CONTENTS

1. Introduction, 5

- 1.1 Concept of an electric circuit, 5
- 1.2 Charge, current, Kirchhoff's current law, 6
- 1.3 Voltage, power, Kirchhoff's voltage law, 7
- 1.4 Time functions of circuit variables, 8

2. Circuit elements, 11

2.1 Classification, 11

2.2 Basic active elements, 12

2.3 Basic passive elements, 13

2.4 Basic rules of equivalence, 16

3. Resistive circuits, 18

3.1 Elementary analysis, 18

3.2 Thevenin's and Norton's theorems, 20

3.3 Superposition theorem, 23

3.4 Power and power matching, 23

4. Circuit equations, 25

4.1 Topology of electric circuits, 25

4.2 Independent circuit equations, 27

4.3 Direct application of the KCL and KVL, 28

4.4 Loop current analysis, 29

4.5 Nodal voltage analysis, 31

4.6 Reciprocity theorem. 33

5. Sinusoidal steady state, 35

5.1 Sinusoidal function, 35

5.2 Basic circuit elements at the sinusoidal excitation, 35

5.3 Phasors, 37

5.4 Impedance and admittance, 39

5.5 Rules of equivalence, elementary circuit analysis, 41

5.6 Phasor diagrams, 44

5.7 Circuit theorems for the sinusoudal steady state, 46

5.8 Power and power matching, 48

5.9 Circuit equations for the sinusoidal steady state, 50

5.10 Circuit functions, 56

5.11 Frequency characteristics, 58

5.12 Resonant circuits, 65

5.13 Three-phase systems, 69

6. Transients, 75

6.1 Circuit equations for transients, 75

6.2 First order circuits, 76

6.3 Higher order circuits, 86

7. Recommended books, 93