and power p(t) to scale versus time. Find the average power delivered to the resistance. (5 points)

2. Calculate the rms value of the half-wave rectified sinusoidal wave shown in Figure below (5 points)



3. Consider the phasors shown in Figure below. The frequency of each signal is f = 200Hz. Write a time-domain expression for each voltage in the form $V_m \cos(\omega t + \theta)$. State the phase relationships between pairs of these phasors (10 points)



4. (a) The current and voltage for a certain circuit element is shown in Figure - A. Determine the nature and value of the element. (5 points)

   (b) Repeat for Figure B (5 points)

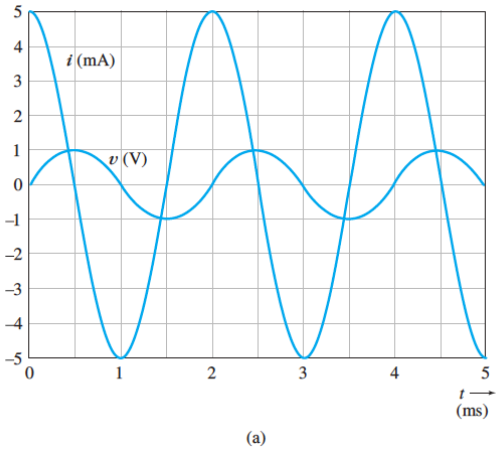


Figure- A

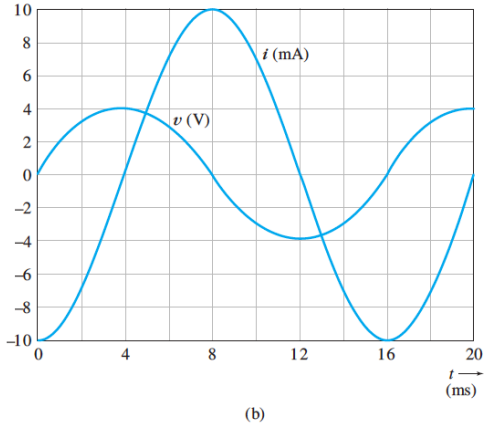
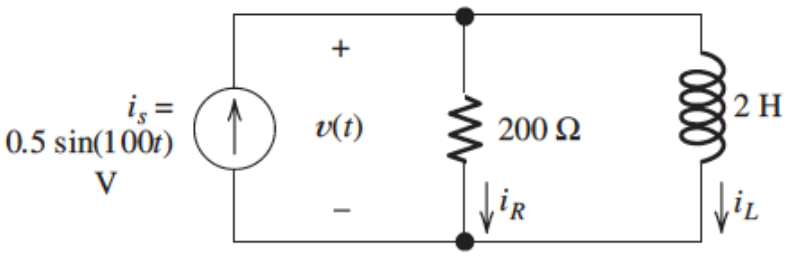
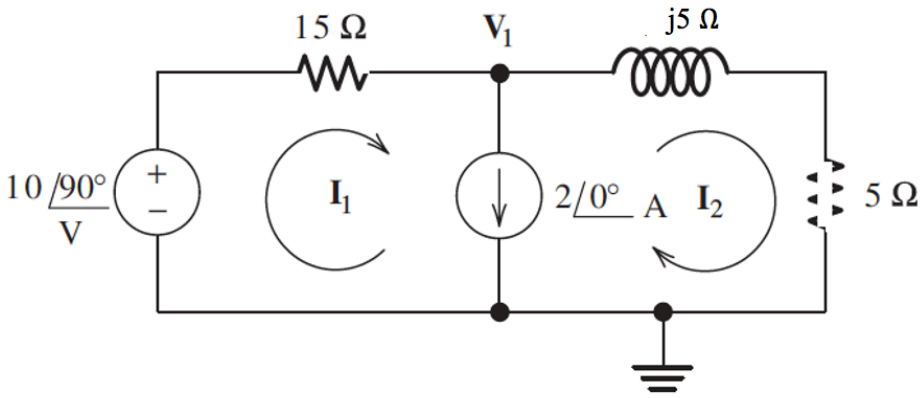


Figure- B

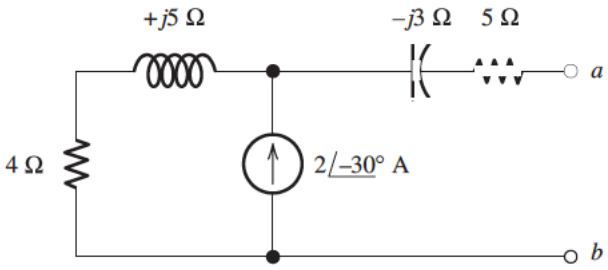
5. Find the phasors for the voltage and the currents of the circuit shown in Figure below. Construct a phasor diagram showing Is, V, I_R, and I_L. What is the phase relationship between V and Is? (10 points)



6. Solve for the node voltage shown in Figure (10 points)

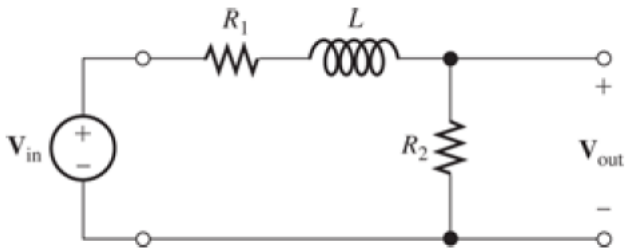


7. Find the Thevenin voltage, Thevenin impedance, and Norton current for the two terminal circuit shown in Figure (10 points)



8. A balanced wye-connected three-phase source has line-to-neutral voltages of 440V rms. Find the rms line-to-line voltage magnitude. If this source is applied to a wye-connected load composed of three 30 Ω resistances, find the rms line-current magnitude and the total power delivered. (10 points)
9. (a) Derive an expression for the transfer function H(f) = Vout/Vin for the circuit shown in Figure. Find an expression for the half-power frequency. (5 points)

   (b) Given R1 = 50 Ω, R2 = 50 Ω , and L = 15 μH, sketch the magnitude of the transfer function versus frequency (5 points)



10. (a) A parallel resonant circuit has R = 5 kΩ, L = 50 μH, and C = 200 pF. Determine the resonant frequency, quality factor, and bandwidth. (10 points)

    (b) Consider the parallel resonant circuit shown in Figure below. Determine the L and C values, given R = 1 k Ω, f_0 = 10 MHz, and bandwidth B = 500 kHz. If source current I = $10^{-3} < 0^{\circ}$, draw a phasor diagram showing the currents through each of the elements in the circuit at resonance. (10 points)