

<<连续与离散时间信号与系统>>

图书基本信息

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前言

The book is primarily intended for instruction in an upper-level undergraduate or a first-year graduate course in the field of signal processing in electrical and computer engineering. Practising engineers would find the book useful for reference or for self study. Our main motivation in writing the book is to deal with continuous-time (CT) and discrete-time (DT) signals and systems separately. Many instructors have realized that covering CT and DT systems in parallel with each other often confuses students to the extent where they are not clear if a particular concept applies to a CT system, to a DT system, or to both. In this book, we treat DT and CT signals and systems separately. Following Part I, which provides an introduction to signals and systems, Part II focuses on CT signals and systems. Since many students are familiar with the theory of CT signals and systems from earlier courses, Part II can be taught to such students with relative ease. For students who are new to this area, we have supplemented the material covered in Part II with appendices which are included at the end of the book. Appendices A-F cover background material on complex numbers, partial fraction expansion, differential equations, difference equations, and a review of the basic signal processing instructions available in MATLAB. Part III, which covers DT signals and systems, can either be covered independently or in conjunction with Part II. The book focuses on linear time-invariant (LTI) systems and is organized as follows. Chapters 1 and 2 introduce signals and systems, including their mathematical and graphical interpretations. In Chapter 1, we cover the classification between CT and DT signals and we provide several practical examples in which CT and DT signals are observed. Chapter 2 defines systems as transformations that process the input signals and produce outputs in response to the applied inputs. Practical examples of CT and DT systems are included in Chapter 2. The remaining fifteen chapters of the book are divided into two parts. Part II constitutes Chapters 3-8 of the book and focuses primarily on the theories and applications of CT signals and systems. Part III comprises Chapters 9—17 and deals with the theories and applications of DT signals and systems. The organization of Parts II and III is described below.

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内容概要

本书涵盖了连续与离散时间信号与系统的方方面面。

全书内容分为三大部分，分别为信号与系统概述、连续时间信号与系统，以及离散时间信号与系统。书中还有大量的例题和习题，供学生巩固所学内容。

本书既可作为高等院校电子电气等相关专业学生的参考教材，又可供电子电气工程师参考。

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章节摘录

Signals are detectable quantities used to convey information about time-varying physical phenomena. Common examples of signals are human speech, temperature, pressure, and stock prices. Electrical signals, normally expressed in the form of voltage or current waveforms, are some of the easiest signals to generate and process. Mathematically, signals are modeled as functions of one or more independent variables. Examples of independent variables used to represent signals are time, frequency, or spatial coordinates. Before introducing the mathematical notation used to represent signals, let us consider a few physical systems associated with the generation of signals. Figure 1.1 illustrates some common signals and systems encountered in different fields of engineering, with the physical systems represented in the left-hand column and the associated signals included in the right-hand column. Figure 1.1 (a) is a simple electrical circuit consisting of three passive components: a capacitor C , an inductor L , and a resistor R . A voltage $v(t)$ is applied at the input of the RLC circuit, which produces an output voltage $v_C(t)$ across the capacitor. A possible waveform for $v(t)$, $v_C(t)$ is the sinusoidal signal shown in Fig. 1.1 (b). The notations $v(t)$ and $v_C(t)$ includes both the dependent variable, v and v_C , respectively, in the two expressions, and the independent variable t . The notation $v(t)$ implies that the voltage v is a function of time t . Figure 1.1 (c) shows an audio recording system where the input signal is an audio or a speech waveform. The function of the audio recording system is to convert the audio signal into an electrical waveform, which is recorded on a magnetic tape or a compact disc. A possible resulting waveform for the recorded electrical signal is shown in Fig 1.1 (d). Figure 1.1 (e) shows a charge coupled device (CCD) based digital camera where the input signal is the light emitted from a scene. The incident light charges a CCD panel located inside the camera, thereby storing the external scene in terms of the spatial variations of the charges on the CCD panel. Figure 1.1 (g) illustrates a thermometer that measures the ambient temperature of its environment. Electronic thermometers typically use a thermal resistor, known as a thermistor, whose resistance varies with temperature. The fluctuations in the resistance are used to measure the temperature. Figure.

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