University of Portland
School of Engineering

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

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

Bonjour! Mieux de la chance!

(Wednesday, April 20, 2011)

Name:_____ ☺

*Signature:*_____ ☺

"Honesty is the best policy."
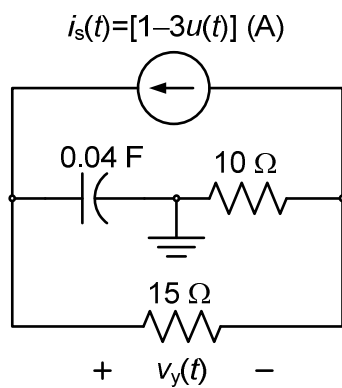**Aesop (~ 620B.C. –?)**

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

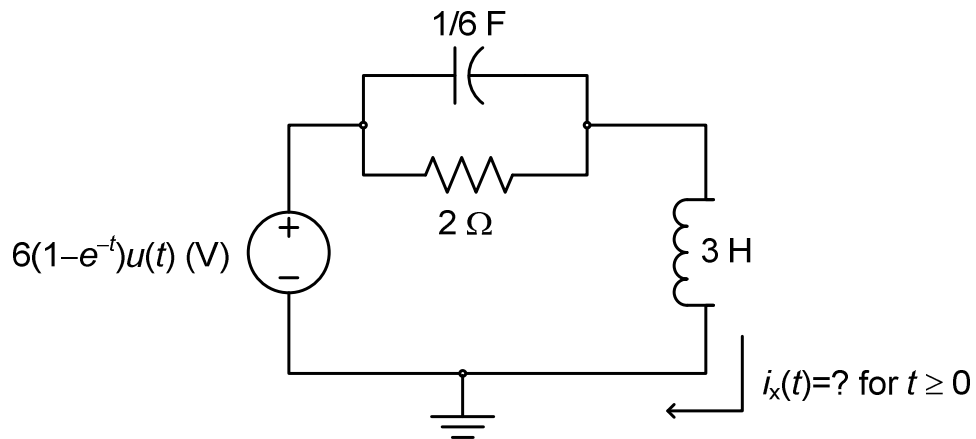*"Honest people are the true winners of the universe."*
Anonymous

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

$i_s(t)=[1-3u(t)]$ (A)

(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.

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

(3) (<u>Total:</u> 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) $x(t) = 4e^{3-2t}\cos(2t-2)u(t-1)$

(b) (12.5 points) $x(t) = 3t\dfrac{d^2}{dt^2}\left(e^{-\pi|2t-1|}\right)$

<u>Please show your work step by step.</u>

(4) (<u>Total:</u> 25 points) **Inverse Fourier transforms.** Using tables and properties, find the inverse Fourier transform of

(a) (12.5 points) $X(\omega) = \dfrac{2j\omega\cos(3\omega)}{(2+j\omega)(3+j\omega)}$

(b) (12.5 points) $X(\omega) = \dfrac{d}{d\omega}\left[\dfrac{3\sin(2\omega)\sin(4\omega)}{\omega}\right]$

<u>Please provide your work step by step.</u>

(5) (<u>Total:</u> 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) Kirchhoff   (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!