

ABSTRACTS

O.A. Andronova, V.I. Voytitskiy

ON SPECTRAL PROPERTIES OF ONE BOUNDARY VALUE PROBLEM
WITH A SURFACE ENERGY DISSIPATION

Abstract. We study a spectral problem in a bounded domain $\Omega \subset \mathbb{R}^m$ depending on a bounded operator coefficient $S > 0$ and a dissipation parameter $\alpha > 0$. In the general case we establish sufficient conditions ensuring that the problem has a discrete spectrum consisting of countably many isolated eigenvalues of finite multiplicity accumulating at infinity. We also establish the conditions, under which the system of root elements contains an Abel-Lidskii basis in the space $L_2(\Omega)$. In model one- and two-dimensional problems we establish the localization of the eigenvalues and find critical values of α .

Keywords: spectral parameter, quadratic operator pencil, localization of eigenvalues, compact operator, Schatten-von-Neumann classes S_p , Abel-Lidskii basis property.

B.A. Babajanov, A.B. Khasanov

INTEGRATION OF EQUATION OF TODA'S PERIODIC CHAIN KIND

Abstract. In this work we apply the method of the inverse spectral problem to integrating an equation of Toda's periodic chain kind. For the one-band case we write out explicit formulae for the solutions to an analogue of Dubrovin system of equations and thus, for the our problem. These solutions are expressed in term of Jacobi elliptic functions.

Keywords: Toda's chain, discrete Hill operator, inverse spectral problem, trace formulae

Zh.A. Balkizov

DIRICHLET BOUNDARY VALUE PROBLEM
FOR A THIRD ORDER PARABOLIC-HYPERBOLIC EQUATION
WITH DEGENERATING TYPE AND ORDER IN THE HYPERBOLICITY DOMAIN

Abstract. In the work we study an analogue of Tricomi equation for a third order parabolic-hyperbolic equation with smaller derivatives having multiple characteristics. Under certain conditions for the given functions and parameters involved in the considered equation, we prove unique solvability theorem for the studied problem. The uniqueness of the solution is proved by means of the generalized Tricomi method, while the existence is proved via the method of integral equations.

Keywords: Degenerate hyperbolic equation, equation with multiple characteristics, third order parabolic-hyperbolic equation, Dirichlet boundary value problem, analogue of Tricomi equation, Tricomi method, second kind integral Volterra equation, second kind integral Fredholm equation.

V.V. Gorbatsevich

ON GEOMETRY OF SOLUTIONS TO APPROXIMATE EQUATIONS AND THEIR SYMMETRIES

Abstract. The paper is devoted to developing a geometric approach to the theory of approximate equations (including ODEs and PDEs) and their symmetries. We introduce dual Lie algebras, manifolds over dual numbers and dual Lie group. We describe some constructions applied for these objects. On the basis of these constructions, we show how one can formulate basic concepts and methods in the theory of approximate equations and their symmetries. The proofs of many general results here can be obtained almost automatically from classical ones, unlike the methods used for studying the approximate equations.

Keywords: approximate equation, approximate Lie algebra, dual numbers, dual Lie algebra, manifold over dual numbers.

B.A. Klischuk, R.R. Salimov

LOWER BOUNDS FOR THE AREA OF THE IMAGE OF A CIRCLE

Abstract. In the work we consider Q -homeomorphisms w.r.t p -module on the complex plane as $p > 2$. We obtain a lower bound for the area of the image of a circle under such mappings. We solve the extremal problem on minimizing the functional of the area of the image of a circle.

Keywords: p -module of a family of curves, p -capacity of capacitor, quasiconformal mappings, Q -homeomorphisms w.r.t. p -module.

A.I. Parfenov

DISCRETE HÖLDER ESTIMATES FOR A CERTAIN KIND OF PARAMETRIX. II

Abstract. In the first paper of this series we have introduced a certain parametrix and the associated potential. The parametrix corresponds to an uniformly elliptic second order differential operator with locally Hölder continuous coefficients in the half-space. Here we show that the potential is an approximate left inverse of the differential operator modulo hyperplane integrals, with the error estimated in terms of the local Hölder norms. As a corollary, we calculate approximately the potential whose density and differential operator originate from the straightening of a special Lipschitz domain. This corollary is meant for the future derivation of approximate formulas for harmonic functions.

Keywords: cubic discretization, Lipschitz domain, local Hölder norms, parametrix, potential, straightening.

K.U. Khubiev

ANALOGUE OF TRICOMI PROBLEMS FOR CHARACTERISTICLY LOADED HYPERBOLIC-PARABOLIC EQUATIONS WITH VARIABLE COEFFICIENTS

Abstract. In the work we study an analogue of Tricomi problems for characteristicly loaded hyperbolic-parabolic equations with variable coefficients. We prove the unique solvability of the studied problem. The uniqueness of the solutions is proved by means of the maximum principle, while the existence is established by the method of integral equations.

Keywords: loaded equations, mixed equations, hyperbolic-parabolic equations, Tricomi problem, boundary value problem.

I.K. Shafigullin

LOWER BOUND FOR THE HARDY CONSTANT FOR AN ARBITRARY DOMAIN IN \mathbb{R}^n

Abstract. In the paper we consider the conjecture by E.B. Davies on a uniform lower bound for the Hardy constant. We provide the known counterexamples rebutting this conjecture for the dimension 4 and higher. In the work we obtain non-zero lower bounds for the Hardy constants. These estimates are order sharp as $n \rightarrow +\infty$, where n is the space dimension. Moreover, these estimates are independent of the properties of the considered domains and are true for all domains not coinciding with the entire space. In the proof of the main theorem we reduce the multidimensional case to the one-dimensional case by choosing special classes of functions. As a result, the considered inequalities are reduced to the well-known Poincaré inequality.

Keywords: Hardy constant, lower bounds, Hardy inequalities, variational inequalities

B. Venkateswarlu, N. Rani

THIRD HANKEL DETERMINANT FOR THE INVERSE OF RECIPROCAL OF BOUNDED TURNING FUNCTIONS HAS A POSITIVE REAL PART OF ORDER ALPHA

Abstract. Let RT be the class of functions $f(z)$ univalent in the unit disk $E = z : |z| < 1$ such that $\operatorname{Re} f'(z) > 0$, $z \in E$, and $H_3(1)$ be the third Hankel determinant for inverse function to $f(z)$. In this paper we obtain, first an upper bound for the second Hankel determinant, $|t_2 t_3 - t_4|$, and the best possible upper bound for the third Hankel determinant $H_3(1)$ for the functions in the class of inverse of reciprocal of bounded turning functions having a positive real part of order alpha.

Keywords: univalent function, function whose reciprocal derivative has a positive real part, third Hankel determinant, positive real function, Toeplitz determinants.