Contents

1	Ideal Components	1
	The Ideal Resistor	1
	The Ideal Capacitor	3
	The Ideal Inductor	4
	The Ideal Voltage Source	5
	The Ideal Current Source	7
	The Ideal Switch	7
	The Ideal Transformer	8
	The Ideal Transmission Line	9
	Exercises	13
2	The Laplace Transform and Its Application to Transients	
-	in Linear Circuits	21
	Laplace Transforms of Some Simple Functions	22
	Basic Laplace Transform Theorems	22
	Inversion of the Laplace Transform	23
	Transient Response of an R-C Circuit	26
	Transient Response of a Series R-L-C Circuit	29
	Transient Response of a Series-Parallel R-L-C Circuit	33
	Transients in Ideal Transmission Lines	35
	Exercises	40
3	Transient Response of Cascaded Circuits and Ladder	
J	Networks	43
	The Transfer Function	43
	The Elmore Delay and the Elmore Risetime	44
		ix

x • Contents

	Cascaded Circuits	4:
	Ladder Networks	4
	Exercises	54
4	Real Components	5'
	Resistors	5
	Capacitors	59
	Inductors	60
	Transformers	6
	Transmission Lines	6.
	Exercises	6
5	Junction Diodes	69
	Characteristics	69
	Stored Charge and Capacitances	72
	Body Resistance and Conductivity Modulation	73
	The Diode Model	74
	Transients in Junction Diode Circuits	75
	Exercises	93
6	Tunnel-Diodes	95
	Analysis of Tunnel-Diode Transient Using a Simplified Equivalent Circuit	97
	Analysis of Tunnel-Diode Transient Using the Complete	102
	Equivalent Circuit Exercises	103
	Exercises	103
7	Junction Transistors	111
	The PNP Transistor	111
	The NPN Transistor	114
	Small-Signal Parameters	116
	The Grounded Base Configuration	116
	The Grounded Emitter Configuration	118

Contents • xi

	The		Collector	Configuration	(Emitter	110
		llower)				119 121
Transient Response of the Emitter Follower						
	Exerc	cises				129
8	The En	nitter-Couple	d Transistor	Pair		131
	Com	putation of t	he Switching	g Transient		131
	Resu	lts				137
	Exerc	cises				146
9	Digital	Fanout Circ	uits			149
	Singl	e-Stage Circu	ait			149
	_	Stage Circui				151
		i-Stage Circu				152
	Exer	_				154
10	Linea	r Amplifiers				155
	The	Gain-Cell o	f Gilbert			155
	Tra	nsient Respo	nse			156
	Inp	ut Impedanc	e			158
		ercises				158
	Answer		159			
	Referen	ices				161
	Index					165