ECE207 Elements of Electrical Engineering II

Test 1, Fall 2004

Name_______________________

Box #_________

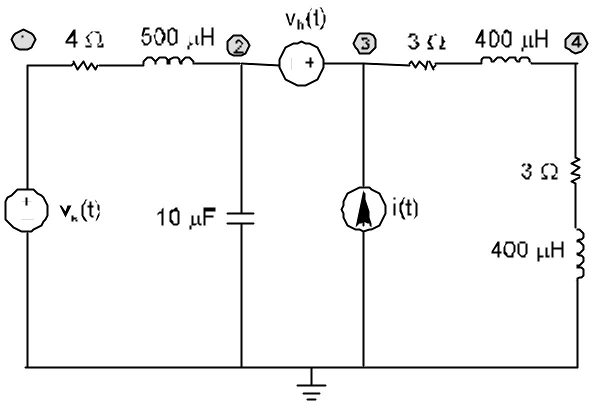
For full credit, give units, properly use phasor notation
and be neat and clear in your solution procedure.

Calculators and an 8½ x 11 sheet (both sides) permitted.

question	possible points	awarded points
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

1. The circuit below has its nodes labeled.

i) Give the rms phasor circuit in the space provided given that all sources are 1591.5 Hz and $v_a(t) = \sqrt{2}(50)\cos(wt + 30°)$ V, $v_b(t) = \sqrt{2}(25)\cos(wt - 30°)$ V, $i(t) = \sqrt{2}(5)\cos(wt + 60°)$ A.

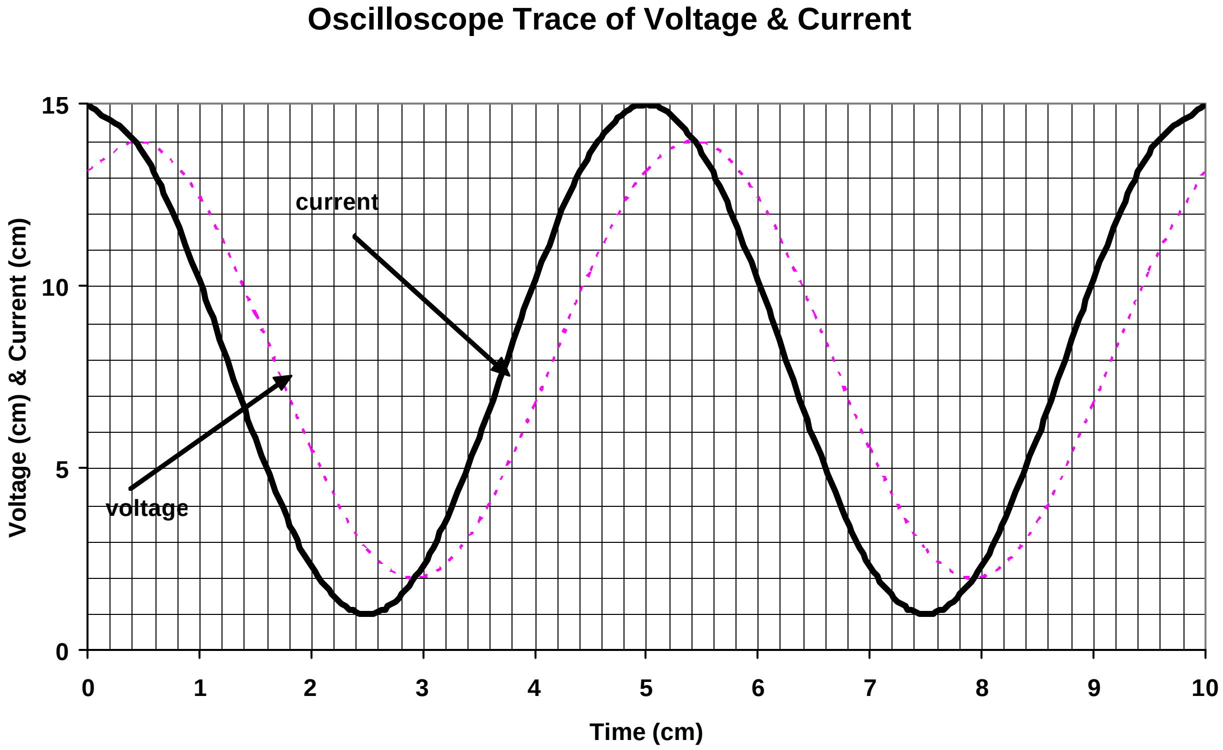


Phasor Circuit

ii) List the nodal equations needed to solve for all nodal voltages (DO NOT SOLVE)

2. A trace from an oscilloscope is shown below. The voltage channel was set on 20 V/cm, while the current channel was set on 200 mA/cm. The time-base was set at 2 msec/cm. Determine:

- i) Real power associated with the circuit.
- ii) Reactive power associated with the circuit.
- iii) Apparent power associated with the circuit.
- iv) Frequency (Hz) of the supply.
- v) Impedance of the circuit.



3. A single-phase load with an applied voltage of v(t) and load current of i(t), where:

$$v(t) = 5657 \cos(?\, t + 23.1^{\circ})\ \text{V}$$
$$i(t) = 1768 \cos(?\, t - 13.8^{\circ})\ \text{A}$$

is connected to a 60 Hz power system. Find:

i) Voltage and current phasors in terms of rms quantities
ii) Power triangle with - values of P, Q, S, and ? specified
iii) Capacitance (µF) of a capacitor to be connected in parallel with the load to improve the power factor to 0.95 lagging

4. For the system below, there are two loads connected in parallel. Find:

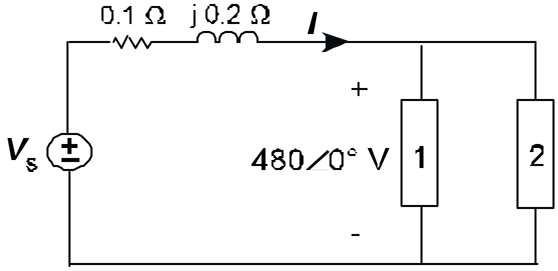
Load 1	(3 + j4) Ω
Load 2	30 kW @ 0.8 lag

i) ***I*** (5 pts)

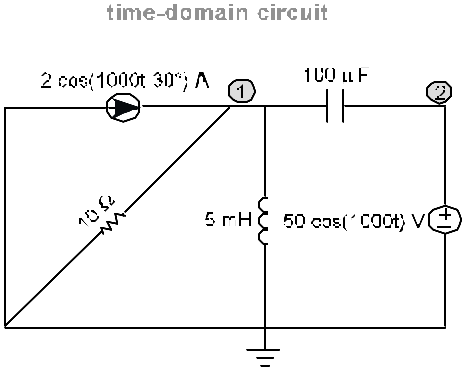
ii) ***S***$_{\text{load}}$ (5 pts)

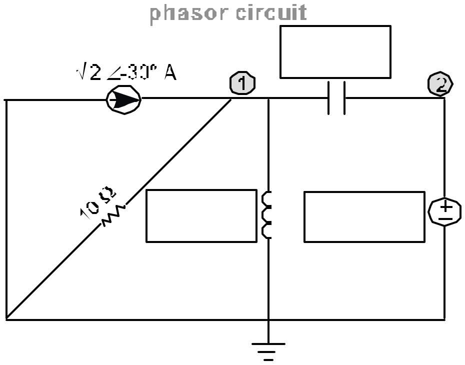
iii) %VR (5 pts)

iv) %η (5 pts)



5. Check all T/F statements either True or False (**T/F**) (2 pts each)





for the first three questions

___ Complete the phasor circuit above.

___ The complex power delivered by the current source is $\boldsymbol{S} = \boldsymbol{V}_1\,(\sqrt{2}\angle 30°\ \text{A})$.

___ The sum of the average power delivered by the sources must equal that absorbed by the resistance.

Why or why not? ____

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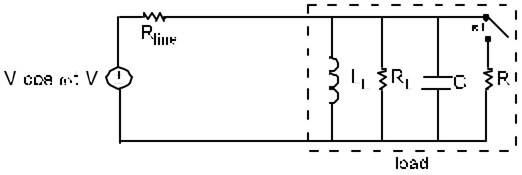


for the next four questions

|load impedance| is much larger than R_{line}

___ As C is increased from zero (s1 open) the power factor would increase which would lower %VR and raise %η.

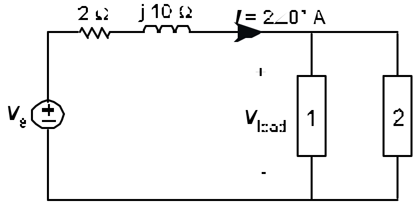
Why or why not? ____

____

___ Closing s1 (C = 0) raises the load power factor and increases the power dissipated in both the load and in R_{line}.

___ Increasing L_L would lower the value of C required to correct the load pf to 1.

___ For a given R_L and L_L, increasing C from zero (s1 open) decreases the line current.



for the next three questions

load 1 = 150∠-53.1° VA
load 2 = 70 W @ pf=1

___ $\boldsymbol{V}_{load}$= 100∠36.87° A.

___ The total average power delivered by the source is 160 W.

Why or why not? ____

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___ A power-factor-correction capacitor, C_{pfc}, in parallel with the loads will increase the load pf, lower the %VR, and increase the system %η.

Why or why not? ____