621.3192 SUK

CONTENTS

		Page
Chapter 1	**Preliminaries and Circuit Element**	**1**
1.1	Introduction	1
1.2	Basic symbols and notation	3
1.3	The resistor	5
1.4	The capacitor	10
1.5	The inductor	12
1.6	Remarks on two-terminal elements	15
1.7	Independent sources	16
1.8	Power and energy	17
1.9	Controlled sources	22
1.10	Concluding remarks	24
	Problems	24
Chapter 2	**Network Equilibrium Equations and Analysis of LTI Networks**	**28**
2.1	Kirchhoff's laws	29
2.2	Series and parallel connection of like elements	31
2.3	Numbers of independent voltage and current variables	41
2.4	Network equilibrium equations	45
2.5	Cutset analysis	45
2.6	Loop analysis	49
2.7	Node analysis	52
2.8	Mesh analysis	56
2.9	Concluding remarks	61
	Problems	62
Chapter 3	**Some Network Properties and Theorems**	**76**
3.1	Linear networks	76
3.2	Superposition theorem	77
3.3	Thevenin's theorem	82
3.4	Norton's theorem	85
3.5	Tellegen's theorem	88
3.6	Reciprocity theorem	90
3.7	Concluding remarks	91
	Problems	92
Chapter 4	**Analysis of Simple Circuits with Dynamic Excitations**	**98**
4.1	Singularity functions	98
4.2	Step and impulse responses of first-order circuits	103
4.3	Application of basic techniques to solve more complex circuit problems	106
4.4	Capacitors with initial voltages and inductors with initial currents	110
4.5	Classical approach to the solution of a complex circuit problem	113
4.6	Responses of a second-order-circuit – RLC series circuit	117
4.7	Concluding remarks	121
	Problems	122
Chapter 5	**Steady-State Circuit Analysis**	**128**
5.1	Complex arithmetic and Euler's formula	128
5.2	Steady-state response of a network to the excitation ε^{8t}	132
5.3	Classes of circuit problems implied by an exponential excitation	139
5.4	Alternating-current circuit analysis	144

5.5	Power in an ac circuit	152
5.6	Maximum power transfer	161
5.7	Concluding remarks	163
	Problems	163
Chapter 6	**Two-Terminal Electronic Devices and Their Circuit Moedls**	**171**
6.1	Intrinsic and extrinsic semiconductors	171
6.2	The p-n junction and the semiconductor diode	174
6.3	Small-signal analysis- the dynamic resistance of a diode	179
6.4	Other diodes	181
6.5	The ideal diode and the piecewise linear model of a diode	185
6.6	Practical diode circuits	187
6.7	Concluding remarks	192
	Problems	193
Chapter 7	**Two-Port and Three-Terminal Linear Networks**	**199**
7.1	Definitions of two-port parameters	199
7.2	Three-terminal and four-terminal two-ports	205
7.3	Relationships among two-port parameters	207
7.4	Relationships in a loaded two-port	210
7.5	Circuit models of two-ports with known parameters	211
7.6	The mutual inductance and the transformer	212
7.7	Interconnection of two-ports	219
7.8	The indefinite admittance matrix	225
7.9	Reciprocal and nonreciprocal networks	231
7.10	Concluding remarks	232
	Problems	232
Chapter 8	**Field-Effect Transistor Circuits**	**240**
8.1	The junction field-effect transistor (JFET)	240
8.2	JFET characteristics	244
8.3	dc analysis of basic FET amplifier circuit	246
8.4	Large-signal analysis of basic FET amplifier circuit	247
8.5	Small-signal parameters of an FET	249
8.6	Relationships among small-signal components of quantities in an FET	251
8.7	Self-biased FET amplifier	255
8.8	The source follower	260
8.9	The common-gate amplifier	262
8.10	The metal-oxide-semiconductor FET (MOSFET) or insulated-gate FET (IGFET)	263
8.11	The biasing of the MOSFET	268
8.12	ac analysis of MOSFET circuits	272
8.13	Other FET circuit considerations	273
	Problems	275
Chapter 9	**Bipolar Transistor Circuits**	**283**
9.1	The bipolar junction transistor	283
9.2	Current components in a transistor	284
9.3	Large-signal model for the junction transistor	288
9.4	Transistor configurations	289
9.5	The common-base transistor characteristics	290
9.6	The common0emitter transistor characteristics	292
9.7	dc analysis of basic common-emitter transistor amplifier	293
9.8	Other transistor circuit biasing schemes	297
9.9	Transistor ratings and biasing considerations	303
9.10	Stabilization of the operating point	305
9.11	Small-signal ac models for the bipolar transistor	306
9.12	Other ac transistor circuit models	310
9.13	Comparison of the three orientations of the transistor	312
9.14	ac analysis of transistor circuits	316

9.15	High-frequency equivalent circuits of a transistor	321
	Problems	322
Chapter 10	**Other Electronic Devices and Circuits**	**332**
10.1	Vacuum tubes	332
10.2	Ac analysis of vacuum-tube circuits	338
10.3	Integrated electronics	339
10.4	Operational amplifier	345
10.5	Operation amplifier circuits	347
10.6	Concluding remarks	350
	Problems	350
Chapter 11	**Network Analysis in the Frequency domain**	**357**
11.1	Net work functions in the complex-frequency domain	357
11.2	Poles and zeros	361
11.3	Frequency characteristics of network functions	363
11.4	Resonance in second-order circuits	366
11.5	Bode diagrams	371
11.6	Concluding remarks	381
	Problems	381
Chapter 12	**Network Analysis in the Time Domain and the System Concept**	**388**
12.1	The impulse response	389
12.2	The convolution integral	391
12.3	Some properties of the convolution integral	398
12.4	Remarks on the convolution integral	401
12.5	The system concept	402
	Problems	403
Chapter 13	**System Response to Periodic Excitations : Fourier Analysis**	**406**
13.1	The Fourier series	406
13.2	Some special cases	411
13.3	Application to circuit problems	416
13.4	Effective value of a periodic quantity	417
13.5	Average power in a circuit with periodic excitations	418
13.6	Fourier series in complex form	420
13.7	Frequency spectrum and the concept of transform	422
	Problems	426
Chapter 14	**Fourier Transform and Applications**	**431**
14.1	The Fourier integral	431
14.2	Properties of the Fourier transform	436
14.3	Relationship between the impulse response and the network function	439
14.4	Circuit analysis using the Fourier transform	443
14.5	Ideal low-pass filters	444
14.6	Modulation theorem and amplitude modulation	450
14.7	Far-field pattern of an aperture antenna	452
14.8	The limiting cases of some Fourier transforms	456
	Problems	460
Chapter 15	**Laplace Transform and Applications**	**464**
15.1	The two-sided Laplace transform	464
15.2	Some properties of the two-sided Laplace transform	470
15.3	Application of two-sided Laplace transform to circuit problems	470
15.4	The one-sided Laplace transform	473
15.5	Some properties of the one-sided Laplace transform	476
15.6	The inverse Laplace transform : Tables of Laplace transform	481
15.7	Partial-fraction expansion of a rational function	485
15.8	Solution of differential equations by Laplace transform	488
15.9	The complete solution of network problems	490

15.10	Network elements with initial energy	492
15.11	The initial-value and final-value theorems	498
15.12	Calculation of impulse response by Laplce transform	501
15.13	Finding the two-side Laplace transform from the one-sided Laplace ransform	502
	Problems	505
Chapter 16	**State-Variable Method of System Analysis**	**511**
16.1	The concept of the state of a network and its state equation	512
16.2	The proper network and its state equation	515
16.3	Networks with controlled sources and mutual inductances	520
16.4	State equation of an improper network	521
16.5	Time-domain solution of the state equation	522
16.6	Laplace - transform solution of the state equation	525
16.7	Concluding remarks	527
	Problems	528
Chapter 17	**Logic Circuits**	**532**
17.1	The logic operations	533
17.2	Boolean algebra	538
17.3	Boolean expressions for a binary function	540
17.4	Circuits of logic gates	543
17.5	The binary number system	547
17.6	Combinational and sequential circuits	548
17.7	The flip-flop (FF)	549
17.8	Shift registers	554
17.9	The counter	555
17.10	The adder	556
17.11	The subtractor	558
17.12	The multiplier	560
17.13	The serial adder	561
17.14	A BCD-to-decimal decoder	563
17.15	Concluding remarks	565
	Problems	565
Index		**613**