RULES

This is a closed book, closed notes test. You are, however, allowed one piece of paper (front side and half of the back side only) for notes and definitions, but no sample problems. You must staple your definitions sheet to the back of your test when you hand your test in. You are also permitted to use a calculator. Additionally, tables of common transforms have been provided at the end of this test.

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	25	
2	25	
3	25	
4	25	
Total	100	

Name _______ November 20, 2013

PROBLEM 1

(25 Points)

A system is defined by the following transfer function.

 $H(s) = \frac{3,000,000s}{s^2 + 3,010s + 30,000}$

Determine all zeros, poles, and corner frequencies, and write them on the lines that have been provided. Also, plot the frequency response (Bode plot – both magnitude and phase) of this system on the semilog paper on the following page. Only asymptotic responses are required. Clearly label all important points and all slopes. Clearly indicate which trace is the overall magnitude and phase (summation of the parts).

Zeros

Poles _____

Corner Frequencies

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PROBLEM 2

(25 Points)

For the following continuous-time filter, whose frequency response is shown in the following figure, determine the following (see below). You *must* write your answer on the lines provided below. Write all values as scalar numbers (*not* dB values). Only determine the Q of the filter if that is applicable (i.e. there is a Q); otherwise, write N/A for not applicable. (Point values are indicated in parentheses below.) The following page is for extra work.



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(PROBLEM 2 Work Page)

PROBLEM 3

A system is defined by the following transfer function.

$$H(z) = \frac{z}{\left(z + \frac{1}{2}\right)\left(z - \frac{1}{4}\right)}$$

This system receives the following input.

$$X(z) = \frac{\frac{1}{4}z}{z + \frac{1}{4}}$$

A. Determine the z-domain output, Y(z), of the system, H(z), in response to the input, X(z). (5 Points)

B. Determine the general form of the time-domain solution, y[n]. (5 Points)

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(25 Points)

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C. Determine the complete solution for the time-domain	n response, $y[n]$. (10 Points)

D. Determine the final value of y[n] as $n \rightarrow \infty$.

(5 Points)

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PROBLEM 5

(25 Points)

A. Find the transfer function of the following discrete-time system. Write your answers as rational functions of "z," and simplify where applicable. (10 Points)

$$y[n] + \frac{1}{4}y[n-2] = x[n] - x[n-1]$$

B. For discrete-time systems, describe the condition for stability in terms of poles and zeros. (5 Points)

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C. Plot the poles and zeros of the system defined in Part A on the Real-Imaginary plane. (5 Points)

D. Is the system of Part A stable, marginally stable, or unstable. You must justify your answer to receive full credit. (5 Points)