

Contents

Preface	xiv
Chapter I. Preliminaries	1
1. Linear Spaces. Linear Rings	1
2. Linear Operators. Perturbations	7
3. Algebras of Linear Operators. Conjugate Operators and Φ_E -Operators	13
4. Banach Spaces	20
5. The Volterra Integral Equation	34
Chapter II. Algebraic and almost Algebraic Operators	40
1. Hermite Interpolation Formula. Partition of Unity. Properties of N th Roots of Unity	40
2. Algebraic and almost Algebraic Elements	43
3. Regularization in Algebraic and almost Algebraic Elements	49
4. Algebraic and almost Algebraic Operators	54
5. Equations with Coefficients Commuting with an Algebraic Operator	58
6. Involutions of Order N	61
7. Multi-Involutions	66
Chapter III. Equations with Operators Permuting an Involution of Order N	73
1. Equations with Operators Anticommuting with Involution	73
2. Equations with Polynomials in an Operator Anticommuting with an Involution	82
3. Homogeneous Equation with a Permuting Operator	88
4. Non-Homogeneous Equations with a Permuting Operator	95
Chapter IV. Algebraic Derivative and Abstract Differential Equations	101
1. Algebraic Derivative in Linear Spaces	101
2. Differential Equations with Constant Coefficients in Linear Spaces	106
3. Differential Equations with Algebraic Operators in Linear Spaces	111
4. Algebraic Derivative and Differential Equations in a Linear Ring	118
5. Differential Equations with Algebraic Operators in a Linear Ring	124
Chapter V. Periodic Solutions of Differential-Difference Equations	126
1. Ordinary Linear Differential-Difference Equations with Constant Coefficients	126
2. Ordinary Linear Differential-Difference Equations with Periodic Coefficients	132
3. Perturbations of Deviations Preserving Periodic Solutions of Linear Differential-Difference Equations	139
4. Partial Linear Differential-Difference Equations with Constant and Periodic Coefficients	146
5. Non-Linear Differential-Difference Equations	148

Chapter VI. Exponential-Periodic Solutions of Differential-Difference Equations	153
1. Ordinary Linear Differential-Difference Equations with Constant and Periodic Coefficients	153
2. Non-Linear Differential-Difference Equations	158
Chapter VII. Linear Differential Equations with Reflection and Rotation of Argument	164
1. Ordinary Linear Differential-Equations with Reflection	164
2. Ordinary Linear Differential Equations with Rotation	170
Chapter VIII. Functional-Differential Equations of Carleman Type	177
1. Properties of Functions satisfying Carleman Condition of Order $m \geq 2$	178
2. First Order Linear Functional-Differential Equations of Carleman Type	184
3. Higher Order Linear Functional-Differential Equations of Carleman Type	188
4. Non-Linear Functional-Differential Equations of Carleman Type	190
Chapter IX. Optimal Control Problems with Time Delays	193
1. Periodic Linear Problems	195
2. Periodic Non-Linear Problems	198
3. Problems with Damping	201
4. Almost Periodic Linear Problems	204
5. Almost Periodic Non-Linear Problems	207
Chapter X. Boundary Problems with Transformed Argument	210
1. Boundary Problems for the Laplace Equation	210
2. Boundary Problems for the Heat Equation	217
3. Boundary Problems for the Wave Equation	219
Chapter XI. Integral Equations with Transformed Argument	221
1. Integral and Integro-Differential Equations with Reflection	221
2. Periodic Solutions of Linear Integro-Differential-Difference Equations of Fredholm Type	225
3. Periodic Solutions of Non-Linear Integro-Differential-Difference Equations of Fredholm Type	229
4. Periodic Solutions of Linear Integro-Differential-Difference Equations of Volterra Type	232
5. Exponential-Periodic Solutions of Integro-Differential-Difference Equations of Fredholm Type	236
Chapter XII. Singular Integral Equations of one Variable	241
1. Cauchy and Hilbert Singular Integrals	241
2. Involutionary Cases of Singular Integral Equations	248
3. Almost Involutionary Cases of Singular Integral Equations	256
4. Singular Integral Equations in the Case $A_0^2 - A_1^2 = 0$	258
Chapter XIII. Singular Integral Equations in one Variable with Transformed Argument	263
1. Singular Integral Equations with Reflection	263
2. Singular Integral Equations with Rotation	269
3. Singular Integral Equations of Carleman Type	272

Chapter XIV. Singular Integral Equations in Several Variables . . .	277
1. Singular Integral Equations in Polycylindrical Domains	277
2. Singular Integral Equations with the Bicadze Operator	280
Chapter XV. Wiener-Hopf Equations, Generalized Abel Equations and Equations with the Fourier Transform and Similar Trans- formations	282
1. The Fourier Transform in $L^2(\mathbf{R}^n)$	282
2. The Wiener-Hopf Integral and Integro-Differential Equations	288
3. Generalized Abel Equations	293
4. Equations with the Fourier Transform, the Sine and Cosine Fourier Trans- form and the Hankel Transform	297
Chapter XVI. Cyclic Functional Equations	299
1. Cyclic Functional Equations	299
2. Multicyclic Functional Equations	302
Chapter XVII. Some Miscellaneous Topics	305
1. Matrix and Operator Equations	305
2. Polyharmonic Solutions of the Equation $\sum_{k=0}^{n-1} a_k \Delta^k u = v$	308
3. Characterization of Commutators with Singular Integral Operators	314
Bibliography	317
Name Index	341
Subject Index	345