

## Homework Assignment #9 – due in Breakiron 368 at 5:30 pm on Tuesday, Dec. 10, 2013

**Instructions, notes, and hints:**

You may make reasonable assumptions and approximations in order to compensate for missing information, if any. Provide the details of all solutions, including important intermediate steps. You will not receive credit if you do not show your work.

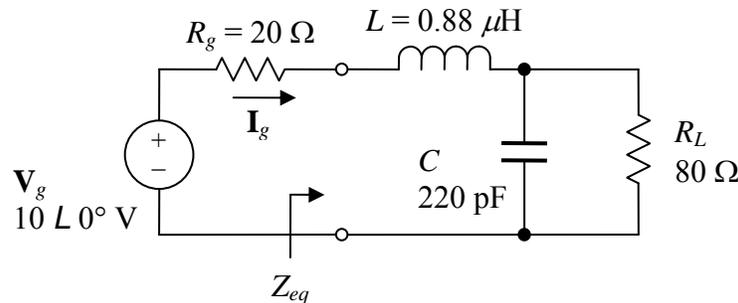
All Problems: Unless otherwise specified, complex impedances should be expressed in rectangular form, and voltage and current phasors should be expressed in polar form.

Prob. 8.46: In parts (a) and (b), the “power factor of the source” should actually be “power factor of the load.”

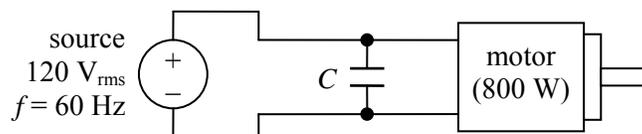
**Assignment:**

Probs. 8.18cde, 8.19a, 8.28, 8.43, and 8.46 in the textbook plus the following additional problems:

- At what frequency  $f$  (in Hz) is the current  $\mathbf{I}_g$  in the circuit shown below in phase with the signal voltage  $\mathbf{V}_g$ ? What is the equivalent impedance  $Z_{eq}$  seen by the signal source (represented by the  $\mathbf{V}_g$  and  $\mathbf{R}_g$  combination) at that frequency?



- Without power factor correction the motor shown below absorbs 800 W at a power factor of 70% lagging. Only a small selection of power factor correction capacitors for the indicated line voltage and frequency are in stock at the site, so the plant engineer selects one that is rated at  $-750$  VAR and connects it in parallel with the motor's terminals. What is the new power factor with the capacitor in place? Remember to specify whether the new pf is lagging or leading.



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3. How much real power does the motor in Prob. 2 absorb with the capacitor in place? For full credit, you must briefly explain your answer.
4. How much current (in rms form) is supplied by the source in Prob. 2 with and without the capacitor in place?
5. Two loads, *A* and *B*, are connected in parallel across a 115-V<sub>rms</sub> 400-Hz line (standard for many commercial aircraft), as shown in the figure below. Load *A* (a hatch open/close assist motor) consumes 2 kW with a 90% lagging power factor. Load *B* (another assist motor) has an apparent power of 2.5 kVA with an 80% lagging power factor. Find the real power, reactive power, and apparent power delivered by the source. What is the power factor seen by the source?

