University of Portland
School of Engineering

EE 262-Signals & Systems-3 cr. hrs.
Spring 2006

Midterm Exam # 3

(Prepared by Professor A. S. Inan)

(Friday, April 21, 2006)
(Closed Book Exam, Formula Sheets Allowed.)
(Total Time: 55 mins.)

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

This box will be used by Inan for grading →	**Problem # 1**
	Problem # 2
	Problem # 3
	Problem # 4
	Total Score:

(1) (10 mins., 20 points) **Unilateral Laplace transform.** Find the unilateral Laplace transform of the signal $y(t)$ given by

$$y(t) = [7e^{-2t+3}u(t-2) * e^{-t}u(t-1)] * \delta(t-3)$$

Please show your work step by step!

(2) (15 mins., 25 points) **Inverse Laplace transform.** The unilateral Laplace transform of a signal $x(t)$ is given by

$$x(t) \overset{L_u}{\leftrightarrow} X(s) = 3e^{-2s} \frac{d}{ds}\left(\frac{(s+5)}{(s+1)^2(s^2+9)} \right)$$

Find the signal $x(t)$. Please show your work step by step!

(3) (15 mins., 25 points) **The transfer function and the impulse response of an LTI system.** The governing differential equation of an LTI system with input signal $x(t)$ and output signal $y(t)$ is given by

$$\frac{d^2y(t)}{dt^2} + 20\frac{dy(t)}{dt} + 100y(t) = 10\frac{dx(t)}{dt} - 30x(t)$$

Use Laplace transform to find the impulse response $h(t)$ of this system.

(4) (15 mins., 30 points) **Solving electric circuit problems using Laplace transform.** For the circuit shown, use Laplace transform to find the capacitor voltage $v_C(t)$ after t=0. Please show your work clearly.