University ☺f P☺rtland
Sch☺☺l ☺f Engineering

EE 262-δignals & δystems-3 cr. hrs.
Spring 2011

Midterm Exam # 2

(Prepared by Professor A. S. Inan)

(Wednesday, March 30, 2011)

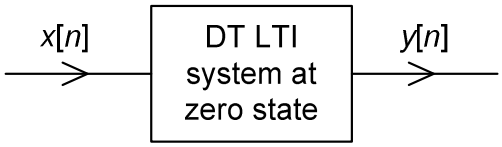
Name:_____ ☺

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**

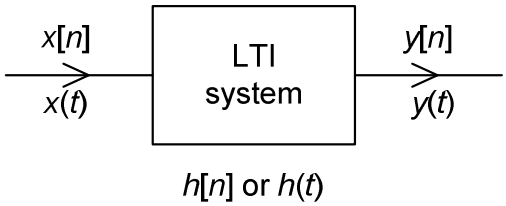
Select and do any 4 of the 5 problems assigned during class time. The fifth problem is a take-home problem due class time on Friday, April 1, 2011.

(1) (20 points). **DT LTI system.** The unit impulse of a DT LTI system is given below. Find and sketch the zero-state response $y_{zs}[n]$ of this system due to input signal $x[n] = 2\delta[n] - 3\delta[n-2]$.



$h[n] = u[n] + 3\delta[n-2] - u[n-3]$

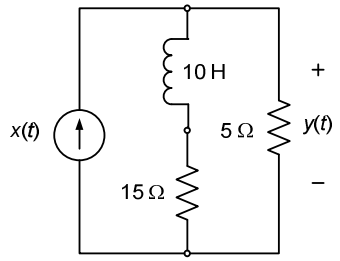
(2) (Total: 15 points) **LTI system.** For each of the following unit impulse responses corresponding to an LTI system, determine whether the system is (a) Memoryless, (b) Causal, and (c) BIBO stable. Provide a clear justification for each answer.



(a) (7.5 points) $h[n] = (1-n)u[n-1]$

(b) (7.5 points) $h(t) = 2\sin(\pi t)u(t-1)$

(3) (Total: 25 points) **Electric circuits.** For the electric circuit shown:

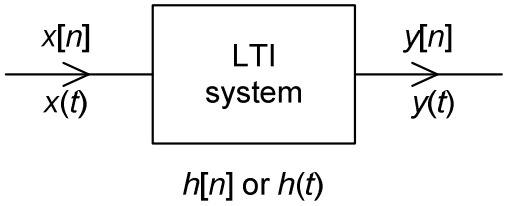


(a) (10 points) Find its transfer function $H(s)$. Provide your work step by step.

(b) (10 points) Find the impulse response $h(t)$. Show your work.

(c) (5 points) Find the unit step response $y_s(t)$. Provide your work.

(4) (Total: 20 points) **LTI system.** Consider an LTI system.



(a) (10 points) If the system is continuous time, given the unit-step response of the system to be

$$y_s(t) = \left(5te^{-t} + 11e^{-t} - 3\right)u(t)$$

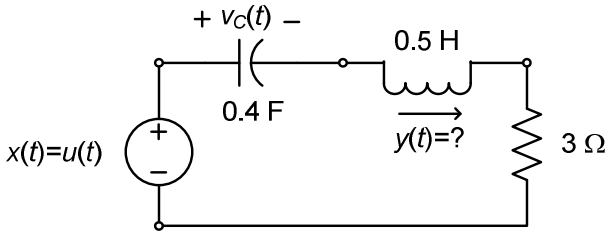
Find the unit-impulse response $h(t)$ of the system. What is $h(2)$?

(b) (10 points) If the system is discrete time, given the impulse response of the system to be

$$h[n]=\left(\frac{1}{2}\right)^{n} u[n]$$

Find the unit-step response $y_s[n]$ of the system. What is $y_s[2]$?

(5) (Total: 20 points) **Electric circuits.** In the circuit shown, assuming $v_C(0^-) = -3$ V and $y(0^-) = 0.5$ A, do the following:



(a) (10) Draw the Laplace domain circuit with all the numerical values provided.

(b) (10) Using part (a) circuit, obtain $Y(s)$ and perform inverse Laplace on it to obtain $y(t)$ for $t > 0$.