CONTENTS

	Preface	V
	Preface to the English edition	VI
	Main symbols and abbreviations	IX
1.	Introduction to the problems of integrated circuits	1
2.	Principles of integrated-circuit technology	7
2.1	Principles of monolithic planar technology	7
2.2	Thin-film technology	22
2.3	Thick-film technology	26
2.4	Principles of hybrid technologies	27
2		
J. 21	Elements of integrated functional blocks	28
J.I		29
3.1.1		33
3.1.2		38
3.1.3		40
3.2		42
3.2.1		42
3.2.2		48
3.3	Diodes	52
3.4	Transistors	54
3.5	Special types of integrated-circuit elements	68
4.	Models of transistors and diodes for integrated functional blocks .	76
4.1	Linear models of integrated transistors	76
4.1.1	Noise in transistors	83
4.2	Nonlinear models of integrated transistors	85
5.	Principles of integrated-circuit design	97
5.1	The idea of functional blocks	97
5.2	Economic aspects	100
5.3	Reliability questions	106
5.4	Basic physical limitations and energy relations of integrated circuits	121
5.5	Parasitic effects	135
5.6	Parameter tolerances	137
5.7	Planarity problems	137
6.	Principles of the theory of sensitivities and tolerances	141
6.1	Relation between the circuit functions and their parameters	142

`		
6.2	Basic concepts of the theory of sensitivities and tolerances	148
6.3	Multiparameter sensitivity	155
6.4	Large-change sensitivities and tolerances	164
6.5	Methods of sensitivity determination	170
7.	Theoretical principles of integrated-circuit design	179
7.1	Computer methods of integrated-circuit design	1 79
7.2	Circuit functions and methods for their approximation	187
7.2.1	Most important types of circuit functions of integrated functional	
	blocks	188
7.2.2	Survey of approximation methods	192
7.3	Analysis of circuit models and systems	197
7.4	Principles of optimization methods used in the design of integrated	
	functional blocks	205
7.4.1	Linear and linearized optimization	208
7.4.2	Nonlinear optimization	212
7.5	Optimization programs and software packages	225
7.5.1	The GOSPEL optimization package	226
7.5.2	The UNOPT and UNMIN optimization packages	227
7.5.3	The SPONA optimization package	228
7.6	Morphological design of integrated-circuit	230
7.7	Application of computer methods in the integrated-circuit	
	production process	243
7.8	Program systems for computer-aided integrated-circuit analysis	
	and synthesis	244
8.	Basic integrated logic functional blocks	248
81	Problems of integrated logic circuits and networks	248
0.1	respectively of integrated regic chearts and networks	<i>м</i> -т0

	production process	243
7.8	Program systems for computer-aided integrated-circuit analysis	
	and synthesis	244
8.	Basic integrated logic functional blocks	248
8.1	Problems of integrated logic circuits and networks	248
8.2	Properties of the main types of integrated logic functional blocks	253
8.3	Integrated functional memory blocks	275
9.	Basic linear integrated functional blocks	281
9.1	Basic types of integrated functional blocks	281
9.2	Integrated amplifiers	285
9.3	Gyrators, converters and mutators	313
9.4	Stabilized power sources	323
9.5	Distributed RC functional blocks	332
9.6	Selective functional blocks	337
9.7	Special linear integrated functional blocks	362
	References	368
	Index	384

VIII