

Contents

1	Basic Concepts	1
1.1	Electric Charge, Current, Voltage, Power, Energy, and Sources	1
1.2	Ohm's Law, Kirchhoff's Laws, Parallel–Series Connection of Resistors and Sources, Delta–Wye Conversion.	14
1.3	Resistivity and Resistance, Voltage and Current Division, Resistive Sensors and Mixture Models, Blood Cell Counting, Wheatstone Bridge, Infinite Ladders.	39
	References.	83
2	Analysis Methods	85
2.1	Nodal Analysis	85
2.2	Mesh Analysis	123
2.3	Linearity and Superposition	140
2.4	Source Transformation	155
2.5	Thévenin–Norton Equivalent Circuits and Maximum Power Transfer	165
3	Capacitors and First-Order RC Circuits	185
3.1	Capacitors, Permittivity, Capacitance	185
3.2	First-Order RC Circuits	215
	References.	275
4	Inductors and First-Order RL Circuits	277
4.1	Inductors.	277
4.2	First-Order RL Circuits.	288
	References.	304
5	Second-Order Circuits	305
5.1	Second-Order RLC Circuits	305

5.2	Duality Principle	338
	References	345
6	Sinusoidal Steady-State Analysis	347
6.1	Average and RMS Values of Signals	347
6.2	The Phasor, Admittance, Impedance	352
6.3	AC Analysis Methods, Resonance, and Matching	379
6.4	Power in AC Circuits	407
6.5	Inductive Coupling and Transformers	416
	References	432
7	Laplace Transform Methods	435
7.1	LT, Inverse LT, Initial and Final Value Properties	435
7.2	Circuits in s-Domain	452
7.3	Transfer Functions, Poles and Zeros, Frequency Response	461
7.4	Impedance and Admittance	500
7.5	Frequency and Component Scaling	519
7.6	TF Approximation (Reducing the Order of a Transfer Function)	522
	References	534
8	Network Synthesis	535
8.1	Positive Real Functions, Hurwitz Polynomials	535
8.2	LC Driving Point Impedance (DPI)	550
8.3	RC Driving Point Impedance	563
8.4	RC Driving Point Impedance Synthesis	582
8.5	Hilbert (Kramers–Kronig) Transforms	608
8.6	Constructing a Network Function from Its Real Part	614
8.7	Constructing a Network Function from Its Phase	619
8.8	Impedance Spectroscopy	629
	References	645
9	Two-Port Networks	647
	Reference	667
10	Operational Amplifiers	669
10.1	Basic Op-amp Circuits	669
10.2	Filters and Other Op-amp Circuits	723
	References	771
	Appendix	773
	Historical Profiles	791
	Selected Bibliography	801
	Index	805

Electrical Circuits in Biomedical Engineering

Problems with Solutions

Keskin, A.Ü.

2017, XI, 812 p. 721 illus., 710 illus. in color., Hardcover

ISBN: 978-3-319-55100-5