

*University of Portland*  
*School of Engineering*

**EE 262-Signals & Systems-3 cr. hrs.**  
**Spring 2011**

**Sample Midterm Exam # 3**  
(Prepared by Professor A. S. Inan)



Bonjour!  
Mieux de la  
chance!

(Tuesday, April 19, 2011)

**Name:** \_\_\_\_\_ 😊

**Signature:** \_\_\_\_\_ 😊

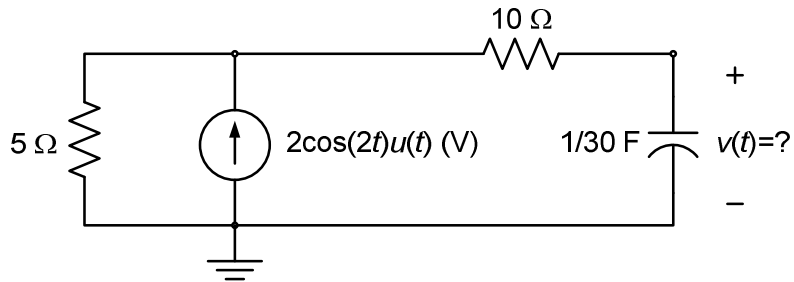
*“Honesty is the best policy.”*  
Aesop (~ 620B.C. -?)

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

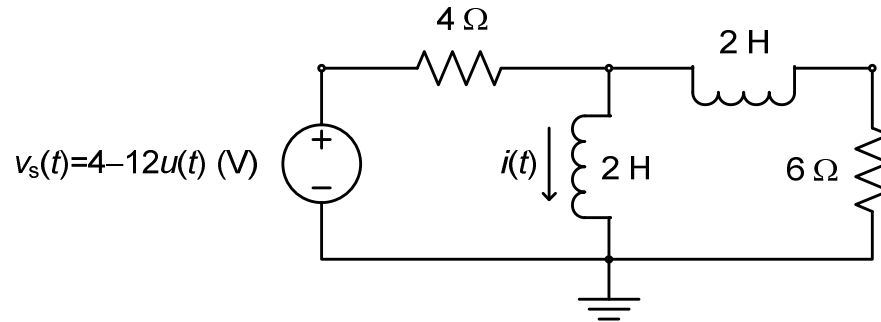
*“Honest people are the true winners of the universe.”*  
Anonymous

One problem take-home: Do any three of the four problems given during class time. The problem you choose not to do in class is take-home due to the beginning of the next class. Best of luck!

(1)(25 points). **Laplace transform in electric circuits.** Using Laplace domain equivalent circuit, find the complete simplified mathematical expression for the capacitor voltage  $v(t)$  for  $t \geq 0$ .



(2)(Total: 25 points) **Laplace transform in electric circuits.** For the electric circuit shown:



(a)(10 points) Draw the complete unilateral Laplace domain equivalent circuit with all the pertinent values included. Show how you obtain the initial conditions and how you model them in your equivalent circuit.

(b)(15 points) Using the circuit drawn in part (a), find the complete simplified mathematical expression for the inductor current  $i(t)$  for  $t > 0$ .

(3)(Total: 25 points) **Fourier transforms.** Use the tables of Fourier transforms and properties to find the Fourier transform of the following functions:

(a) (12.5 points)  $x(t) = 3e^{1-t} \sin(t-2)u(t-2)$

(b) (12.5 points)  $x(t) = 3 \frac{d}{dt} (te^{-2|t+1|})$

Please show your work step by step.

(4)(25 points) **Inverse Fourier transforms.** Using tables and properties, find the inverse Fourier transform of

$$X(\omega) = \frac{3 \sin(2\omega)}{(1 + j\omega)^2}$$

Please provide your work step by step.

(5) (Total: 1 point!) **Who am I?**

Hi! Do you recognize me?  
Who do you think I am?  
Okay, I will provide some help. First, please answer the following questions. This activity may help you guess my identity.



(5-1) (0.1 point) Which of the following is my last name?

- (a) Fourier                      (b) Kirchoff                      (c) Lagrange  
(d) Laplace                      (e) Ohm

(5-2) (0.2 point) Can you guess which of the following coincides with my birthday?

- (a) March 21, 1668              (b) March 21, 1768              (c) March 21, 1868  
(d) March 21, 1968              (e) March 21, 2068

(5-3) (0.3 point) Which one of the following was my obsession during my lifetime?

- (a) Exercise                      (b) Religion                      (c) Heat  
(d) Sleep                          (e) Music

(5-4) (0.4 point) Which of the following is NOT true about my life?

- (a) I was arrested, imprisoned and narrowly escaped guillotine on two separate occasions during the French Revolution.  
(b) I never got married.  
(c) Napoleon sent me to Egypt.  
(d) Famous mathematicians such as Lagrange, Laplace, Legendre, Biot and Poisson supported my work.



Okay, did you unfold my identity? Thank you and best of luck to you in the exam! And, if you have any questions especially on Fourier transform, don't hesitate to let me know!