Name *Answers*

EE-3221-11 – Dr. Durant – Quiz 6
Winter 2017-'18, Week 6

Convolution: $y(n) = \sum_{k=-\infty}^{\infty} h(k)x(n-k)$ z-transform: $X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n}$

1. (3 points) Calculate the ***convolution*** of x = [1 4 3 2] with h = [5 -1 3]. ***Show your work.***
2. (2 points) Given the difference equation y(n) = -0.3 y(n-1) + 2 x(n), ***take the z-transform*** of both sides of the equation. Remember, z^{-1} represents a sample delay.
3. (3 points) Solve the above equation for the ***transfer function H(z)***.
4. (2 points) ***Calculate*** the inverse z-transform of $X(z) = z^{+1}\frac{z}{z-1} - z^{-1}\frac{z}{z+0.8}$ ***and state*** the values of the first ~~3~~ 4 non-zero samples.

(1)

k=0	5	20	15	10		
k=1		-1	-4	-3	-2	
k=2			3	12	9	6
y=[	5	19	14	19	7	6]

(2) $Y(z) = -0.3z^{-1}Y(z) + 2X(z)$

(3) $Y(z)(1+0.3z^{-1}) = 2X(z)$

$H(z) = \frac{Y(z)}{X(z)} = \frac{2}{1+0.3z^{-1}} = \frac{2z}{z+0.3}$

(4) $x(n) = u(n)$ advanced by 1 $- (-0.8)^n u(n)$ delayed by 1

$= u(n+1) - (-0.8)^{n-1} u(n-1)$

n	$u(n+1)$	-0.8^{n-1}	Δ
-1	1	N/A	1
0	1	N/A	1
1	1	1	0
2	1	-0.8	1.8

Name Answers

EE-3221-41 – Dr. Durant – Quiz 6
Winter 2017-‘18, Week 6

Convolution: $y(n) = \sum_{k=-\infty}^{\infty} h(k)x(n-k)$

z-transform: $X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n}$

1. (3 points) Calculate the ***convolution*** of x = [3 2 4] with h = [5 -3 2 1]. ***Show your work.***
2. (2 points) Given the difference equation y(n) = 0.7 y(n-1) + 3 x(n), ***take the z-transform*** of both sides of the equation. Remember, z^{-1} represents a sample delay.
3. (3 points) Solve the above equation for the ***transfer function H(z)***.
4. (2 points) ***Calculate*** the inverse z-transform of $X(z) = z^{-2}\frac{z}{z+1} - z^{-1}\frac{z}{z-0.3}$ ***and state*** the values of the first 3 non-zero samples.

(1)

k=0:	15	10	20			
k=1:		-9	-6	-12		
k=2:			6	4	8	
k=3				3	2	4
y=[	15	1	20	-5	10	4]

(2) $Y(z) = 0.7z^{-1}Y(z) + 3X(z)$

$Y(z)(1-0.7z^{-1}) = 3X(z)$

(3) $H(z) = \frac{Y(z)}{X(z)} = \frac{3}{1-0.7z^{-1}} = \frac{3z}{z-0.7}$

(4) $x(n) =$ $(-1)^n u(n)$ delayed by 2 $-$ $0.3^n u(n)$ delayed by 1

$= (-1)^{n-2} u(n-2) - 0.3^{n-1} u(n-1)$

$= (-1)^n u(n-2) - 0.3^{n-1} u(n-1)$

n	$(-1)^n$	0.3^{n-1}	Δ
		1	-1
1	N/A	0.3	~~1.3~~ 0.7
2	1		~~0.91~~ -1.09
3	-1	0.09	