



Electric Circuits Fundamentals

Sergio Franco, *San Francisco State University*

Oxford University Press, 1995

ISBN: 0-19-513613-6

Contents

FOREWORD, by Adel S. Sedra

PREFACE: Pedagogy and Approach, Content, Course Options, Supplements, Acknowledgments

CONTENTS

1 BASIC CONCEPTS

- 1.1 Units and Notation
- 1.2 Electric Quantities
- 1.3 Electric Signals
- 1.4 Electric Circuits
- 1.5 Kirchhoff's Laws
- 1.6 Circuit Elements
- 1.7 Sources

Summary

Problems

2 RESISTIVE CIRCUITS

- 2.1 Resistance
- 2.2 Series/Parallel Resistance Combinations
- 2.3 Voltage and Current Dividers
- 2.4 Resistive Bridges and Ladders
- 2.5 Practical Sources and Loading
- 2.6 Instrumentation and Measurement

Summary

Problems

3 CIRCUIT ANALYSIS TECHNIQUES

- 3.1 Circuit Solution by Inspection
- 3.2 Nodal Analysis
- 3.3 Loop Analysis
- 3.4 Linearity and Superposition
- 3.5 Source Transformations
- 3.6 Circuit Analysis Using SPICE

Summary

Problems

4 CIRCUIT THEOREMS AND POWER CALCULATIONS

- 4.1 One-Ports
- 4.2 Circuit Theorems
- 4.3 Nonlinear Circuit Elements
- 4.4 Power Calculations
- 4.5 Circuit Analysis Using SPICE

Summary

Problems

5 TRANSFORMERS AND AMPLIFIERS

- 5.1 Dependent Sources**
- 5.2 Circuit Analysis with Dependent Sources**
- 5.3 The Transformer**
- 5.4 Amplifiers**
- 5.5 Circuit Analysis Using SPICE**

Summary

Problems

6 OPERATIONAL AMPLIFIERS

- 6.1 The Operational Amplifier**
- 6.2 Basic Op Amp Configurations**
- 6.3 Ideal Op Amp Circuit Analysis**
- 6.4 Summing and Difference Amplifiers**
- 6.5 Transresistance, Transconductance, and Current Amplifiers**
- 6.6 Op Amp Circuit Analysis Using SPICE**

Summary

Problems

7 ENERGY STORAGE ELEMENTS

- 7.1 Capacitance**
- 7.2 Inductance**
- 7.3 Natural Response of RC and RL Circuits**
- 7.4 Responses to DC and AC Forcing Functions**

Summary

Problems

8 TRANSIENT RESPONSE OF FIRST-ORDER CIRCUITS

- 8.1 Basic RC And RL Circuits**
- 8.2 Transients in First-Order Networks**
- 8.3 Step, Pulse, and Pulse-Train Responses**
- 8.4 First-Order Op Amp Circuits**
- 8.5 Transient Analysis Using SPICE**

Summary

Problems

9 TRANSIENT RESPONSE OF SECOND-ORDER CIRCUITS

- 9.1 Natural Response of Second-Order Circuits**
- 9.2 Transient Response of Second-Order Circuits**
- 9.3 Step Response of Second-Order Circuits**
- 9.4 Second-Order Op Amp Circuits**
- 9.5 Transient Analysis Using SPICE**

Summary

Problems

10 AC RESPONSE

- 10.1 Sinusoids and Phasors**
- 10.2 AC Response of the Basic Elements**
- 10.3 AC Response of First-Order Circuits**
- 10.4 AC Response of Second-Order Circuits**

Summary

Problems

11 AC CIRCUIT ANALYSIS

- 11.1 Phasor Algebra**
- 11.2 AC Impedance**
- 11.3 Frequency-Domain Analysis**
- 11.4 First-Order Op Amp AC Circuit**

11.5 AC Analysis Using SPICE

Summary

Problems

12 AC POWER AND THREE-PHASE SYSTEMS

12.1 AC Power

12.2 Complex Power

12.3 Three-Phase Systems

12.4 Y-Y and Y- Δ Systems

12.5 Power in Three-Phase Systems

12.6 SPICE Analysis of Three-Phase Systems

Summary

Problems

13 AC RESONANCE

13.1 Series Resonance

13.2 Parallel Resonance

13.3 Resonant Op Amp Circuits

13.4 Scaling

Summary

Problems

14 NETWORK FUNCTIONS

14.1 Complex Frequency

14.2 Network Functions

14.3 The Natural Response Using $H(s)$

14.4 The Complete Response Using $H(s)$

14.5 The Frequency Response Using $H(s)$

14.6 Network Function Building Blocks

14.7 Piecewise-Linear Bode Plots

14.8 Circuit Responses Using SPICE

Summary

Problems

15 TWO-PORT NETWORKS AND COUPLED COILS

15.1 Two-Port Parameters

15.2 The z , y , a , and h Parameters

15.3 Two-Port Interconnections

15.4 Magnetically Coupled Coils

15.5 Transformers

15.6 SPICE Analysis of Two-Ports and Coupled Coils

Summary

Problems

16 THE LAPLACE TRANSFORM

16.1 The Step and Impulse Functions

16.2 The Laplace Transform

16.3 Operational Transforms

16.4 The Inverse Laplace Transform

16.5 Application to Differential Equations

16.6 Application to Circuit Analysis

16.7 Convolution

Summary

Problems

17 FOURIER ANALYSIS TECHNIQUES

17.1 The Fourier Series

17.2 The Effect of Shifting and Symmetry

17.3 Frequency Spectra and Filtering

- 17.4 The Exponential Fourier Series**
- 17.5 The Fourier Transform**
- 17.6 Properties of the Fourier Transform**
- 17.7 Fourier Transform Applications**
- 17.8 Fourier Techniques Using SPICE**

Summary

Problems

APPENDIX 2A: Standard Resistance Values

APPENDIX 3A: Solution of Simultaneous Linear Algebraic Equations: Gaussian Elimination, Cramer's Rule

APPENDIX 9A: Euler's Formula and the Undamped Response

APPENDIX 11A: Summary of Complex Algebra

Answers to Odd-Numbered Problems

INDEX