EE 327 Signals and Systems 1 Name ___________________________

Test 1 September 20, 2013

RULES

This is a closed book, closed notes test. You are, however, allowed one half of one piece of paper (front side only) for notes and definitions, but no sample problems. You must staple your equations sheet to the back of your test when you hand your test in.

You are permitted to use a calculator.

You have 50 minutes to complete the test. Please read through the entire test before starting, and read through the directions carefully. To receive partial credit, you must show your work.

There is to be absolutely no cheating. Cheating will not be tolerated.

I you have any questions, please raise your hand, and I will come to you to answer them. Do not hesitate to ask questions.

Problem	Value	Score
1	20	
2	10	
3	20	
4	25	
5	25	
Total	100	

PROBLEM 1 (20 Points)

A. Sketch a plot of the following signal. (5 Points)

$$x_1(t) = \delta(t) - \delta(t+1)$$

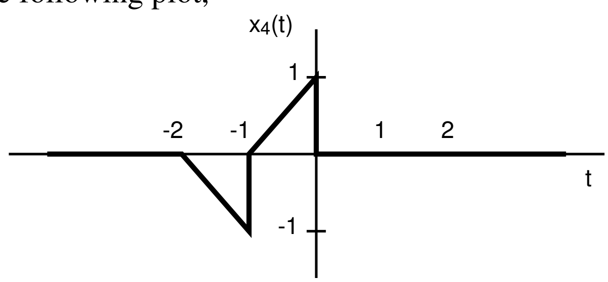
B. Sketch a plot of the following signal. (5 Points)

$$x_2(t) = (2t+1)(u(t-1) - u(t-2))$$

C. Using the signal $x_2(t)$ from Part B, sketch a plot of the following signal. (5 Points)

$$x_3(t) = -x_2(t-1)$$

D. If $x_4(t)$ is given by the following plot,



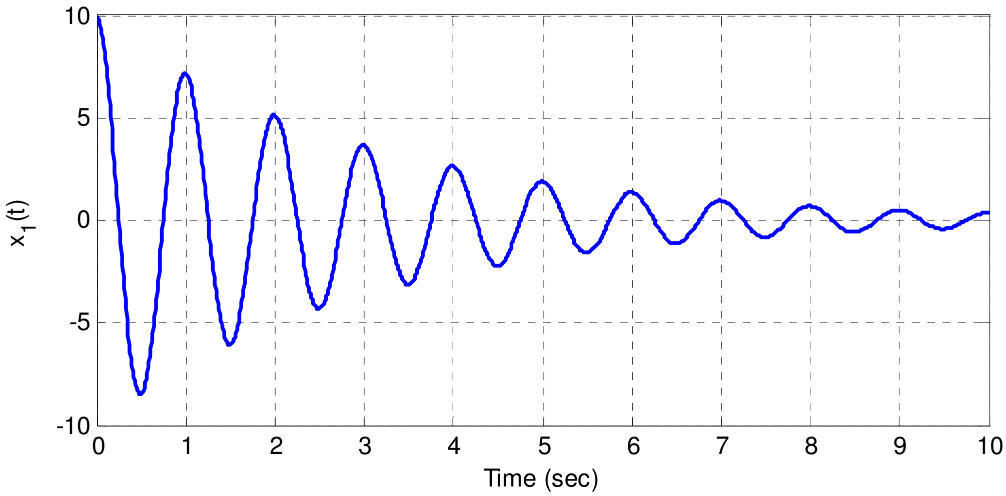
sketch $x_5(t)$ which is given by the following expression. (5 Points)

$$x_5(t) = x_4(-t+1)$$

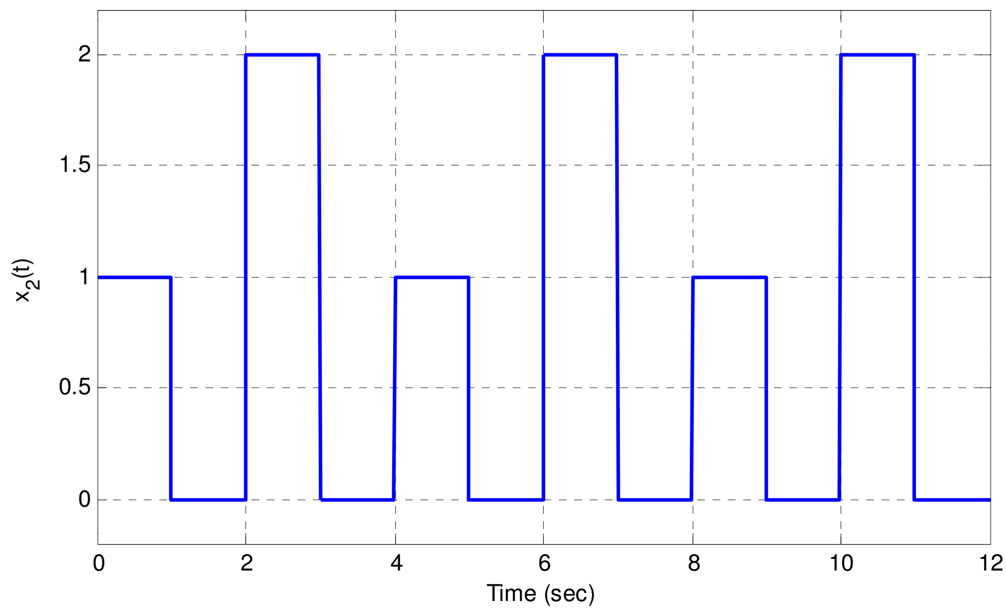
PROBLEM 2 (10 Points)

For Parts A and B, determine whether or not the following signals are periodic. If the signal is period, what is the fundamental frequency? You <u>must</u> clearly justify your answer to receive full credit.

A.



B.



PROBLEM 3 (20 Points)

Determine the properties of the following system. Choose one property from each column, and circle the appropriate property. You must show your work to receive partial credit.

(4 Points Each)

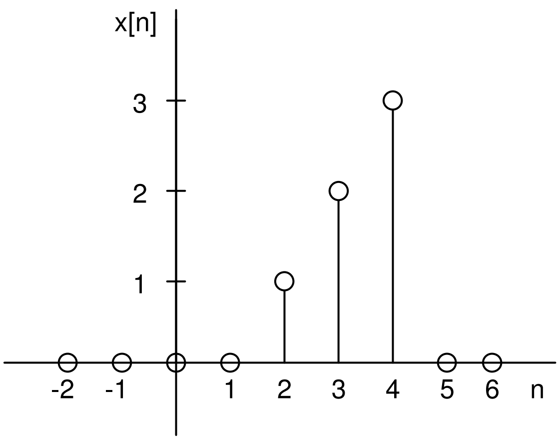
$$y[n] = \begin{cases} x[n] & n \neq 0 \\ 0 & n = 0 \end{cases}$$

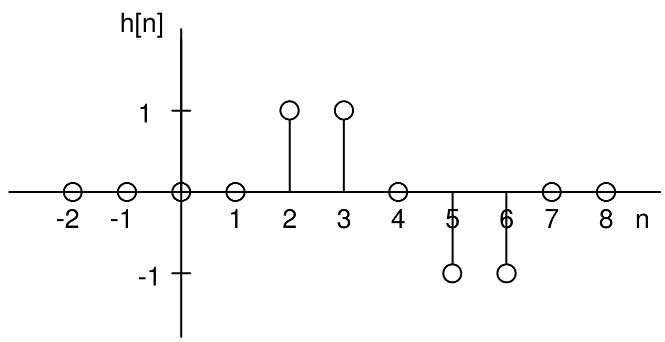
<u>Column 1</u>	<u>Column 2</u>	<u>Column 3</u>	<u>Column 4</u>	<u>Column 5</u>
Causal	Has Memory	Stable (BIBO)	Linear	Time Invariant
OR	OR	OR	OR	OR
Non Causal	Memoryless	Unstable	Nonlinear	Time Varying

PROBLEM 4 (25 Points)

A. What is the mathematical definition of the convolution sum (i.e. an equation)? (3 Points)

B. Determine the output, y[n], of the system to the input signal, x[n], if the system is defined by the impulse response, h[n]. Write an <u>expression</u> for y[n] and also <u>sketch</u> y[n]. (20 Points)





y[n] = ____

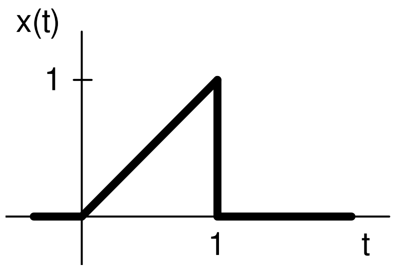
– Extra Room for Part B –

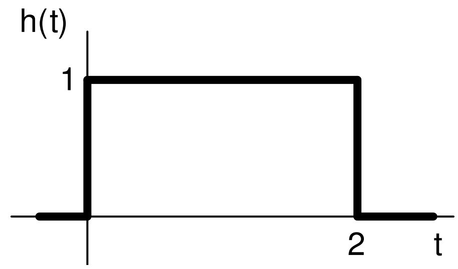
C. If you were to find y[n] using Matlab, provide the line(s) of code that would be used to write the result to variable `yy`. Assume that the coefficients of x[n] and h[n] have already been entered into the Matlab workspace and are represented by the variables `xx` and `hh`. If any necessary information is missing that is needed to find this output, describe what that information is and how it should be incorporated into your Matlab code. (2 Points)

PROBLEM 5 (25 Points)

Use the impulse response, h(t), and input, x(t), shown below to find the output signal, y(t). Write your summary solution in the box provided below (you must write your solution here to receive full credit). You do <u>not</u> need to sketch the output signal.

$$x(t) = t(u(t) - u(t-1))$$
$$h(t) = u(t) - u(t-2)$$





Answer

– Problem 5 Work Page –