## Contents

Foreword to the Second Edition xi								
In	Introduction							
Notation xv								
1	Des	cription of Signals	1					
	1.1	Types of Random Signals	1					
	1.2	Characteristics of Signals	6					
	1.3	Time-Domain and Frequency-Domain Descriptions						
		of Periodic Signals	9					
	1.4	Building a Better Mousetrap: Complex Exponentials	14					
	1.5	Problems and Exercises	18					
2	Spectral Representation of Deterministic Signals: Fourier							
	-	es and Transforms	21					
	2.1	Complex Fourier Series for Periodic Signals	21					
	2.2	Approximation of Periodic Signals by Finite Fourier Sums						
	2.3	Aperiodic Signals and Fourier Transforms	35					
	2.4	Basic Properties of the Fourier Transform	37					
	2.5	Fourier Transforms of Some Nonintegrable						
		Signals; Dirac's Delta Impulse	41					
	2.6	Discrete and Fast Fourier Transforms	44					
	2.7	Problems and Exercises	46					
3	Ran	dom Quantities and Random Vectors	51					
	3.1	Discrete, Continuous, and Singular Random Quantities	52					
	3.2	Expectations and Moments of Random Quantities						
	3.3	Random Vectors, Conditional Probabilities, Statistical						
		Independence, and Correlations	75					
	3.4	The Least-Squares Fit, Linear Regression						
	3.5	The Law of Large Numbers and the Stability of Fluctuations Law	89					

vii

こうきょう かいしょう いろせきの は関連経験

	3.6	Estimators of Parameters and Their Accuracy; Confidence Intervals 92			
	3.7	Problems, Exercises, and Tables100			
4	Stationary Signals				
	4.1	Stationarity and Autocovariance Functions			
	4.2	Estimating the Mean and the Autocovariance			
		Function; Ergodic Signals119			
	4.3	Problems and Exercises			
5	Pow	ver Spectra of Stationary Signals			
	5.1	Mean Power of a Stationary Signal127			
	5.2	Power Spectrum and Autocovariance Function129			
	5.3	Power Spectra of Interpolated Digital Signals			
	5.4	Problems and Exercises			
6	Tra	nsmission of Stationary Signals Through Linear Systems			
	6.1	Time-Domain Analysis143			
	6.2	Frequency-Domain Analysis and System's Bandwidth151			
	6.3	Digital Signal, Discrete-Time Sampling155			
	6.4	Problems and Exercises			
7	Optimization of Signal-to-Noise Ratio in Linear Systems				
	7.1	Parametric Optimization for a Fixed Filter Structure163			
	7.2	Filter Structure Matched to Input Signal167			
	7.3	The Wiener Filter170			
	7.4	Problems and Exercises			
8	Gau	ssian Signals, Covariance Matrices, and Sample Path Properties 175			
	8.1	Linear Transformations of Random Vectors175			
	8.2	Gaussian Random Vectors178			
	8.3	Gaussian Stationary Signals			
	8.4	Sample Path Properties of General and Gaussian Stationary Signals 184			
	8.5	Problems and Exercises			
9		ctral Representation of Discrete-Time Stationary			
	Sign	als and Their Computer Simulations193			
	9.1	Autocovariance as a Positive-Definite Sequence			
	9.2	Cumulative Power Spectrum of Discrete-Time Stationary Signal 196			
	9.3	Stochastic Integration with Respect to Signals			
		with Uncorrelated Increments			
	9.4	Spectral Representation of Stationary Signals			
	9.5	Computer Algorithms: Complex-Valued Case			
	9.6	Computer Algorithms: Real-Valued Case			
	9.7	Problems and Exercises			

Solutions to Selected Problems and Exercises	
Bibliographical Comments	
Index	