Contents



W1784

Preface ix

Introduction

Summary

Problems

Problems

1-3 Singularity Functions

31

33

92

2 Linear Time-Invariant Systems with Deterministic Inputs 36
Introduction 36
2-1 The System Differential Equation and System Function H(s) 36
2-2 The Impulse Response $h(t)$ 42
2-3 The Evaluation and Properties of Convolution Integrals 53
2-4 The System Difference Equation and System Function $H(\alpha)$ or $H(z)$ 66
2-5 The Pulse Response $h(n)$ 75
2-6 Discrete Convolution and Properties of Convolution Summations 82
Summary 91

Signal Operations and Singularity Functions

1-2 Shifting, Reflecting, and Time-scaling Operations 5

1-1 Continuous and Discrete Waveforms 1

3*	Linear Time-invariant Systems with Random Inputs 96
	oduction 96
	Correlation Integrals for Continuous Finite Energy Waveforms 97
	Correlation Summations for Discrete Finite Energy Functions 105
	Correlation Functions for Periodic Waveforms (Infinite Energy-Finite Power) 115
	Statistics and Correlation Functions for Finite Power Noise Waveforms 121
3-5	Linear Systems with Random and Signal plus Noise Inputs 135
Sun	nmary 141
Prol	olems 142
4	The One-sided Laplace Transform 147
	oduction 147
	Definition and Evaluation of Some Transforms 148
	Important Theorems of the Laplace Transform 153
	The Inverse Laplace Transform 161
	Applications of the Laplace Transform 171
	nmary 181
Pro	blems 181
5*	The Two-sided Laplace Transform 185
Inti	oduction 185
5-1	Definition and Evaluation of Some Transforms 185
	Important Theorems of Bilateral Laplace Transforms 190
	The Inverse Two-sided Laplace Transform 195
5-4	Linear Systems with Random and Signal plus Noise Inputs 209
Sur	mmary 215
Pro	blems 217
6	The One-sided Z Transform 221
	roduction 221
	Definition and Evaluation of Some Transforms 222
	Important Theorems of the Z Transform 233
	The Inverse Z Transform 237
	Applications of the Z Transform 242
	mmary 251
Pro	oblems 251
7*	The Two-sided Z Transform 254
	croduction 254
7-1	The Definition and Evaluation of Some Transforms 254

^{*}We suggest omitting starred chapters in an introductory course.

CONTENTS

7-2 Important Theorems of Bilateral Z Transforms 259

7-3 The Inverse Two-sided Z Transform 264

7-4 Linear Systems with Random and Signal Plus Noise Inputs 274	
Summary 279	
Problems 280	
TON THE RESERVE TO SERVE TO SE	
O. The Fermion Transferrer 004	
8 The Fourier Transform 284	
Introduction 284	
8-1 The Trigonometric Fourier Series 285	
8-2 Generalized Fourier Series 291	
8-3 The Fourier Transform 3008-4 Fourier Transform Properties 309	
	23
8-6 Applications of Fourier Theory 327	23
Summary 341	
Problems 341	
9 The Discrete Fourier Transform and the Fast Fourier	
Transform 349	
Introduction 349	
9-1 The Discrete Fourier Transform 350	
9-2 Aliasing and Leakage Problems 358	
9-3 DFT Properties 365	
9-4 The Fast Fourier Transform 373	
9-5 Applications of the FFT 386	
Summary 388	
Problems 388	
There include the roader temperatures in the finite side to the contribution of pure	
10 State Variable Theory 391	
Introduction 391	
10-1 State Variable Representations 392	
10-2 Block Diagrammatics 395	
10-3 Realizations of A, B, C, D 401	
10-4 Solution of the State Equations 428	
10-5 Controllability 441	
10-6 State Variable Feedback 447	
10-7 Observability 451	
10-8 Observers 457	
Summary 459	
Problems 460	

VIII CONTENTS

Appendix: The Formulas of Complex Variables 469

Bibliography 485

Answers to Drill Sets 487

Answers to Selected Problems 491

Index 497