ELEC 225 Circuit Theory I Fall 2013

Homework Assignment #6 – due in BRKI 368 at 5:30 pm Tuesday, Nov. 5, 2013 (extended deadline)

***Instructions, notes, and hints*:**

You may make reasonable assumptions and approximations in order to compensate for missing information, if any. Provide the details of all solutions, including important intermediate steps. You will not receive credit if you do not show your work.

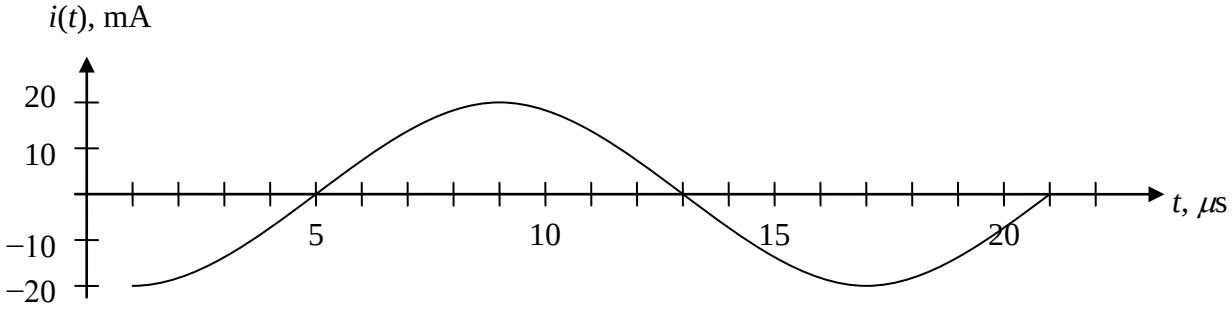
For all problems asking for a phase shift: Remember that the standard way of expressing phase is to use values with magnitudes less than 180°. That is, phase shift is normally expressed in the range −180° to +180°. For example, a waveform that lags (follows) another waveform by −210° would usually be said instead to *lead* the other by +150° (−210° = +150°).

Probs. 7.4, 7.11, and 7.12: Use the cosine standard.

***Assignment*:**

Probs. 7.1, 7.4, 7.11, 7.12, and 7.14 in the textbook plus the following additional problems.

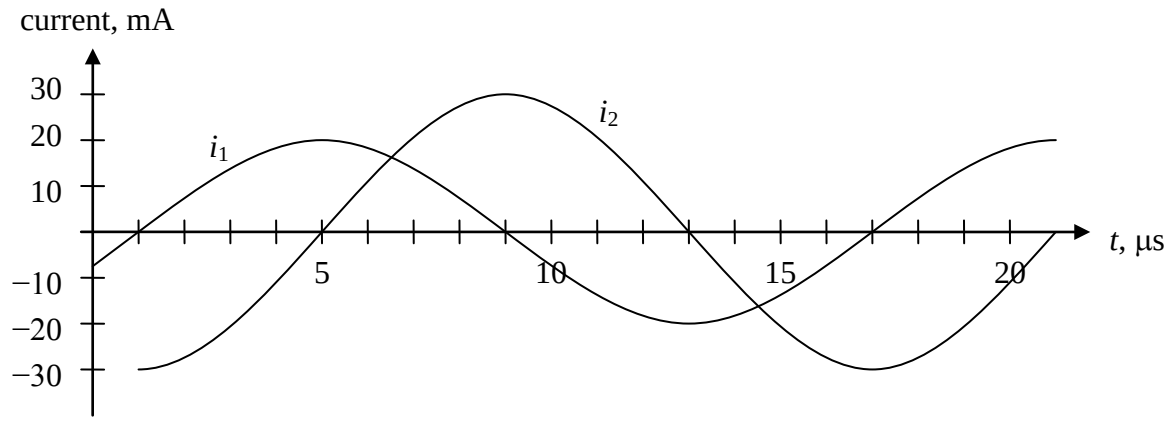
1. Find a mathematical expression for the following sinusoidal current in cosine form. Assume that the sinusoidal waveform extends beyond the curve shown in the positive and negative *t* directions. Pay attention to the units on both axes.



2. What is the period of the sinusoidal waveform in Prob. 1?
3. If the current in Prob. 1 is flowing through a 330-μH inductor, what is the maximum voltage drop (any polarity) across the inductor at any time?
4. Redraw the current waveform in Prob. 1 for the case when it has experienced a phase shift of +45°. (You may copy the figure and draw the new waveform on it. If you do, clearly indicate which waveform is the new one.)

(*continued on next page*)

5. Calculate the phase shift (in degrees) between waveforms i_1 and i_2 in the figure below. Be sure to indicate which waveform leads or lags (follows) the other.



6. The voltage $v_C(t)$ across the capacitor in the circuit fragment shown below is given by $v_C(t) = 12\cos(400\pi t)$ V.

   a. Find an expression for the voltage across the inductor. (You should not have to solve a differential equation, although you might have to evaluate derivatives.)
   b. What is the total voltage drop $v_{tot}(t)$ across the two components?
   c. Compare the magnitude of v_{tot} to those of v_C and v_L. For all *practical* purposes, the magnitude of v_{tot} can be considered to be what value?