

Contents

PREFACE TO THE ENGLISH EDITION	vii
PREFACE TO THE RUMANIAN EDITION	ix

Introduction

I.1 Vector Representation of Systems of Differential Equations	1
I.2 The Existence Theorem	3
I.3 Differential Inequalities	4
I.4 The Uniqueness Theorem	8
I.5 Theorems of Continuity and Differentiability with Respect to Initial Conditions	10
Notes	12

CHAPTER 1

Stability Theory

1.1 Theorems on Stability and Uniform Stability	14
1.2 Asymptotic Stability	21
1.3 Linear Systems	39
1.4 Stability for Linear Systems	43
1.5 Linear Systems with Constant Coefficients	46
1.6 The Lyapunov Function for Linear Systems with Constant Coefficients	56
1.7 Stability by the First Approximation	58
1.8 Total Stability	85
1.9 Linear Systems with Periodic Coefficients	104
1.10 The Perron Condition	120
Notes	129

CHAPTER 2

Absolute Stability of Nonlinear Control Systems

2.1 The Canonical Form and the Corresponding Lyapunov Function	133
2.2 Intrinsic Study of Control Systems	147
2.3 The Method of V. M. Popov	161
2.4 The Practical Stability of Systems with Elements of Relay Type	216
Notes	222

CHAPTER 3
Theory of Oscillations

3.1	Linear Oscillations	223
3.2	Almost-Periodic Solutions of Linear Systems	230
3.3	Quasi-Linear Systems	236
3.4	Systems Containing a Small Parameter	253
3.5	The Method of Averaging	264
3.6	Topological Methods	275
3.7	Autonomous Systems	278
3.8	Autonomous Systems Containing a Small Parameter	287
3.9	Periodic Solutions of the Second Kind	303
3.10	A Method of Successive Approximations	308
3.11	Periodic Perturbations of Autonomous Systems	317
3.12	Singular Perturbations	325
	Notes	335

CHAPTER 4
Systems with Time Lag

4.1	The Existence Theorem. General Properties	336
4.2	Stability Theory	342
4.3	Linear Systems with Time Lag	359
4.4	The Perron Condition for Systems with Time Lag	371
4.5	An Estimate in the Stability Theory of Linear Systems with Time Lag	377
4.6	The Stability of Some Control Systems with Time Lag	383
4.7	Periodic Linear Systems with Time Lag	402
4.8	Periodic Linear Systems with Time Lag. Stability Theory	406
4.9	Periodic Solutions of Linear Periodic Systems with Retarded Argument	411
4.10	The Critical Case for Linear Periodic Systems with Time Lag	413
4.11	Almost-Periodic Solutions for Linear Systems	423
4.12	Systems with a Small Parameter with Time Lag	426
4.13	Systems with Retarded Argument Containing a Small Parameter	432
4.14	Almost-Periodic Solutions for Quasi-Linear Systems with Time Lag	452
4.15	The Averaging Method for Systems with Retarded Argument	460
4.16	Other Theorems Relative to Periodic and Almost-Periodic Solutions of Systems with Time Lag	483
4.17	Singular Perturbation for Systems with Time Lag	490
4.18	Invariant Periodic Surfaces in a Class of Systems with Time Lag	501
	Notes	509

Appendix

A.1	Elements from the Theory of the Fourier Transform	511
A.2	The Permutation of the Integration Order in Stieltjes' Integral	518
	Bibliography	521
	SUBJECT INDEX	527