

Ivan Franko National University of Lviv

Pidstryhach Institute for Applied Problems of Mechanics and
Mathematics of the National Academy of Sciences of Ukraine
National University "Lviv Polytechnic"



International Conference on

DIFFERENTIAL EQUATIONS

Dedicated to the 110th Anniversary of
Ya. B. Lopatynsky

BOOK OF ABSTRACTS



September 20-24, 2016

Lviv, Ukraine

Ivan Franko National University of Lviv
Pidstryhach Institute for Applied Problems of Mechanics and Mathematics
of the National Academy of Sciences of Ukraine
National University "Lviv Polytechnic"

INTERNATIONAL CONFERENCE

on Differential Equations

dedicated to the 110th anniversary

of Ya. B. Lopatynsky

20 – 24 September, 2016, Lviv, Ukraine

BOOK OF ABSTRACTS

Lviv 2016

Ivan Franko National University of Lviv
Address: Universytetska St., 1, Lviv, 79000, Ukraine
Internet: <http://www.franko.lviv.ua>

CONFERENCE ORGANISERS

- Ivan Franko National University of Lviv
- Pidstryhach Institute for Applied Problems of Mechanics and Mathematics of the National Academy of Sciences of Ukraine
- National University "Lviv Polytechnic"

PROGRAM COMMITTEE

Emmanuele DiBenedetto (USA), Angelo Favini (Italy), Alexander Gladkov (Belarus), Myroslav Gorbachuk (Ukraine), Mansur Ismailov (Turkey), Mykola Ivanchov (Ukraine), Stepan Ivasyshen (Ukraine), Jaan Janno (Estonia), Michael Klibanov (USA), Alexander Kozhanov (Russia), Francois Murat (France), Alexander Pankov (USA), Andrey Piatnitski (Norway), Bogdan Ptashnyk (Ukraine), Anatoly Samoilenko (Ukraine), Ihor Skrypnyk (Ukraine), Vsevolod Solonnikov (Russia).

ORGANIZING COMMITTEE

R. V. Andrusyak, M. M. Bokalo, O. M. Buhrii (*scientific secretary*), Yu. D. Golovaty, V. S. Il'kiv, M. I. Ivanchov (*chairman*), N. M. Huzyk (*scientific secretary*), P. I. Kalenyuk (*vice-chairman*), M. Ya. Komarnytsky, V. M. Kyrlych, H. P. Lopushanska, Z. M. Nytrebych, B. Yo. Ptashnyk (*vice-chairman*).

© Department of Differential Equations
Ivan Franko National University of Lviv, 2016

Gorbachuk M.L. Solving some problems in theory of semigroups of linear operators in the Banach space	58
Gorbachuk V.M. On existence of bounded almost periodic solutions to elliptic equations in the Banach space	59
Gorban Yu.S. Existence of entropy solutions for nonlinear elliptic degenerate anisotropic equations	60
Goriunov A. Approximation of the Sturm-Liouville operators with singular potentials ..	61
Gorodetskyi V.V., Martynyuk O.V., Petryshyn R.I. On correct solvability of nonlocal multipoint problem for differential operator equation of second order	62
Grushka Ya.I. Problem of irreversibility of time for the Tachyon kinematics	63
Gryshchuk S.V. Hypercomplex monogenic functions' methods in boundary value problems related to plane elasticity	64
Hasanoglu (Hasanov) A. Inverse source problems for the Euler-Bernoulli beam with boundary and interior measured output data	65
Hashemi M.S. New geometric integrator-based upon the Lie groups to solve mechanical models	65
Hentosh O.Ye. Hamiltonian structures of the supersymmetric mKP-hierarchy on extended phase space and its additional homogeneous symmetries	65
Hnyp Ye.V. On the Fredholm boundary-value problems with parameter on the Slobodetsky space	67
Hrabchak H.Ye. Asymptotics of spectrum of the Laplacian on networks with very heavy nodes	68
Huzyk N.M. Non-local inverse problem for parabolic equation with strong power degeneration	69
Ilnytska O.V., Bokalo M.M. Boundary value problems for coupled systems of degenerate parabolic equations with variable delay	70
Il'kiv V.S., Strap N.I. Nonlocal boundary value problem for differential-operator equation with weak nonlinearity in the refined Sobolev scale	71
Ismailov M.I. Inverse source problem for heat equation with nonlocal and nonclassical boundary conditions	72
Ivanchov M.I. Inverse problems for parabolic equations in 2D domains	73
Janno J. Inverse problem for generalized time fractional diffusion equation	74

EXISTENCE OF ENTROPY SOLUTIONS FOR NONLINEAR
ELLIPTIC DEGENERATE ANISOTROPIC EQUATIONS

Yuliya S. Gorban

Donetsk National University
Vinnytsya, Ukraine

e-mail: yuliya_gorban@mail.ru

Let Ω be a bounded domain in \mathbb{R}^n with a boundary $\partial\Omega$, $n \geq 2$. Assume that $1 < q_i < n$ are real numbers, and ν_i are nonnegative functions in Ω such that $\nu_i > 0$ a.e. in Ω , $\nu_i \in L^1_{loc}(\Omega)$, $\nu_i^{-1/(q_i-1)} \in L^1(\Omega)$, $i = 1, \dots, n$. Suppose the Carathéodory functions $a_i : \Omega \times \mathbb{R}^n \rightarrow \mathbb{R}$, $i = 1, \dots, n$, satisfy the conditions of growth, strict monotonicity and the following coercivity condition: $\sum_{i=1}^n a_i(x, \xi) \xi_i \geq c \sum_{i=1}^n \nu_i |\xi_i|^{q_i} - g(x)$; here c is a positive constant, and $g \in L^1(\Omega)$ is a nonnegative function. Set $q = \{q_1, \dots, q_n\}$, $\nu = \{\nu_1, \dots, \nu_n\}$. We define $W^{1,q}(\nu, \Omega) = \{u \in L^1(\Omega) : \nu_i |D_i u|^{q_i} \in L^1(\Omega), i = 1, \dots, n\}$. $W^{1,q}(\nu, \Omega)$ is a Banach space with respect to the norm

$$\|u\|_{W^{1,q}(\nu, \Omega)} = \|u\|_{L^1(\Omega)} + \sum_{i=1}^n \left(\int_{\Omega} \nu_i |D_i u|^{q_i} dx \right)^{1/q_i}.$$

Denote by $\overset{\circ}{W}^{1,q}(\nu, \Omega)$ the closure of $C_0^\infty(\Omega)$ in $W^{1,q}(\nu, \Omega)$. Let $F : \Omega \times \mathbb{R} \rightarrow \mathbb{R}$ be a Carathéodory function. We consider the Dirichlet problem

$$-\sum_{i=1}^n \frac{\partial}{\partial x_i} a_i(x, \nabla u) = F(x, u) \quad \text{in } \Omega, \quad (1)$$

$$u = 0 \quad \text{on } \partial\Omega. \quad (2)$$

Definition. An entropy solution of problem (1), (2) is a function $u : \Omega \rightarrow \mathbb{R}$ such that: 1) $T_k(u) \in \overset{\circ}{W}^{1,q}(\nu, \Omega)$, where T_k is a standard cut function of the level $k > 0$; 2) $F(x, u) \in L^1(\Omega)$;

3) if $w \in \overset{\circ}{W}^{1,q}(\nu, \Omega) \cap L^\infty(\Omega)$, $k \geq 1$, and $l \geq k + \|w\|_{L^\infty(\Omega)}$, then

$$\int_{\Omega} \left\{ \sum_{i=1}^n a_i(x, \nabla T_l(u)) D_i T_k(u-w) \right\} dx \leq \int_{\Omega} F(x, u) T_k(u-w) dx.$$

Theorem. Suppose the following conditions are satisfied: (i) for a.e. $x \in \Omega$ the function $F(x, \cdot)$ is nonincreasing on \mathbb{R} ; (ii) for any $s \in \mathbb{R}$ the function $F(\cdot, s)$ belongs to $L^1(\Omega)$. Then there exists an entropy solution of problem (1), (2). Proof is based on the results represented in [1], [2].

1. Kovalevsky A.A., Gorban Yu.S. On T -solutions of degenerate anisotropic elliptic variational inequalities with L^1 -data, *Izv. Math.* 75 (1) (2011) 101-160.
2. Kovalevsky A.A. Entropy solutions of Dirichlet problem for a class of nonlinear elliptic fourth order equations with L^1 -right-hand sides, *Izv. Math.* 65 (2) (2001) 27-80.

We consi

defined on a

where the d

It was a
Shin-Zettl
 $D^{(0)}y, D^{(1)}y$,
natural qu
operator L
in the form

Theore
Then there
icients p_n
sufficiently

where $\| \cdot \|$

Moreov
the smooth
The pr
A weal
For p

1. Gor
2. Gor
3. Yan
4. Hor