ECE 2100 Circuit Analysis
Summer I 2015
Exam #2

NAME: _____

INSTRUCTIONS:

1. **THIS EXAM IS CLOSED BOOK AND CLOSED**. 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: _____

Potentially Useful Facts

1. $$A\angle\theta = Ae^{j\theta} = A\cos\theta + A\sin\theta\, j$$

2. $$\overrightarrow{Z_L} = j\omega L$$

3. $$\overrightarrow{Z_C} = \frac{1}{j\omega C}$$

4. $$\vec{S} = \overrightarrow{V_{RMS}}\left(\overrightarrow{I_{RMS}}\right)^* \text{ (follows passive sign convention)}$$
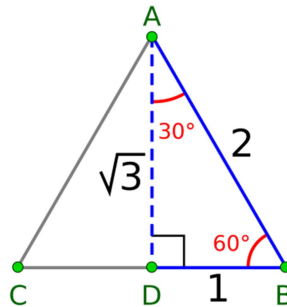
5. $$V_{RMS} = \sqrt{\frac{1}{T}\int_0^T v^2(t)\,dt}$$

6.

source (released to public domain):
https://commons.wikimedia.org/wiki/File:45-45-triangle.svg

7.
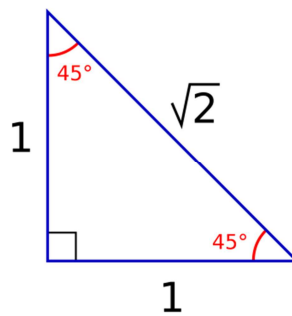
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https://commons.wikimedia.org/wiki/File:30-60-90.svg

Maximum exam score is 30 points.

1.   (2 points) Show how to build an impedance 100 +10j ohms at ω=10 rad/s.

2.   (2 points) What is the primary advantage of using sinusoidal voltages (AC) instead of constant voltages (DC) for electric power distribution? Explain,

3.   (1 point) What is the power factor of a purely resistive load?

4.   (5 points) Assume an ideal operational amplifier.

      a.   Find the value of I. Assume an ideal operational amplifier.
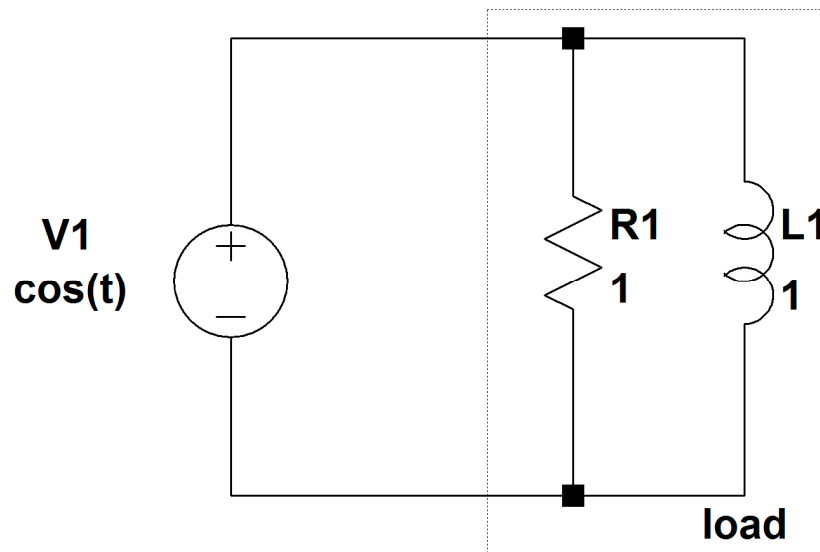   b.   What is the power of the 1mA current source?
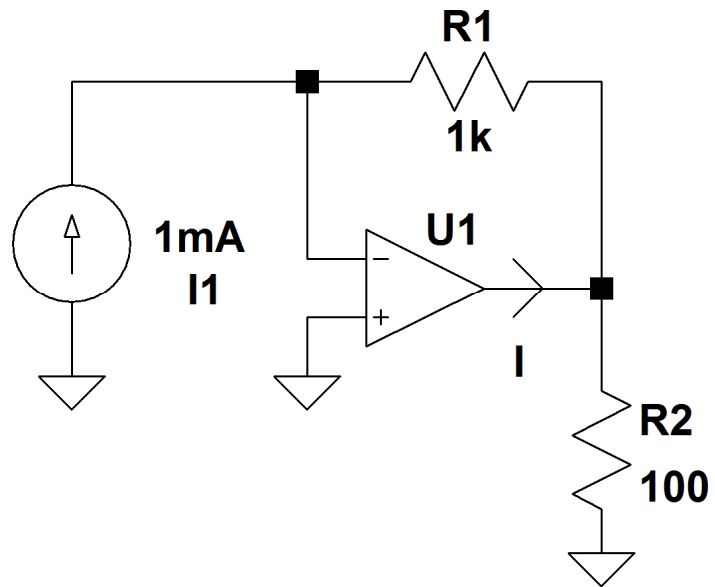
5. (5 points) Find the current i(t) in the sinusoidal steady state using the principle of superposition.

i(t)

C1
1F

I1
1A

R1
1

V1
cos(t)
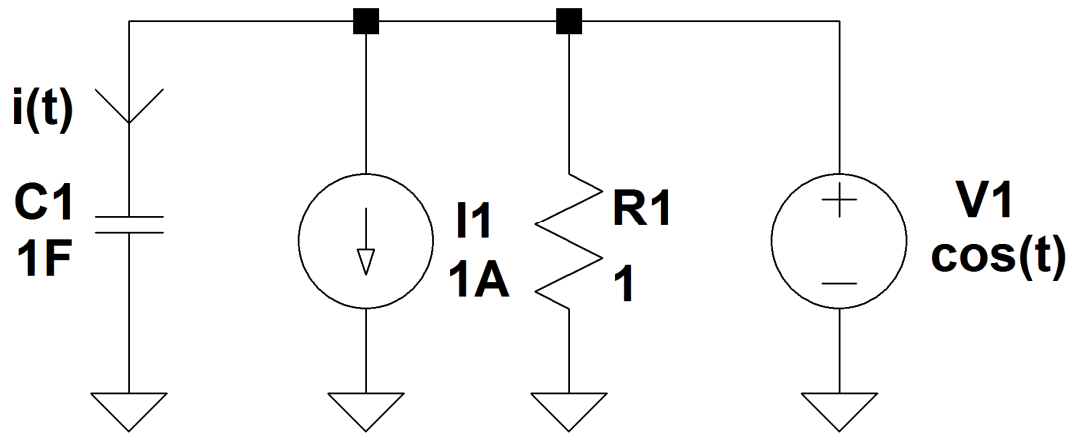
6.   (5 points) Find the power of each circuit element.
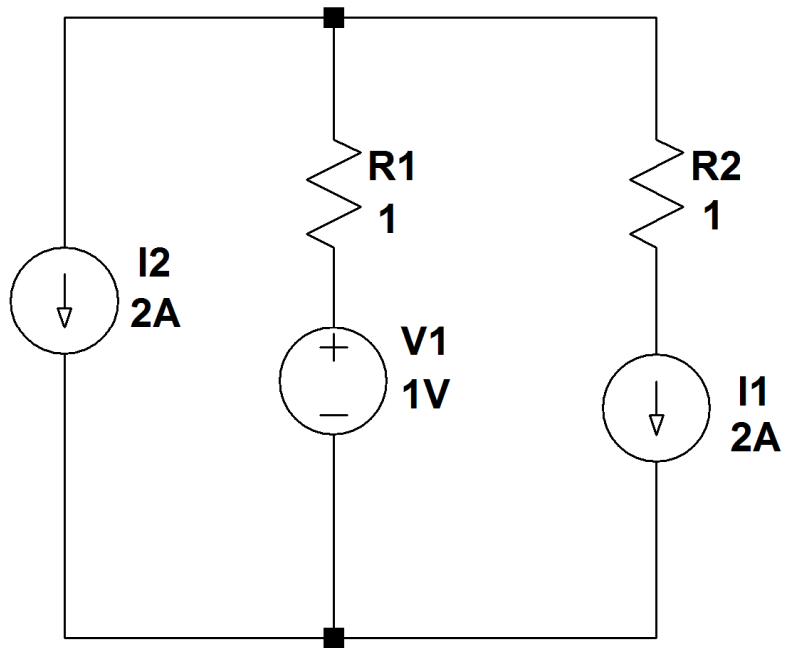
7.   (5 points) Find the complex power of the load.

8. (5 points) Find the value of a component to add in parallel with the load of question (7) so that the voltage source provides only real power.