

ABSTRACTS

N.F. Abuzyarova

SOME PROPERTIES OF PRINCIPAL SUBMODULES IN THE MODULE OF ENTIRE FUNCTIONS
OF EXPONENTIAL TYPE AND POLYNOMIAL GROWTH ON THE REAL AXIS

Abstract. In the work we consider a topological module of entire functions $\mathcal{P}(a; b)$, which is the isomorphic image of Fourier-Laplace transform of Schwarz space formed by distributions with compact supports in a finite or infinite segment $(a; b) \subset \mathbb{R}$. We study the conditions ensuring that the principal submodule of module $\mathcal{P}(a; b)$ can be uniquely recovered by zeroes of a generating function.

Keywords: entire functions, subharmonic functions, Fourier-Laplace transform, principal submodules, local description of submodules, invariant subspaces, spectral synthesis.

E.O. Azizyan, Kh.A. Khachatryan

ONE-PARAMETRIC FAMILY OF POSITIVE SOLUTIONS FOR A CLASS OF NONLINEAR
DISCRETE HAMMERSTEIN-VOLTERRA EQUATIONS

Abstract. In the present work we study a class of nonlinear discrete Hammerstein-Volterra equations in a post-critical case. We prove the existence of a one-parametric family of positive solutions in space l_1 . We describe the set of parameters and establish the monotonic dependence of each solution both in a parameter and a corresponding index.

Keywords: post-criticality condition, iterations, monotonicity, one-parametric family of solutions.

S.N. Askhabov

PERIODIC SOLUTIONS OF CONVOLUTION TYPE EQUATIONS
WITH MONOTONE NONLINEARITY

Abstract. By the method of monotone operators we establish global existence and uniqueness theorems, as well as estimates and methods of finding the solutions for various classes of nonlinear integral equations of convolution type in the real space of 2π -periodic functions $L_p(-\pi, \pi)$.

Keywords: nonlinear convolution type equations, monotone operator, potential operator.

V.F. Vil'danova

ON DECAY OF SOLUTION TO LINEAR PARABOLIC EQUATION WITH DOUBLE DEGENERACY

Abstract. For a linear parabolic second order equation with a double degeneracy $\mu(x)u_t = (\rho(x)a_{ij}(t, x)u_{x_i})_{x_j}$ in an unbounded domain we obtain the upper bound for the decay rate of the solution to the Dirichlet initial boundary value problem. For a wide class of revolution domains we prove a lower bound. We adduce the examples showing the upper and lower bounds are in some sense sharp.

We prove the unique solvability of the problem in an unbounded domain by Galerkin's approximations method.

Keywords: parabolic equation with a double degeneracy, decay rate of a solution, upper bound, existence of a solution.

S.A. Iskhokov, M.G. Gadoev, I.Ya. Yakushev

GARDING INEQUALITY FOR HIGHER ORDER ELLIPTIC OPERATORS WITH A NON-POWER DEGENERATION AND ITS APPLICATIONS

Abstract. For higher order elliptic operators in an arbitrary (bounded or unbounded) domain in n -dimensional Euclidean space \mathbb{R}_n with a non-power degeneration we prove a weighted analogue of Garding inequality. By means of this inequality we study the unique solvability of variational Dirichlet problem, whose solution is sought in the closure of the class of infinitely differentiable compactly supported functions. The degeneration of the coefficients in various variables is characterized via different functions. The lower coefficients of the operators are assumed to belong to some weighted L_p -spaces. For one class of elliptic operators with a power degeneration in a half-space we study the solvability of variational Dirichlet problem with inhomogeneous boundary conditions.

Keywords: elliptic operator, non-power degeneration, Garding inequality, variational Dirichlet problem.

A.A. Klyachin, I.V. Truhlyaeva

ON THE CONVERGENCE OF ALMOST POLYNOMIAL SOLUTIONS OF THE MINIMAL SURFACE

Abstract. In this paper we consider the polynomial approximation of the Dirichlet problem for minimal surface equation. It is shown that under certain conditions on the geometric structure of the domain the absolute values of the gradients of the solutions are bounded as the degree of these polynomials increases. The obtained properties imply the uniform convergence of approximate solutions to the exact solution of the minimal surface equation.

Keywords: minimal surface equation, uniform convergence, approximate solution.

A.R. Manapova, F.V. Lubyshev

ON FRECHÈT DIFFERENTIABILITY OF COST FUNCTIONAL IN OPTIMAL CONTROL OF COEFFICIENTS OF ELLIPTIC EQUATIONS

Abstract. In the work we consider non-linear optimal control problems for semi-linear elliptic equations with discontinuous data and solutions (states), with controls in the boundary conditions of conjugation of heterogeneous media and in the right hand side of the state equation. We prove the differentiability and Lipschitz continuity for the grid analogue of the cost functional for extremum problems.

Keywords: optimal control problem, semi-linear elliptic equations, cost functional, differentiability, Lipschitz continuity.

D.A. Tursunov, U.Z. Erkebaev

ASYMPTOTIC EXPANSIONS OF SOLUTIONS TO DIRICHLET PROBLEM FOR ELLIPTIC EQUATION WITH SINGULARITIES

Abstract. The paper proposes an analogue of Vishik-Lyusternik-Vasileva-Imanalieva boundary functions method for constructing a uniform asymptotic expansion of solutions to bi-singular perturbed problems. By means of this method we construct the uniform asymptotic expansion for the solution to the Dirichlet problem for bi-singular perturbed second order elliptic equation with two independent variables in a circle. By the maximum principle we justify formal asymptotic expansion of the solution, that is, an estimate for the error term is established.

Keywords: asymptotic expansion, Dirichlet problem, Airy function, modified Bessel functions, boundary functions.

V.B. Sherstyukov

MINIMAL VALUE FOR THE TYPE OF AN ENTIRE FUNCTION OF ORDER $\rho \in (0, 1)$, WHOSE ZEROS LIE IN AN ANGLE AND HAVE A PRESCRIBED DENSITY

Abstract. In the work we find the minimal value that can be taken by the type of an entire function of order $\rho \in (0, 1)$ with zeros of prescribed upper and lower densities and located in an angle of a fixed opening less than π . The main theorem generalizes the previous result by the author (zeros lie on one ray) and by A.Yu. Popov (only the upper density of zeros was taken into consideration). We distinguish and study in detail the case when the an entire function has a measurable sequence of zeroes. We provide applications of the obtained results to the uniqueness theorems for entire functions and to the completeness of exponential systems in the space of analytic in a circle functions with the standard topology of uniform convergence on compact sets.

Keywords: type of an entire function, upper and lower density of zeros, uniqueness theorem, completeness of exponential system.