

*University of Portland*  
*School of Engineering*

**EE 261-Electrical Circuits-3 cr. hrs.**  
**Fall 2011**

**Midterm Exam # 3**

(Friday, December 2, 2011)

(Closed Book Exam, Three Formula Sheet are Allowed)

(Total Time: 55 minutes)

**Name:** \_\_\_\_\_ 😊

**Signature:** \_\_\_\_\_ 😊

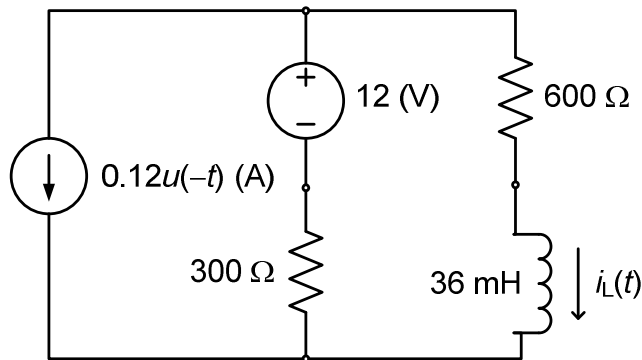
*“An honest mind possesses a kingdom.”*  
Lucius Annaeus Seneca (4B.C.–65A.D.)

*“Honest people are the true winners of the universe.”*  
Anonymous

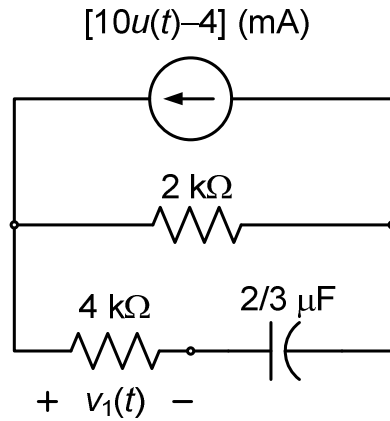
**NOTE:** On all the problems, please show your work clearly, and provide the appropriate units for your answers. Also mark on the schematic to show any current or voltage that you define in your solution.

P # 1 (30 pts.)	P # 2 (30 pts.)	P # 3 (40 pts.)	Total (100 pts.)

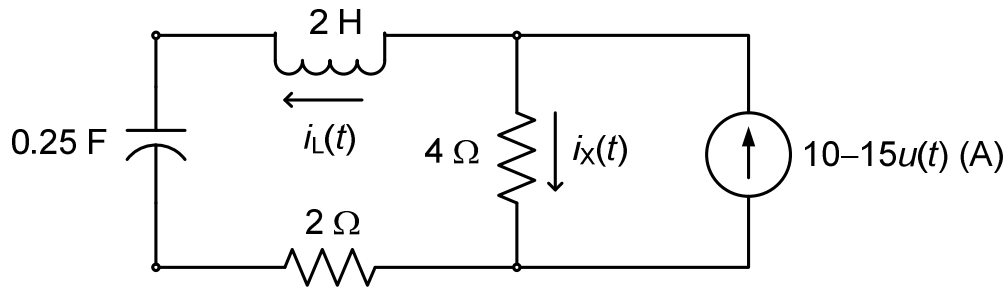
1. (15 mins., 30 points) In the circuit shown, find the complete mathematical expression for the current  $i_L(t)$  which flows through the 36 mH inductor for  $t \geq 0$ . (Please show your work clearly and provide brief justifications for the steps you take. Also, don't forget to provide the correct units for your answer.)



2. (15 mins., 30 Points) In the circuit shown below, find the complete mathematical expression and sketch the voltage  $v_1(t)$  across the  $4\text{ k}\Omega$  resistor for  $t > 0$ . (Please show your work step by step.)



3. (20 mins., Total: 40 Points) Consider the second-order circuit shown.



(a) (10 points) Solve for the roots ( $s_1$  and  $s_2$ ) of the characteristic equation of the above circuit for  $t \geq 0$ .

(b) (10 points) Based on the results of part (a), write the general mathematical expression for the inductor current  $i_L(t)$  for  $t \geq 0$ . (At this stage, leave the constant coefficients in your answer as unknown quantities.)

(c) (15 points) Find the values of the coefficients of the  $i_L(t)$  expression found in part (b) using the initial and final conditions.

(d) (5 points) Using the result of part (c), write the complete mathematical expression for the current  $i_X(t)$  for  $t \geq 0$ .