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ECE-420
Exam 1
Fall 2012

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 _____

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

a) Determine $H(z)$

b) Determine $X(z)$

c) Assume $Y(z)=z^{-1}G(z)$, determine $g(n)$ and then $y(n)$

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2) Consider the difference equation $y(n+1)-2y(n)=x(n)$ with the initial condition $y(0)=\frac{1}{2}$

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 $y(0)$, $y(1)$, and $y(2)$

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

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

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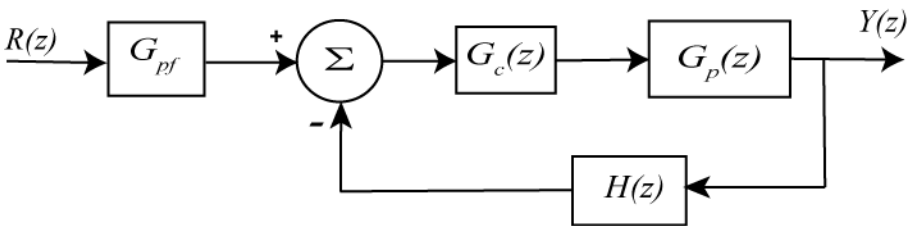
4) Assume the following feedback configuration



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

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

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