

Contents

Preface	ix
1 Circuit Elements, Impedance, Network Analysis	1
Gunter N. Franz	
1.1 Circuit Elements: Basic Concepts and Definitions, Element Laws	3
1.2 The Generalization of Ohm's Law: Impedance and Admittance	23
1.3 The Laws of Kirchhoff	37
1.4 Analysis of Simple Circuits	64
1.5 Analysis of Complex Networks	92
1.6 Two-Ports, Couplers, and Controlled Sources	105
Appendix 1.A Complex Numbers	119
Problems	122
References	123
2 Controlled Devices: Transistors	125
Gunter N. Franz	
2.1 Semiconductors	126
2.2 The Semiconductor Junction; Junction Diodes	128
2.3 Field Effect Transistors	130
2.4 Bipolar Junction Transistors	145
2.5 Special Transistor Circuits	158
Problems	162
References	163

3	Introduction to Signals and Systems	165
Gunter N. Franz		
3.1	Periodic Signals: Fourier Series	167
3.2	Aperiodic Signals: The Fourier Transformation	174
3.3	The Laplace Transformation	180
3.4	Impulse Functions, Generalized Derivatives, Sampled Functions	190
3.5	Linear Network and System Analysis	199
	Problems	221
	References	222
4	Analog Design Using Integrated Circuits	223
Paul B. Brown		
4.1	Introduction to Integrated Circuits	224
4.2	Introduction to Operational Amplifiers and the Negative Feedback Configuration	226
4.3	Introduction to Analog Computation	234
4.4	Analog Computation Symbols and Diagrams	247
4.5	Some Nonlinear Functions	250
4.6	Multiplication and Division	256
4.7	Positive Feedback	257
4.8	Performance Specifications of Analog Building Blocks	259
4.9	Modification of Input and Output Characteristics	261
4.10	Instrumentation Amplifiers	265
4.11	Higher-Level Building Blocks	265
	Problems	265
	Selected References	267
5	Digital Devices	269
Paul B. Brown		
5.1	Analog Versus Digital Signals	271
5.2	Principles of Binary Logic	272
5.3	Binary, Octal, and Hexadecimal Arithmetic	280
5.4	Other Number Representation Systems	293
5.5	Hardware Logic Implementation	296
5.6	MSI Combinatorial Logic Devices	307
5.7	Busses	314
5.8	Flipflops and Registers	316
5.9	Counters	330
5.10	Some Other MSI Devices	337
5.11	Preset Counters	340
5.12	Implementation of Binary Arithmetic	341
5.13	State Logic Design	345
5.14	Large-Scale Integration: Memories	351
	Problems	358
	Selected References	360

6	Waveform Generation and Signal Conditioning	361
Paul B. Brown		
6.1	Level Detection	363
6.2	Switching Techniques	367
6.3	Pulse Generators	367
6.4	Oscillators	371
6.5	Amplitude and Frequency Modulation	376
6.6	Automatic Gain and Frequency Control	379
6.7	Frequency Division and Multiplication	382
6.8	Frequency Synthesis	385
6.9	Triggerable Waveforms	387
6.10	Complex Waveforms	393
6.11	Noise	396
6.12	Filters	400
6.13	Event Detection	403
Problems		406
Selected References		407
7	Digital Signal Processing	409
Paul B. Brown		
7.1	Discrete Time and Discrete Amplitude Representations of Analog Signals	410
7.2	Binary Representation of Discrete Amplitude Signals	415
7.3	D/A Conversion	417
7.4	A/D Conversion	418
7.5	Multiplexing	420
7.6	Digital Signal Processing	420
Problem		426
References		426
8	Principles of Radio Frequency Electronics and Electromagnetic Radiation	427
Howard Moraff		
8.1	The Electromagnetic Spectrum	430
8.2	RF Signals	431
8.3	Electromagnetic Fields and Waves	453
8.4	Antennas and Propagation	456
8.5	Transmission Lines	464
8.6	Radio Frequency Interference and Noise	466
8.7	Television	469
References		471

9 Transduction	473
Howard Moraff	
9.1 Principles of Transduction	475
9.2 Transducer Circuitry Considerations	486
9.3 Effects of Transducer Properties on Systems	487
References	487
Index	489