**Introduction To Digital Signal Processing Using MATLAB**

**Contents**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Introduction to Digital Signal Processing**
   1. Introduction to Digital Signal Processing
   2. Signals
   3. Signal Classification
   4. Systems
   5. Time-Domain Representation
   6. Frequency-Domain Representation
   7. The Sampling Process
   8. Quantization
   9. Sampling Theorem
   10. Discrete-Time Signals
       1. Examples of Discrete-Time Signals
       2. Arithmetic Operation on Sequences
       3. Some Applications of Digital Signal Processing
   11. Exercise
2. **Discrete-Time LTI Systems**
   1. Introduction
   2. Basic System Properties
      1. Linearity
      2. Time Invariance
      3. Causality
      4. Characterization of Discrete-Time Systems
      5. Recursive system
      6. Non-Recursive system
   3. Exercise
3. **Laplace Transform**
   1. Definition of Laplace Transform
   2. Basic Properties of Laplace Transform
   3. Laplace Transform of some Elementary functions
   4. First Shifting Theorem
   5. Inverse-Laplace Transform
   6. Differentiation and Integration of Laplace Transform
   7. Convolution Theorem
   8. Laplace Transform of Unit Step Function
   9. Laplace Transform of Dirac Delta Function
   10. Second Shifting Theorem
   11. Exercise
4. **Z-Transform**
   1. Introduction
   2. Convergence properties of Z-Transform
   3. Basic Properties of Z-Transform
   4. Difference between Z and Laplace Transform
   5. Transfer Function
   6. Poles and Zeros
   7. Stability and Z-map
   8. Inverse Z-Transform
      1. Residues method for solving the inverse Z-Transform
      2. Partial Fraction Method for solving the inverse Z-transform
   9. Exercise
5. **Fourier Transform**
   1. Introduction
   2. Delta Function Pairs
   3. The Sinc Function
   4. Other Transform Pairs
   5. Gibbs Effect
   6. Harmonics
   7. Inverse Fourier Transform
   8. Exercise
6. **Discrete Time Fourier Transform (DTFT)**
   1. Introduction of DTFT
   2. Properties of DTFT
   3. Linear Convolution
   4. Implementation of Linear Convolution using DTFT
   5. Inverse Discrete Time Fourier Transform (IDTFT)
   6. MATLAB Implementation of DTFT
   7. MATLAB Implementation of IDTFT
   8. Exercise
7. **Discrete Fourier Transform (DFT)**
   1. Introduction
   2. Properties of DFT
   3. Circular Convolution
      1. Graphical Implementation of Circular Convolution
      2. MATLAB Implementation of Circular Convolution
      3. DFT Implementation of Circular Convolution
   4. Inverse Discrete Fourier Transform (IDFT)
   5. Fast Fourier Transform (FFT).
   6. Exercise
8. **Design of Analog Filter**
   1. Basic Introduction of Analog Filter
   2. Lowpass Analog Filters
      1. Butterworth Filters
      2. Chebyshev Filters
      3. The Elliptic Filters
      4. The Bessel Filters
   3. Design of High pass Analog Filter
   4. Design of Band pass Analog Filter
   5. Design of Band Stop Analog Filter
   6. Exercise
9. **Design of Digital Filters**
   1. Introduction
   2. FIR Filter Design
      1. Window Function
      2. The Window Fourier Series Method
      3. The Gibbs Phenomenon
   3. IIR Filter Design
      1. The Bilinear Transformation Method
      2. Lowpass Digital Filter Design
      3. High pass Digital Filter Design
   4. Exercise
10. **Realization Structures**
    1. Finite Impulse Response Filter (FIR)
    2. Infinite Impulse Response Filter (IIR)
    3. Cascade Realization
    4. Parallel Realization
    5. IIR Filter