Name____ Mail Box __________________

ECE-420
Exam 1

Fall 2013

Calculators can only be used for simple calculations. Solving integrals, differential equations, systems of equations, etc. does not count as a simple calculation.

You must show your work to receive credit.

Problem 1 __________/25

Problem 2 __________/25

Problem 3 __________/10

Problem 4 __________/20

Problem 5 __________/20

Total _______________

Name____ Mail Box ____________________

1) For impulse response $h(n) = \left(\frac{1}{2}\right)^{n-1} u(n-3)$ and input $x(n) = \left(\frac{1}{6}\right)^{n-3} u(n-1)$

a) Determine $H(z)$

b) Determine $X(z)$

c) Assume $Y(z) = z^{-3}G(z)$, determine $g(n)$ and then $y(n)$

Name____ Mail Box __________________

2) Consider the difference equation $y(n+1)+2y(n)=x(n)$ with the initial condition $y(0)=1$

a) Assuming the input is a unit step function, determine the zero input response (ZIR) and the zero state response (ZSR)

b) Determine an expression for the system output

c) Use the difference equation to compute $y(0)$, $y(1)$, $y(2)$ and y(3)

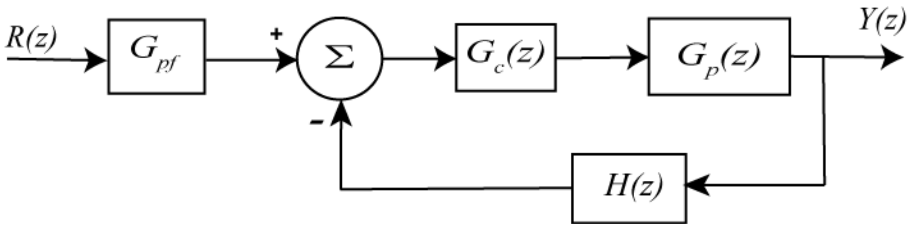
d) Compare the values from part **c** with the values you compute from your answer to part **b**

Name____ Mail Box ____________________

3) Use long division to determine the first three nonzero terms in the impulse response for the following transfer function $H(z) = \dfrac{z}{z^2 + 3z - 1}$

Name____ Mail Box ___________________

4) Assume the following feedback configuration



If $H(z) = z^{-1}, G_c(z) = \frac{c(z+a)}{z+b}, G_p(z) = \frac{2}{z+1}$ determine the parameters *a*, *b*, and *c* so all of the closed loop poles are at 0.5.

Hint: $(z-0.5)^3 = z^3 - 1.5z^2 + 0.75\,z - 0.125$

Name____ Mail Box ____________________

5) For impulse response $h(n) = 2^n u(2-\mathrm{n})$ and input $x(n) = \left(\frac{1}{3}\right)^{n-1} u(\mathrm{n}-2)$, the system output can be written as $A(n)u(n-4) + B(n)u(3-n)$. Determine an expression for $A(n)$ **or** $B(n)$. You do not need to simplify your expression but you must evaluate all sums.

Name____ Mail Box ___________________

Name____ Mail Box ____________________