Lecture 8&9
Digital Signal Processing

Chapter 3

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Topics That we discussed on Lecture 8

1. What is Direct Z transform? Write down the mathematical equation for Z transformation.
2. What is ROC? Explain with example.
3. Derive the direct z-transformation equation in polar form.
4. What is Inverse Z-transformation? Write down the mathematical equation for Inverse Z transformation.
5. Example: 3.1.1 to 3.1.5,3.2.1,3.2.2

Topics That we discussed on Lecture 9

6. State the following property in the z-domain and determine its ROC.(Without proof)
   i. Linearity.
   ii. Time shifting.
   iii. Scaling.
   iv. Time reversal
   v. Convolution of two sequences.
7. Prove the following property and determine its ROC.
   i. Scaling.
   ii. Time reversal
   iii. Convolution of two sequences.

Topics That we discussed on Lecture 9

8. What is poles and zeros in the z-transformation?
9. If B(z) and A(z) are polynomials in z and X(z) is a rational functions, then derive the following equation

$$X(z) = Gz^{N-M} \frac{\prod_{k=1}^{M}(z - z_k)}{\prod_{k=1}^{N}(z - p_k)}$$

10. Write down the mathematical expression for the Inverse z-Transform by Power Series Expansion.
11. Summarize the convolution process of the two signal in z-transformation
12. **Example: 3.2.3 to 3.2.6,3.2.9**

    3.3.1 to 3.3.3

    3.4.2 to 3.4.5 and 3.4.8

Assignment

1.

3.1 Determine the z-transform of the following signals.

(a) $x(n) = \{3, 0, 0, 0, 0, 6, 1, -4\}$

2.

3.2 Determine the z-transforms of the following signals and sketch the corresponding pole-zero patterns.

(a) $x(n) = (1 + n)u(n)$

(b) $x(n) = (a^n + a^{-n})u(n)$, a real

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

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