ECE 2100 Circuit Analysis
Fall 2015
Final Exam

NAME: _____

INSTRUCTIONS:

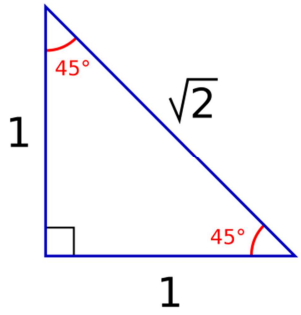
1. **THIS EXAM IS CLOSED BOOK AND CLOSED NOTES**. A "Potentially Useful Facts" sheet is provided.
2. **NO ELECTRONIC DEVICES ARE ALLOWED**.
3. Work each problem in the provided space.
4. Show ALL work required to arrive at a solution for either full or partial credit.
5. READ the entire question before answering.
6. CIRCLE YOUR ANSWERS.
7. Have your student ID on your desktop for inspection by the instructor.
8. SIGN the honesty pledge at the bottom of the page. Exams without a signature will receive no credit.

I have neither given nor received assistance from anyone in regards to completion of this exam. I have followed the instructions as provided on this sheet.

SIGNATURE: _____ DATE: _____

Note: some problems might be adapted from the course text or other sources. Schematics prepared using LTspice IV (linear.com). © 2015 Damon A. Miller (except public domain figures as noted).

Potentially Useful Facts

1. $A\angle\theta = Ae^{j\theta} = A\cos\theta + A\sin\theta\, j$
2. $\overrightarrow{\boldsymbol{Z_L}} = j\omega L$
3. $\overrightarrow{\boldsymbol{Z_C}} = \dfrac{1}{j\omega C}$
4. $\vec{\boldsymbol{S}} = \overrightarrow{\boldsymbol{V_{RMS}}}\left(\overrightarrow{\boldsymbol{I_{RMS}}}\right)^*$ (follows passive sign convention)
5. $V_{\text{RMS}} = \sqrt{\dfrac{1}{T}\int_0^T v^2(t)dt}$
6. 

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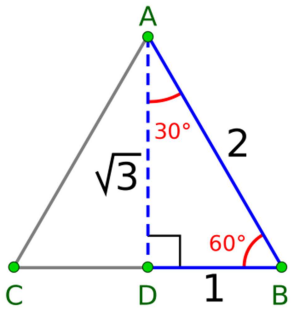
7. 

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Maximum exam score is 35 points.

1. (2 points) Why is electric power distributed via AC rather than DC?

2. (3 points) What is the ideal input resistance of an ammeter? Justify your response.

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3. (5 points) A meter movement has a series resistance of 1Ω and a full scale current of 1mA. Use this meter movement to design a 100mA full scale ammeter. Be sure to show a schematic of your design.

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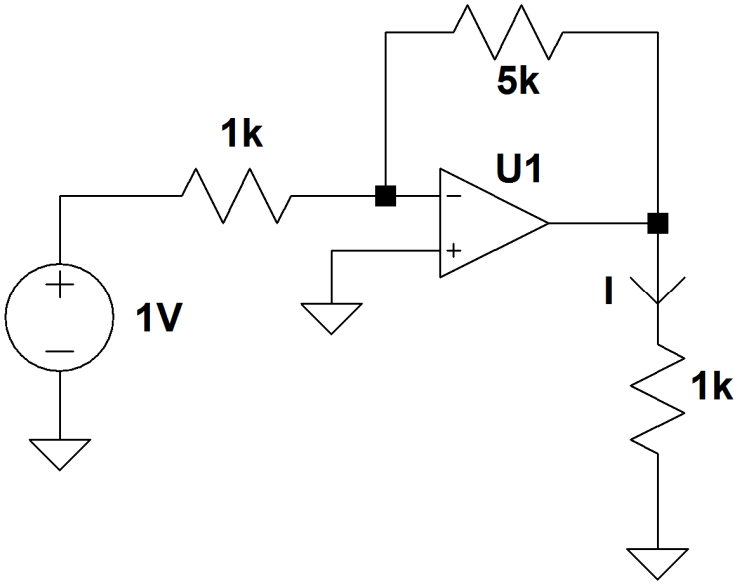
4. (5 points) Find the current *I* assuming an ideal op-amp.



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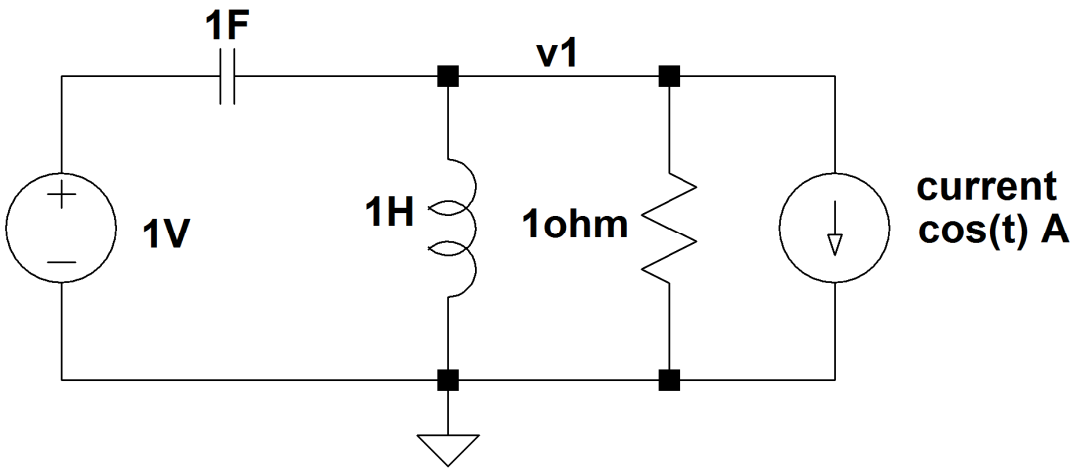
5. (5 points) Find voltage v1(t) in the sinusoidal steady state using the principle of superposition.



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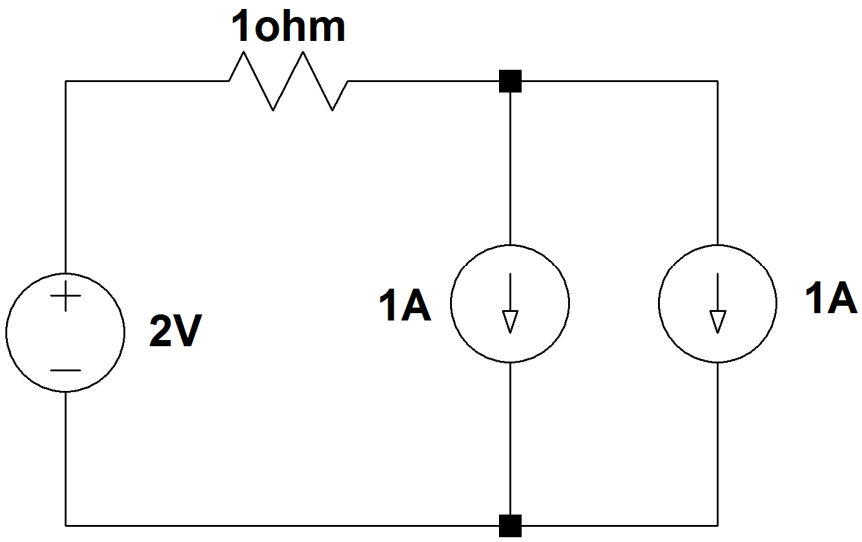
6. (5 points) Find the power of each circuit element.



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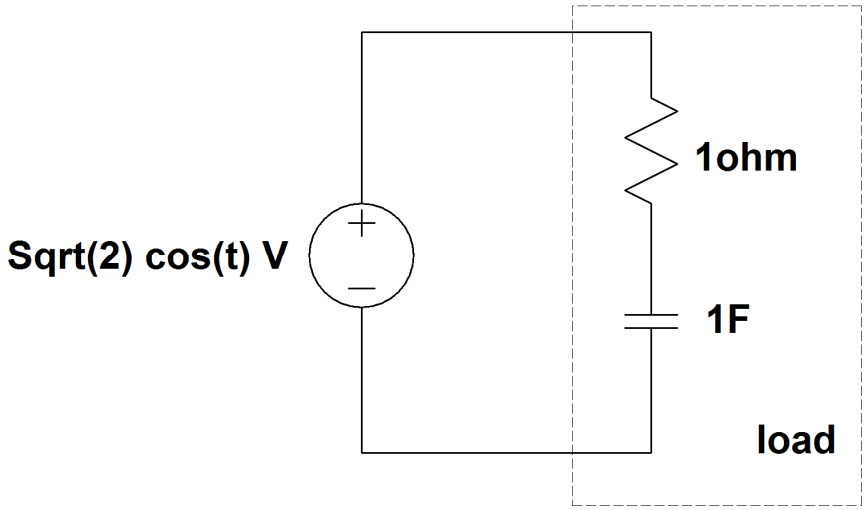
7. (5 points) The complex power of the load is ½ - ½ j VA. Find the value of a component to be placed in parallel with the load to obtain a unity power factor.



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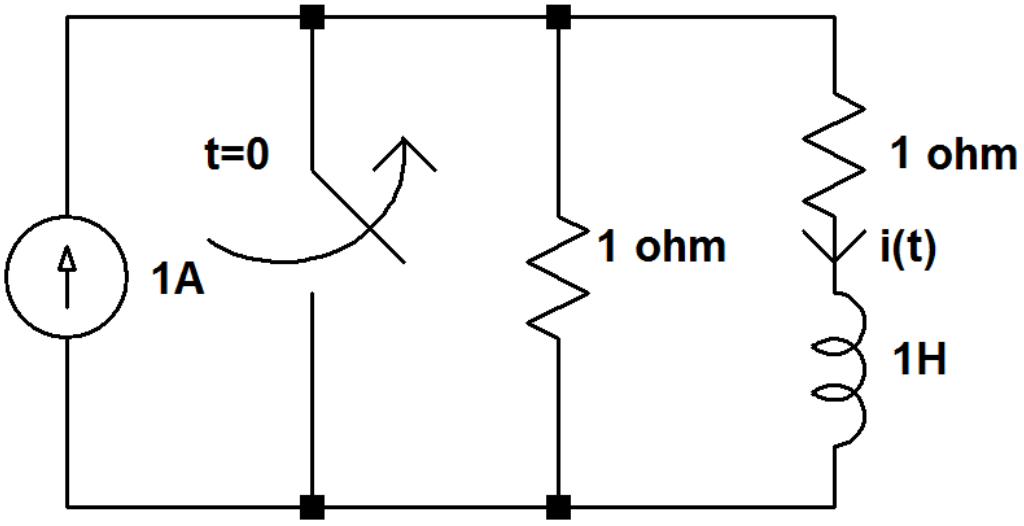
8. (5 points)) The switch is opened at t=0 after having been closed for a long time. Find an expression for i(t) for t≥0.



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