Contents

Translati	ion Editor's Preface		,
Preface			vi
Снартег	1. Development of the idea of an operational (symbolic) calculus	•••	1
1.1.	The origin of the idea	•••	2
1.2.	Heaviside and the emergence of operational		1 3
1.3.	calculus Later developments in operational calculus	•••	13 25
CHAPTER	2. The basis of operational calculus	•••	34
2.1.	Some preliminary operational transformations and		
	their application		34
2.2.	Basic concepts and definitions	•••	36
2.3.	The Laplace integral		38
2.4.	The Bromwich integral	•••	40
2.5.	Some properties of elementary functions and trans-		
	formations	• • •	44
2.6.	Differentiation of an original function: The form of a transform corresponding to the derivative of		
	a pre-assigned original $f(t)$	•••	47
2.7.	Differentiation of transforms: The form of an original corresponding to the derivative of a		
• •	pre-assigned transform $F(p)$	•••	50
2.8.	Integration of original functions: The form of a		
	transform corresponding to the integral of a		
2.0	pre-assigned original $f(t)$	•••	52
2.9.	Integration of transforms: The form of an original		
	function corresponding to the integral of a pre-		55
2.10	assigned transform $F(p)$	•••	57 57
2.10.	The shift property (the retardation theorem)	•••	
2.11.	The displacement property (the attenuation theorem)	•••	58
2.12.	The partial degeneration property of the original		Er
2 12	functions (the lead theorem)	•••	59
2.13.	Convolution or folding property (the theorem of the		-
	product of transforms)	•••	60

2.14.	Generalization of the theorem of the product of		67
	transforms	•••	07
2.15.	Generalization of the theorem of the product of		69
	originals	•••	0)
2.16.	Series expansion of originals and transforms		82
	(expansion theorem)	•••	88
2.17.	Transform of a periodic original	•••	91
2.18.	The limit relations	•••	71
2.19.	Differentiation and integration with respect to		94
	parameters	•••	99
2.20.	Transforms of some functions	•••	99
CHAPTER	3. Operational techniques in the theory of linear		
	ordinary differential equations with constant		
	coefficients	•••	141
3.1.	The solution of linear homogeneous and non-homo-		
J.1.	geneous differential equations with constant coeffi-		
	cients, and systems of such equations	•••	141
3.2.	Examples of solutions of linear differential equations		
3.2.	with constant coefficients	•••	148
CHAPTER	4. Theory of generalized symbolic transformations of		
	linear differential equations with almost-periodic,		
	quasi-periodic and bounded coefficients	•••	157
	and the second of		
4.1.	Linear differential equations with coefficients of		157
	least deviation from a constant	•••	137
4.2.	Lemma on the quasi-periodicity of some types of		164
	matrices	•••	104
4.3.	The analytic property of the vector ξ (t, p, ε) with		167
	respect to ε and p	•••	107
4.4.	The form of solutions of linear differential equa-		182
	tions with bounded coefficients	•••	102
4.5.			195
	of least deviation from a constant	•••	193
Снарте	R 5. Differential equations with deviating arguments	•••	218
	and the second of the second o		
5.1.	Definition of differential equations with deviating		218
_	arguments and their classification	•••	210
5.2.	Problems reducible to differential equations with		930
	retarding arguments	•••	220

5.3.	Basic initial-value problems. Step method	•••	223
5.4.	Solution of systems with constant coefficients and		227
<i></i>	retardation	•••	227
5.5.	Representation of solutions of a system with retar-		222
	dation in the form of a definite integral	•••	233
5.6.	Exponential solutions of a system with retardation	•••	235
5.7.	Series expansion of a solution of a system with		220
	retardation in terms of fundamental solutions		239
CHAPTER	6. The establishment of effective criteria for the		
	stability and instability of solutions of linear		
	differential equations with variable		
	coefficients	•••	245
6.1.	The 'total' transformation of a fundamental system		
•	of equations. The form of its formal solutions		246
6.2.	The asymptotic character of approximate solutions		
	of a fundamental system of equations		257
6.3.	The criterion for the stability of exact solutions of a		
•	fundamental system of equations when $t \rightarrow +\infty$	•••	264
6.4.	Criterion for the instability of solutions of funda-		
• • • • • • • • • • • • • • • • • • • •	mental systems of equations		276
6.5.	Some applications	•••	286
Chapter	7. Linear differential equations of the nth order with		
Omn 12.	coefficients whose variable part consists of		
	bounded functions	•••	299
7.1.	Stability of solutions as $t \rightarrow +\infty$		299
7.2.	Form of formal solutions	•••	302
7.2.	Asymptotic character of approximate solutions		308
1.5.	riojimpionio siminote or approximate solutions	•••	230
Refer	ences	•••	313