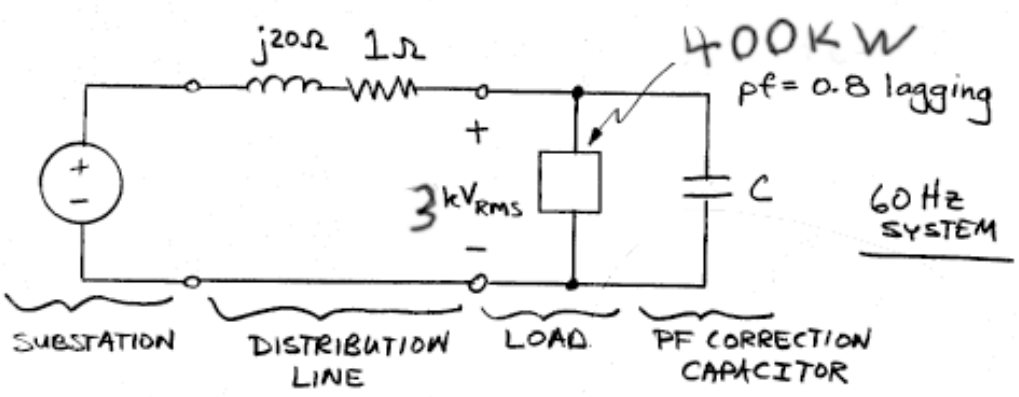
Name_____

Rose-Hulman Institute of Technology
Electrical and Computer Engineering

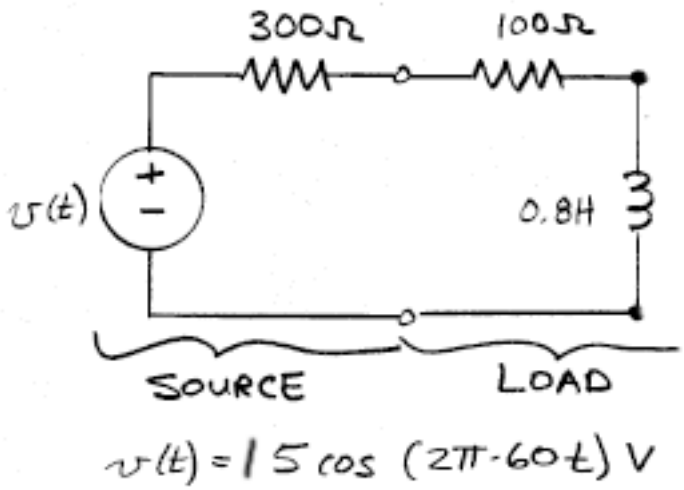
EC 300 - Exam No. 1 Thursday, December 19, 1995

CLOSED BOOK. Work each problem in the space provided on its sheet. Be sure the work you present is clear so the grader can understand what you have done. A calculator (or computer used as a calculator) are allowed. No other aids, animate or inanimate, are permitted. All problems have the same weight. Please do your own work. State answers in engineering form. **Box your answer, please, and don't forget units!**

Problem 1 - Find the value of *C* required to correct the power factor to 0.90 lagging.



Problem 2 - Find the complex power absorbed by the load. Express your answer in rectangular form.



$v(t) = 15 \cos(2\pi \cdot 60t)$ V

Problem 3 - Plot the spectrum of $x(t) = [6\cos(2\bullet 440t + 45°)]^2$ *V*. Plot both the magnitude and angle. Show the angle in degrees

Plot the power spectrum of *x(t)*.

Based on your power spectrum, what is the total power in the signal?

Problem 4 - According to Fourier, and periodic signal can be written as a sum of complex exponentials:

$$x(t) = \sum_{k=-\infty}^{\infty} c_k e^{j2\pi k f_0 t}$$

Given *x(t) = 1 + 4 cos(2•400t + 45°) + 8 cos(2•1200t - 30°).*

What is f_0?

What are the c_k*'s* for *x(t)*? Fill in the table, expressing c_k in polar form with the angle in degrees.

Hint: Some values may be 0. Hint 2: Euler.

k	c_k
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	