

## TEST NO. 3

Course: ENGR 2305 Circuit Analysis  
Section: 44470 Room: ESEE 1311  
Section: 44468 Room: ESEE 1311

Fall – Dec 1, 2006  
Print Your Name:  
Due on Dec 6, 2006 by the end of class period

The total score is 100 points. You have to show all steps and correct answers in order to get full credit. Your equations and steps shall be logical in accordance with the textbook and the lectures given to you. **Late test papers will not be accepted.**

### QUESTION NO. 1 (10%)

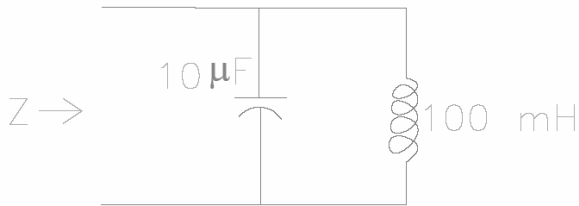
A sinusoidal current  $i(t)$  has an rms value of 5 A, a period of 12 ms, and reaches a positive peak at  $t = 3$  ms. Write an expression for  $i(t)$ .

### QUESTION NO. 2 (10%)

We have  $v_1(t) = 10 \cos(\omega t + 30^\circ)$ . The current  $i_1(t)$  has an rms value of 5 A and leads  $v_1(t)$  by  $20^\circ$ . (The current and the voltage have the same frequency.) Draw a phasor diagram showing the phasors. Write an expression for  $i_1(t)$  of the form  $I_m \cos(\omega t + \theta)$ .

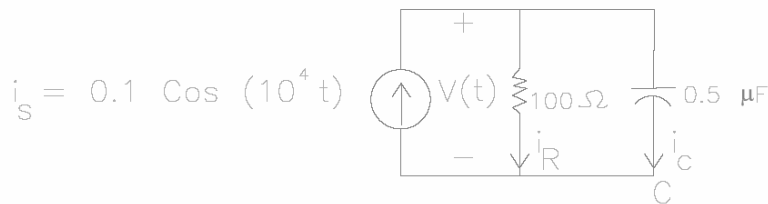
### QUESTION NO. 3 (10%)

Find the complex impedance in polar form of the network shown below for  $\omega = 2000$ .



### QUESTION NO. 4 (10%)

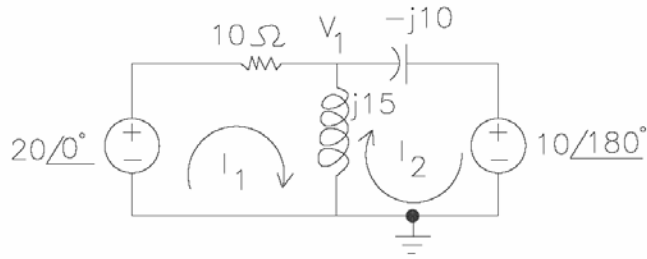
Find the phasors for the voltage and currents for the circuit shown below. Construct a phasor diagram showing  $I_s$ ,  $V$ ,  $I_R$ , and  $I_C$ . What is the phase relationship between  $V$  and  $I_s$ ?



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**QUESTION NO. 5(10%)**

Solve for the node voltage in the circuit diagram shown below.



**QUESTION NO. 6( 10%)**

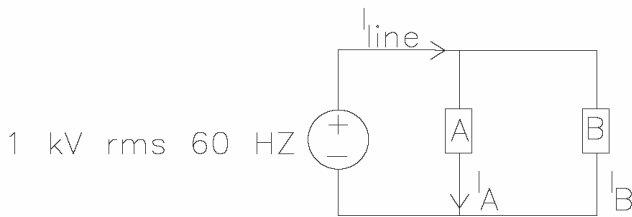
A load has an impedance given by  $Z = 50 - j 50 \Omega$ . The current flowing through this load is

$$i = 15\sqrt{2} \angle 30^\circ$$

Is the load inductive or capacitive? Determine the power factor, power, and reactive power delivered to the load.

**QUESTION NO. 7(10%)**

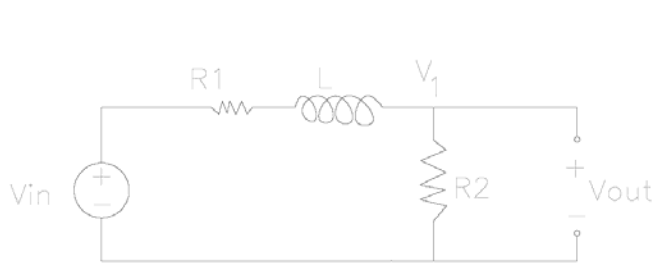
Two loads, A and B, are connected in parallel across a 1-KV rms 60 HZ line as shown in the following. Load A consumes 5KW with a 90% lagging power factor. Load B consumes 10KW with an 80 percent leading power factor. Find the power, reactive power, and apparent power delivered by the source. What is the power factor seen by the source?



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### QUESTION NO. 8 (10%)

- Derive an expression for the transfer function  $H(f) = \frac{V_{out}}{V_{in}}$  for the circuit shown as follow.
- Find expression for the half-power frequency



### QUESTION NO. 9 (10%)

- What frequency is one octave higher than 500 Hz?
- Three Octaves lower?
- Two decades higher?
- One decade lower?

### QUESTION NO. 10 (10%)

Suppose that two filters are in cascade. At a given frequency  $f_1$ , the transfer function values are  $|H_1(f_1)|_{db} = -40$  and  $|H_2(f_1)|_{db} = 60$ . Find the magnitude of the overall transfer function in decibels at  $f = f_1$ .

~END~