EE123 Spring 1996
Midterm #2
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1) (10 points)
(a) (5 points)
Consider the difference equation

$$y[n] = 5y[n-1] + x[n]$$

What initial conditions would make the above difference equation result in a causal LTI system if $x[n] = \delta[n-5]$?

(b) (5 points)

What initial conditions would make the above difference equation result in an anticausal LTI system if $x[n] = \delta[n-5]$?

2.(20 points)

Solve for y[n] for n?0:

$$2y[n-2]\ 3[n-1] + y[n\} = 0,\ y[-2]=2,\ y[-1]=1$$

3. (10 points)

Suppose X(z), the transform of x[n], is given by

$$X(z) = (z^{20})/((z-0.5)\ (z + 1.5)^2)$$

Suppose x[n] is a stable sequence. Determine x[n] at n=-18.

4. (30 points)

Consider two filters with impulse response:

$$h_a[n] = (a^n \text{ for } 0 <= n <= N_a - 1;\ 0 \text{ otherwise})$$

$h_b[n] = (b^n$ for $0 <= n <= N_b - 1$; 0 otherwise)

(a) (6 points)

Give the Z-transforms $H_a(z)$ and $H_b(z)$ and indicate ROCs.

(b) (6 points)

Consider the filter $h_c[n] = h_a[n] * h_b[n]$. What is its Z-transform $H_c(z)$ and ROC?

(c) (6 points)

Consider the inverse filter $H_i(z) = 1/H_c(z)$. For what values of a and b is it causal and stable?

(d) (6 points)

Pick $N_a = 3$ and $N_b = 4$ as well as a =1 and b=1. Give pole-zero plots of $H_a(z)$, $H_b(z)$, and $H_c(z)$.

(e) (6 points)

Sketch $|H_c(e^{jw})|$ for the case (d) above. In particular, indicate where $|H_c(e^{jw})| = 0$, and given the value $|H_c(e^{jw})|$ at w=0

5. (30 points)

Consider the following two signal flow diagrams:

Express a, b, and c each in terms of, alpha, beta, and gamma in order for the two systems to be equivalent.