Contents

Preface — V

Preface of Volume I — VII

8 Analysis of discrete signals and systems in the time domain — 1
8.1 Basic discrete signals — 1
8.1.1 Periodic sequences — 1
8.1.2 Sinusoidal sequences — 2
8.1.3 Complex exponential sequences — 3
8.1.4 Exponential sequences — 4
8.1.5 Unit step sequence — 5
8.1.6 Unit impulse sequence — 5
8.1.7 *z* sequence — 6
8.2 Fundamental operations of sequences — 6
8.2.1 Arithmetic operations — 6
8.2.2 Time shifting — 7
8.2.3 Time reversal — 9
8.2.4 Accumulation — 9
8.2.5 Difference — 9
8.2.6 Time scaling — 10
8.2.7 Convolution sum — 11
8.2.8 Sequence energy — 17
8.2.9 Sequence representation with unit impulse sequences — 17
8.3 Discrete systems — 17
8.3.1 The concept of discrete systems — 17
8.3.2 Properties of discrete systems — 17
8.4 Description methods for discrete systems in the time domain — 19
8.4.1 Representation with the difference equation — 19
8.4.2 Representation with the transfer operator — 21
8.4.3 Representation with unit impulse response — 23
8.5 Analysis of discrete systems in the time domain — 24
8.5.1 Classical analysis method — 24
8.5.2 Unit impulse response — 28
8.5.3 Unit step response — 31
8.5.4 Analysis with response decomposition — 31
8.6 Testing for memorability, invertibility and causality — 38
8.7 Solved questions — 39
8.8 Learning tips — 41
8.9 Problems — 42

Bibliografische Informationen
http://d-nb.info/1124793771

digitalisiert durch DEUTSCHE NATIONAL BIBLIOTHEK

9 Analysis of discrete signals and systems in the *z* domain — 47
9.1 Definition of the *z* transform — 47
9.2 *z* transforms of typical sequences — 49
9.3 Properties of the *z* transform — 51
9.4 Solutions of the inverse *z* transform — 55
9.5 Relations between the *z* domain and the *s* domain — 58
9.6 Analysis of discrete systems in the *z* domain — 61
9.6.1 Analysis method from the difference equation — 61
9.6.2 System function analysis method — 66
9.6.3 Sequence decomposition analysis method — 69
9.7 Emulation of discrete systems — 69
9.8 Stability analysis of discrete systems — 71
9.9 Analysis methods of discrete systems in the frequency domain — 74
9.9.1 Discrete-time fourier series — 74
9.9.2 Discrete time fourier transform — 75
9.9.3 Analysis method of discrete systems with fourier transform — 76
9.9.4 Frequency characteristic of the discrete system — 76
9.10 Concept comparisons between discrete systems and continuous systems — 79
9.11 Solved questions — 80
9.12 Learning tips — 82
9.13 Problems — 82

10 State space analysis of systems — 87
10.1 State space description of a system — 87
10.2 State equations of a system — 90
10.3 Establishment of the state model — 92
10.3.1 Establishment from circuit diagrams — 93
10.3.2 Establishment method from emulation diagrams — 95
10.3.3 Establishment method from mathematical models — 97
10.4 Solutions of the state model — 102
10.4.1 Solutions in the *s* domain — 102
10.4.2 Solutions in the time domain — 108
10.4.3 Calculation of e^{At} — 111
10.5 Judging stability — 112
10.6 Judging controllability and observability — 113
10.7 Solved questions — 114
10.8 Learning tips — 117
10.9 Problems — 118

11 Applications of signals and systems analysis theories and methods — 123
11.1 Nondistortion transmission systems — **123**
11.2 Equilibrium systems — **125**
11.3 Filtering systems — **127**
11.3.1 Ideal filters — **128**
11.3.2 Real filters — **131**
11.4 Modulation/demodulation systems — **131**
11.4.1 DSB modulation system — **132**
11.4.2 DSB demodulation system — **134**
11.4.3 AM modulation system — **135**
11.4.4 AM demodulation system — **136**
11.5 Solved questions — **141**
11.6 Learning tips — **143**
11.7 Problems — **144**

A Reference answers — 145

Bibliography — 157

Resume — 159

Index — 161