

ECE 2100 Circuit Analysis
Spring 2017
Exam #2

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. I HAVE VERIFIED THAT THIS EXAM HAS (8) PAGES.

SIGNATURE: _____ DATE: _____

Note: some problems might be adapted from the course text or other sources. Schematics prepared using LTspice IV (linear.com).

Potentially Useful Facts

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

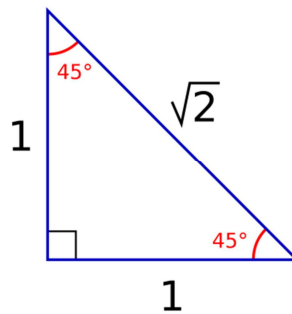
2. $\vec{Z}_L = j\omega L$

3. $\vec{Z}_C = \frac{1}{j\omega C}$

4. $\vec{S} = \vec{V}_{\text{RMS}} (\vec{I}_{\text{RMS}})^*$ (follows passive sign convention)

5. $V_{\text{RMS}} = \sqrt{\frac{1}{T} \int_0^T v^2(t) dt}$

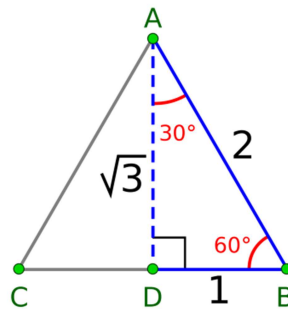
6.



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7.



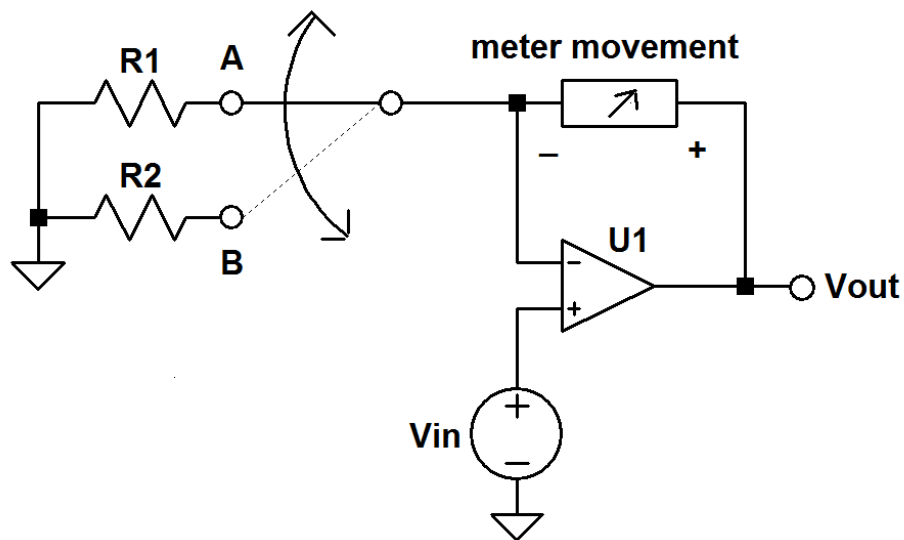
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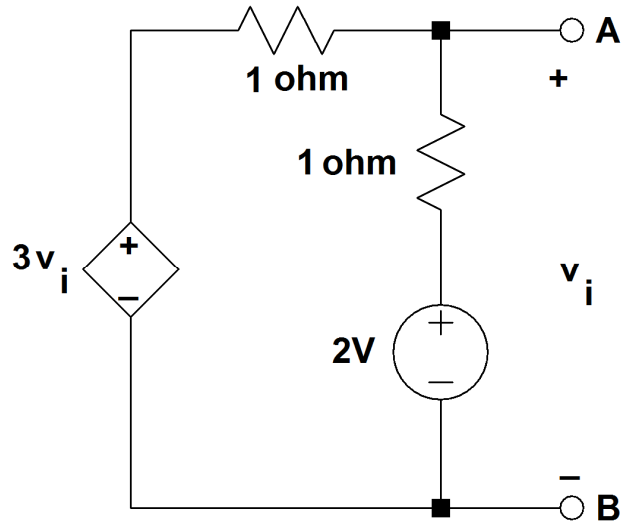
Maximum exam score is 30 points.

1. (5 points) Consider the following circuit. The meter movement has a full scale current of 1mA.

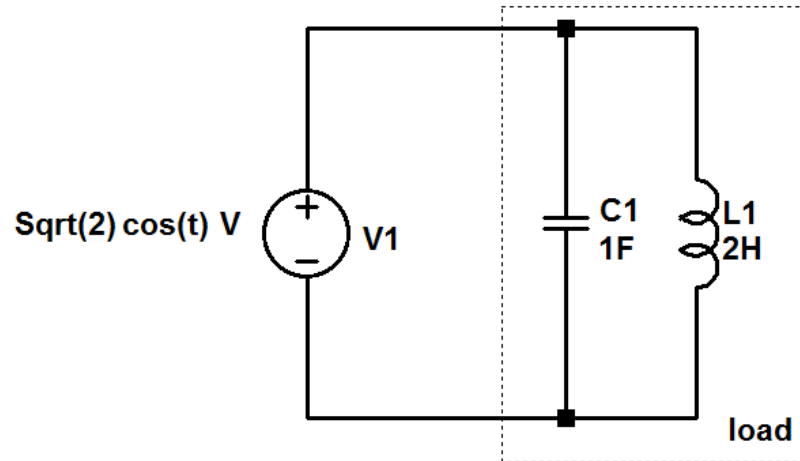
- Find the value of $R1$ to make a 10V full scale voltmeter if the switch is in position A; that is, the meter movement displays a full scale current if $V_{in}=10V$.
- Find the value of $R2$ to make a 1V full scale voltmeter if the switch is in position B.
- Is this an ideal voltmeter in terms of the power drawn from V_{in} ? Why or why not?



2. (5 points) Thevenize the following circuit “looking into” terminals A-B. Be sure to sketch the Thevenin equivalent circuit. The voltage v_i is across terminals A-B as indicated.

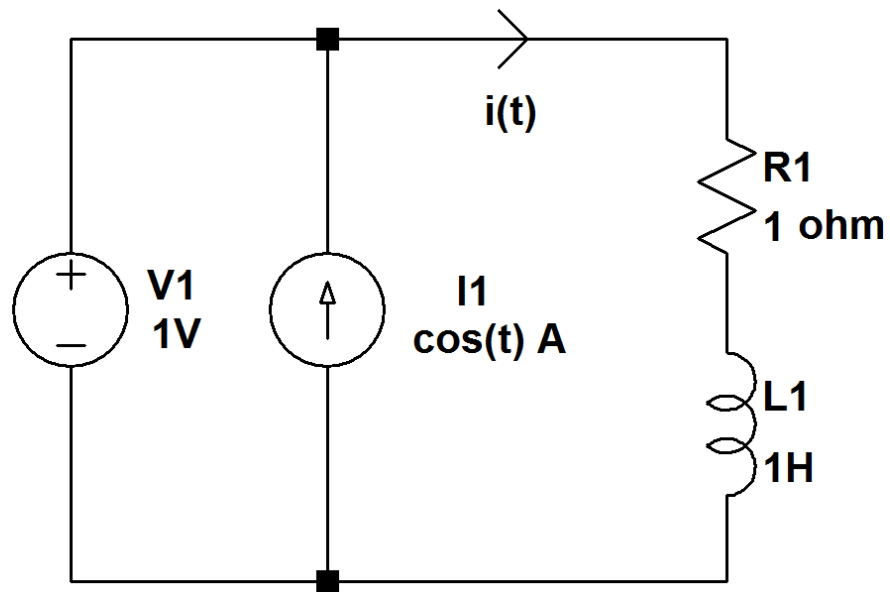


3. (5 points) Consider the following circuit. Find the complex power of the load (consisting of $C1$ and $L1$).



4. (5 points) The complex power of a load is $\vec{S}=1 + j$ VA. If the load voltage is 1V RMS and the frequency is 10 rad/s, find the value of a component to put in parallel with the load to obtain a unity power factor.

5. (5 points) Find current $i(t)$ in the sinusoidal steady state using the superposition principle.



6. (5 points) Find node voltage $v(t)$ in the sinusoidal steady state using nodal analysis.

