

<<信号与系统>>

图书基本信息

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内容概要

本书全面系统地介绍了信号与系统的基本概念、理论、方法及应用。
全书共10章。

第1章介绍了信号与系统的基本概念；第2章讨论了线性非时变系统的时域分析方法；第3、4章分别讨论了离散时间周期与非周期信号、连续时间周期与非周期信号，以及线性非时变系统的傅里叶描述以及傅里叶描述在混合信号类型中的应用；第6、7章分别讨论了连续时间信号与离散时间信号的复指数描述；第5、8、9章分别介绍了信号与系统在通信系统、滤波器与均衡器以及线性反馈系统中的应用；第10章简要说明若干关于非稳定信号以及非线性与时变系统的课题。

<<信号与系统>>

书籍目录

Preface

CHAPTER 1 Introduction

- 1.1 What Is a Signal?
- 1.2 What Is a System?
- 1.3 Overview of Specific Systems
- 1.4 Classification of Signals
- 1.5 Basic Operations on Signals
- 1.6 Elementary Signals
- 1.7 Systems Viewed as Interconnections of Operations
- 1.8 Properties of Systems
- 1.9 Noise
- 1.10 Theme Examples
- 1.11 Exploring Concepts with MATLAB
- 1.12 Summary

Further Reading

Additional Problems

CHAPTER 2 Time-Domain Representations of Linear Time-Invariant Systems

- 2.1 Introduction
- 2.2 The Convolution Sum
- 2.3 Convolution Sum Evaluation Procedure
- 2.4 The Convolution Integral
- 2.5 Convolution Integral Evaluation Procedure
- 2.6 Interconnections of LTI Systems
- 2.7 Relations between LTI System Properties and the Impulse

Response

- 2.8 Step Response
- 2.9 Differential and Difference Equation Representations of LTI

Systems

- 2.10 Solving Differential and Difference Equations
- 2.11 Characteristics of Systems Described by Differential and

Difference Equations

- 2.12 Block Diagram Representations
- 2.13 State-Variable Descriptions of LTI Systems
- 2.14 Exploring Concepts with MATLAB
- 2.15 Summary

Further Reading

Additional Problems

CHAPTER 3 Fourier Representations of Signals and Linear Time-Invariant Systems

- 3.1 Introduction
- 3.2 Complex Sinusoids and Frequency Response of LTI Systems
- 3.3 Fourier Representations for Four Classes of Signals
- 3.4 Discrete-Time Periodic Signals: The Discrete-Time Fourier

Series

<<信号与系统>>

3.5 Continuous-Time Periodic Signals: The Fourier Series

3.6 Discrete-Time Nonperiodic Signals: The Discrete-Time Fourier

Transform

3.7 Continuous-Time Nonperiodic Signals: The Fourier

Transform

3.8 Properties of Fourier Representations

3.9 Linearity and Symmetry Properties

3.10 Convolution Property

3.11 Differentiation and Integration Properties

3.12 Time- and Frequency-Shift Properties

3.13 Finding Inverse Fourier Transforms by Using Partial-Fraction

Expansions

3.14 Multiplication Property

3.15 Scaling Properties

3.16 Parseval Relationships

3.17 Time – Bandwidth Product

3.18 Duality

3.19 Exploring Concepts with MATLAB

3.20 Summary

Further Reading

Additional Problems

CHAPTER 4 Applications of Fourier Representations to Mixed Signal

Classes

4.1 Introduction

4.2 Fourier Transform Representations of Periodic Signals

4.3 Convolution and Multiplication with Mixtures of Periodic and

Nonperiodic Signals

4.4 Fourier Transform Representation of Discrete-Time

Signals

4.5 Sampling

4.6 Reconstruction of Continuous-Time Signals from Samples

4.7 Discrete-Time Processing of Continuous-Time Signals

4.8 Fourier Series Representations of Finite-Duration Nonperiodic

Signals

4.9 The Discrete-Time Fourier Series Approximation to the Fourier

Transform

4.10 Efficient Algorithms for Evaluating the DTFS

4.11 Exploring Concepts with MATLAB

4.12 Summary

Further Reading

Additional Problems

CHAPTER 5 Application to Communication Systems

5.1 Introduction

5.2 Types of Modulation

5.3 Benefits of Modulation

5.4 Full Amplitude Modulation

5.5 Double Sideband-Suppressed Carrier Modulation

<<信号与系统>>

- 5.6 Quadrature-Carrier Multiplexing
- 5.7 Other Variants of Amplitude Modulation
- 5.8 Pulse-Amplitude Modulation
- 5.9 Multiplexing
- 5.10 Phase and Group Delays
- 5.11 Exploring Concepts with MATLAB
- 5.12 Summary
- Further Reading
- Additional Problems

CHAPTER 6 Representing Signals by Using Continuous-Time Complex Exponentials: the Laplace Transform

- 6.1 Introduction
- 6.2 The Laplace Transform
- 6.3 The Unilateral Laplace Transform
- 6.4 Properties of the Unilateral Laplace Transform
- 6.5 Inversion of the Unilateral Laplace Transform
- 6.6 Solving Differential Equations with Initial Conditions
- 6.7 Laplace Transform Methods in Circuit Analysis
- 6.8 Properties of the Bilateral Laplace Transform
- 6.9 Properties of the Region of Convergence
- 6.10 Inversion of the Bilateral Laplace Transform
- 6.11 The Transfer Function
- 6.12 Causality and Stability
- 6.13 Determining the Frequency Response from Poles and Zeros
- 6.14 Exploring Concepts with MATLAB
- 6.15 Summary
- Further Reading
- Additional Problems

CHAPTER 7 Representing Signals by Using Discrete-Time Complex Exponentials: the z-Transform

- 7.1 Introduction
- 7.2 The z-Transform
- 7.3 Prope

章节摘录

Note that in both Figs. 8.14 (a) and (b) the transfer function $H (s)$ is in the form of a transfer impedance, defined by the Laplace transform of the output voltage $v_2 (t)$, divided by the Laplace transform of the current source $i_1 (t)$. Problem 8.8 Show that the transfer function of the filter in Fig. 8.14 (b) is equal to the Butterworth function given in Eq. (8.37). Problem 8.9 The passive filters depicted in Fig. 8.14 have impulse response of infinite duration. Justify this statement. The determination of the elements of a filter, starting from a particular transfer function $H (s)$, is referred to as network synthesis. It encompasses a number of highly advanced procedures that are beyond the scope of this text. Indeed, passive filters occupied a dominant role in the design of communication and other systems for several decades, until the advent of active filters and digital filters in the 1960s. Active filters (using operational amplifiers) are discussed in Chapter 9; digital filters are discussed next.

8.8 Digital Filters A digital filter uses computation to implement the filtering action that is to be performed on a continuous-time signal. Figure 8.15 shows a block diagram of the operations involved in such an approach to design a frequency-selective filter; the ideas behind these operations were discussed in Section 4.7. The block labeled "analog-to-digital (A/D) converter" is used to convert the continuous-time signal $x (t)$ into a corresponding sequence $x (n)$ of numbers. The digital filter processes the sequence of numbers $x (n)$ on a sample-by-sample basis to produce a new sequence of numbers, $y (n)$, which is then converted into the corresponding continuous-time signal by the digital-to-analog (D/A) converter. Finally, the reconstruction (low-pass) filter at the output of the system produces a continuous-time signal $y (t)$, representing the filtered version of the original input signal $x (t)$. Two important points should be carefully noted in the study of digital filters:

1. The underlying design procedures are usually based on the use of an analog or infinite-precision model for the samples of input data and all internal calculations, this is done in order to take advantage of well-understood discrete-time, but continuous-amplitude, mathematics. The resulting discrete-time filter provides the designer with a theoretical framework for the task at hand.
2. When the discrete-time filter is implemented in digital form for practical use, as depicted in Fig. 8.15, the input data and internal calculations are all quantized to a finite precision.

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