

INVERSE AND ILL-POSED PROBLEMS SERIES

Inverse Problems for Kinetic and other Evolution Equations

Yu.E. Anikonov

///VSP///

UTRECHT • BOSTON • KÖLN • TOKYO
2001

Contents

Chapter 1. Formulas for solutions and coefficients of kinetic and other equations	1
1.1. Kinetic equations	1
1.2. Several formulas for solutions and coefficients of kinetic equations	5
1.3. Formulas in the inverse problems for kinetic equations with a potential	9
1.4. Formulas in tomography problems	11
1.5. Formulas of inverse problems for kinetic equation and integral geometry involving integration along geodesics	15
1.6. Differential and functional equations of inverse problems for nonlinear equations	21
Chapter 2. Theorems of uniqueness for inverse problems for kinetic equations	35
2.1. Inverse problem for a system of kinetic equations	35
2.2. Inverse problems for a system of quantum kinetic equations	40
2.3. On uniqueness of determination of a form by its integrals along geodesics	55
2.4. Dynamical model of the ethnic system. Formulas in direct and inverse problems	59
Chapter 3. Spherical harmonic method and inverse problem for kinetic equations	73
3.1. Spherical harmonics method	73
3.2. Steady-state transfer equation	79

3.3. Determining the dispersion index in the case of the P_1 -approximation	93
3.4. Definition of the dispersion index in the case of the P_2 -approximation	101
3.5. Reconstruction of the dispersion index and the source function	121
Chapter 4. Inverse problems for evolution equations of determining two coefficients	127
4.1. Nonlocal boundary-value problems for nonlinear equations and inverse problems of determining two coefficients	127
4.2. Recurrent formulas on derivatives of solutions	139
4.3. Integrodifferential equations in inverse problems of determining two coefficients for evolution equations	144
4.4. Inverse problem for a system of Maxwell equations	152
4.5. Determining two unknown coefficients of the parabolic-type equation	160
4.6. Inhomogeneous conditions of overdetermination	172
4.7. Representation of solutions and coefficients of partial differential equations of the second order	184
Chapter 5. Some results of multidimensional inverse problems theory	199
5.1. Formulas for coefficients in inverse problems for general evolutionary equations	199
5.2. Formulas in inverse problems for difference-differential equations .	208
5.3. Inverse problem for evolutionary equations with degeneration and others	212
5.4. Group analysis and formulas in inverse problems of mathematical physics	216
5.5. Uniqueness of the solution of an integral equation of the first kind over real algebras with division of the finite dimension	237
5.6. Methods of geometry in the inverse seismic problem	244
5.7. Problems associated with projections of convex bodies onto planes	252
Bibliography	267