Name Answers

EE-3220 – Dr. Durant – Quiz 5
Winter 2016-'17, Week 6

Given the difference equation y(n) = 0.9 y(n-1) + 2 x(n)

1. (2 points) Take the z-transform of both sides of the equation. Remember, z^{-1} represents a sample delay.

$Y(z) = 0.9z^{-1}Y(z) + 2X(z)$

2. (2 points) Solve the above equation for the transfer function H(z).

$Y(z)(1 - 0.9z^{-1}) = 2X(z)$

$H(z) = \frac{Y(z)}{X(z)} = \frac{2}{1-0.9z^{-1}} = \frac{2z}{z-0.9}$

(-1/2 recip)

3. (1 point) Write out the first 5 terms of x(n) given that $X(z) = \frac{z}{z+1}$.

Form: $\frac{z}{z-a}$, $a = -1$, geometric series

$x(n) = \{1, -1, 1, -1, 1\}$

4. (2 points) Calculate Y(z) and simplify it using partial fractions.

$Y(z) = H(z)X(z) = \frac{2z^2}{(z-0.9)(z+1)}$

$\frac{Y(z)}{z} = \frac{2z}{(z-0.9)(z+1)} = \frac{A}{z-0.9} + \frac{B}{z+1}$

$2z = A(z+1) + B(z-0.9)$

$A + B = 2 \quad A - 0.9B = 0$

$1.9B = 2 \quad B = \frac{2}{1.9} = \frac{20}{19}$

$A = 2 - B = 2 - \frac{20}{19} = \frac{18}{19}$

$Y(z) = \frac{18/19 \cdot z}{z-0.9} + \frac{20/19 \cdot z}{z+1}$

5. (1 point) Calculate the z-transform of x = [2 6 -5], which starts at ***n = 2***.

$X(z) = 2z^{-2} + 6z^{-3} - 5z^{-4}$

6. (2 points) Calculate the inverse z-transform of $X(z) = z^{-2}\frac{z}{z-1} - z^{-1}\frac{z}{z+0.2}$

$x(n) = u(n-2) + (-0.2)^{n-1}u(n-1)$