MATHEMATICS, MECHANICS

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A SPECTRAL PROBLEM FOR A DIFFERENTIAL BEAM FOURTH ORDER WITH FOURFOLD CHARACTERISTICS AND BOUNDARY CONDITIONS OF THE DECAYING TYPE

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Vagabov Abdulvagab Ismailovich – Doctor of Physical and Mathematical Science, Professor, Head of Department of Higher Algebra and Geometry, Faculty of the Mathematics and Computer Sciences, Dagestan State University, Gadzhiev St., 43a, Makhachkala, Republic Dagestan, 367000, Russia, e-mail: algebra-dgu@mail.ru

The author solves spectral problem for the fourth-order differential beam $\left(\frac{d}{dx}-\lambda\right)^4 y(x)$ *with fourfold characteristics and boundary conditions of the decaying type. The author proves the formula fourfold decomposability four arbitrary functions in series in the root elements of operational beam with periodic boundary conditions.*

Keywords: *Grien function, property element, four multiple decompose.*

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UDC 534

APPLICATION OF A METHOD OF THE BOUNDARY INTEGRATED EQUATIONS TO THE DECISION OF PROBLEMS ON MOVING LOADING

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Galaburdin Aleksander Vitalievich – Candidate of Physical and Mathematical Science, Associate Professor, Department of Higher Mathematics and Informatic, Don State Technical University, Gagarin Sq., 1, Rostov-on-Don, 344000, Russia.

In work the method of the decision of problems of the elasticity theory for the bodies limited to surfaces of rotation on which the loading moving around of an axis of rotation operates is offered. The method is based on application of a method of the boundary integrated equations to the appropriate regional problem of the flat dynamic elasticity theory in space of transformations Fourier on a final interval of time which length is equal to the period of change of loading. Results of the decision of a problem about the spherical environment, loaded are resulted by two mobile concentrated forces.

Keywords: *boundary integrated equations, dynamic problem of the elasticity theory, mobile loading.*

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ON THE PROBLEM OF SOCIAL NETWORK USER AGE PREDICTION

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Grezin Vladimir Sergeevich – Junior Scientific Researcher, FSASE SRI «Spetsvuzavtomatika», Gazetnyi Lane, 51, Rostov-on-Don, 344002, Russia, e-mail: v.grezin@niisva.org

Novosiadlyi Vasilii Aleksandrovich – Candidate of Physical and Mathematical Science, Head of the Laboratory, FSASE SRI «Spetsvuzavtomatika», Gazetnyi Lane, 51, Rostov-on-Don, 344002, Russia, e-mail: nova@niisva.org

This article describes the possible methods of prediction the age of the social network member on the basis of his public specifics. Comparative analysis of the approaches based on statistical methods, methods using artificial neural networks and methods based on modified Markov clustering algorithm to detect groups in the social graph is provided. JavaScript implementation for each method is tested against the samples of the genuine social network data. Complexity and efficiency estimates of the developed methods are presented. Software usage strategy is presented.

Keywords: *social network, social graph, age prediction, graph analysis.*

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THE SOLUTIONS OF DUAL SIMPLEX GAMES

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Zinchenko Aleksxandra Borisovna – Candidate of Physical and Mathematical Sciences, Associate Professor, Department of Operation Research, Institute of Mathematics, Mechanics and Computer Science of the Southern Federal University, Milchakov St., 8a, Rostov-on-Don, 344090, Russia, e-mail: zinch46@mail.ru

The family of (0,1)-normalized, nonnegative, nonsymmetric, dual simplex cooperative games, generated by symmetric convex game, are considered. It is shown that all games in this family have the identical imputation sets and the same cores which (except for the core of convex game) are not stable. The vNM solutions of some games are provided. Each of them consists of the core and complementary polyhedral set. The allocations in complementary sets reflect the existence in a game two groups of pairwise symmetric agents.

Keywords: *cooperative TU game, core, vNM solution, dual simplex game.*

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SOME RESULTS OF THE RESEARCH EXPLOSIONS OF CYLINDRICAL CHARGES IN TWO-LAYER MEDIUM

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Kamalian Ruben Zavenovich – Doctor of Technical Science, Professor, Department of Mathematics and Computer Systems, Academy of Marketing and Social and Information Technologies, Zipovskaya St., 5, Krasnodar, 350010, Russia, e-mail: karuzav@mail.ru

Kamalian Samvel Rubenovich – Candidate of Physical and Mathematical Science, Associate Professor, Head of Department of Mathematics and Applied Informatics, Krasnodar Branch of the Russian State University of Economics and Trade, Sadovaya St., 17, Krasnodar, 350002, Russia, e-mail:karuzav@mail.ru

There are presented experimental studies results on physical models of explosions cylindrical charges in two-layer medium. The main goal of the research was a qualitative study of the displacement of the medium as a result of the dynamic effects on her array. The presence of the three areas of destruction of the array. The ratio between the areas substantially depends on the conditions at the boundary of the array. It is shown that an increase in bilateral offset initiation occurs by increasing the pressure of the explosion products at a meeting of detonation waves. Straightness sensors before and after the explosion indicates a plane passing through the medium-wave voltages and therefore, the deformed state of the uniaxial medium.

Keywords: *model, array, fracture, contact, destruction, detonating cord, combustion products, charge, deformation.*

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DYNAMICS OF INTERNAL FREE BORDER OF LIQUID ON SMALL TIMES AT VERTICAL IMPACT OF THE CIRCULAR CYLINDER WHICH IS COMPLETELY SHIPPED IN LIQUID

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Norkin Mikhail Viktorovich – doctor of Phisical and Mathematical science, associate professor, Professor, Department of Computational Mathematics and Mathematical Physics Vorovich Institute of Mathematics, Mechanics and Computer Science of the Southern Federal University, Milchakov St., 8a, Rostov-on-Don, 344090, Russia, e-mail: norkin@math.sfedu.ru

The joint movement of ideal incompressible liquid and the circular cylinder which is completely shipped in it after impact on small times is considered. The form of internal and external free border of liquid is defined. The asymptotic analysis of internal free border near separation points is carried out.

Keywords: *ideal incompressible liquid, impact with a separation, small times, asymptotic analysis, dynamics of points of a separation, a cavity, Frud number, cavitation number.*

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THEOREMS ON DEFORMED MARTINGALES: RIESZ DECOMPOSITION, CHARACTERIZATION OF LOCAL MARTINGALES AND COMPUTATION OF QUADRATIC VARIATIONS

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Pavlov Igor Viktorovich – Doctor of Physical and Mathematical Science, professor, head of the department of higher mathematics, Rostov State University of Civil Engineering, Sotsialisticheskaya St., 162, Rostov-on-Don, 344022, Russia, e-mail: pavloviv2005@mail.ru

Nazarko Olga Valeryevna – Candidate of Physical and Mathematical Science, Associate professor, department of higher mathematics, Rostov State University of Civil Engineering, Sotsialisticheskaya St., 162, Rostov-on-Don, 344022, Russia, e-mail: olga-nazarko28@gmail.com

In this work in discrete time the decomposition of deformed supermartingale of the 2nd kind as a sum of two deformed processes of the 2nd kind (namely, of a martingale and a potential) is proved (Riesz decomposition). Criterion of the uniqueness of such decomposition is established. The coincidence of local deformed martingale of the 1st kind with generalized deformed martingale of the 1st kind and deformed martingale transformation of the 1st kind is shown. The formula for quadratic variation of deformed martingale of the 1st kind is given.

Keywords: *filtered space, deformed stochastic basis of 2nd kind, weakly deformed stochastic basis of 2nd kind, deformed martingales, supermartingales and potentials, Riesz decomposition, quadratic variation.*

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CONTACT PROBLEM WITH FRICTION FORCES FOR A TRANSVERSELY ISOTROPIC HALF-SPACE

© 2015 г. D.A. Pozharskii, T.G. Zamulina

Pozharskii Dmitrii Aleksandrovich – Doctor of Physical and Mathematical Science, professor, head of department of Applied mathematics, Don State Technical University, Gagarin Sq., 1, Rostov-on-Don, 344000, Russia, e-mail: pozharda@rambler.ru

Zamulina Tatiana Gennadievna – post-graduate student, department of Applied mathematics, Don State Technical University, Gagarin Sq., 1, Rostov-on-Don, 344000, Russia.

The quasi-static contact problem is investigated taking friction force into account for a transversely isotropic half-space is investigated, when the isotropy planes are perpendicular to its boundary. On the basis of a Boussinesq problem, the solution of which has been derived with the help of a double Fourier transformation, the contact problem is reduced to a two-dimensional integral equation of the first kind. Then for solving the problem the Galanov's method of Hammerstein type nonlinear boundary integral equations is used, which allows us to determine the contact domain as well as the contact pressure simultaneously. The contact pressure and the impressed force are calculated for an elliptical punch for different directions of motion and elastic materials.

Keywords: *contact problem, friction, half-space, anisotropy.*

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THE STUDY OF THE GENERALIZED MODEL OF THE FORMATION OF THE PH-GRADIENT FOR ISOELECTROFOCUSING

© 2015 г. N.M. Poliakova

Poliakova Natalia Mikhailovna – assistant, department of computational mathematics and mathematical physics, institute of mathematics, mechanics and computeral science of the Southern Federal University, Miltchakov st., 8a, Rostov-on-Don, 344090, Russia, e-mail: zhuk_nata@mail.ru

The more general compared to the classic model of isoelectrofocusing is investigated numerically. The results of the computational experiment performed on the basis of the finite element method are presented. It is shown that for a more adequate description of the process the Poisson – Boltzmann equation should be used, in particular, instead of the classical equation of electroneutrality.

Keywords: *isoelectrofocusing, pH-gradient, isoelectric point, isoionic point, electroneutrality condition.*

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GERMEYER'S GAMES AT COMPULSION IN A THREE-LEVEL CONTROL SYSTEM OF THE SHIP'S WATER BALLAST

© 2015 г. A.I. Ryzhkin, A.B. Usov

Ryzhkin Artur Igorevich – post-graduate student, Department of the applied mathematics and programming, Faculty of the mathematics, mechanics and computer sciences, Vorovich Institute of Mathematics, Mechanics and Computer Science of the Southern Federal University, Milchakov St., 8a, Rostov-on-Don, 344090, Russia, e-mail: veronik@aaanet.ru

Usov Anatolii Borisovich – doctor of technical science, professor, Department of the applied mathematics and programming, Faculty of the mathematics, mechanics and computer sciences, Vorovich Institute of Mathematics, Mechanics and Computer Science of the Southern Federal University, Milchakov St., 8a, Rostov-on-Don, 344090, Russia, e-mail: usov@math.sfedu.ru

The static three-level game-theoretic model of three-level control system of the ship's water ballast is built. In the study of the model the method of compulsion in view of requirements of keeping the system in the given state is used. A comparison of the results of study of the model in terms of Γ_1 *and* Γ_2 *Germeyer's games is conducted. Numerical calculations for some typical cases are given.*

Keywords: *hierarchical control system, water ballast, compulsion, Germeyer's games, imitation, optimization.*

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INTEGRALS AND DERIVATIVES OF FRACTIONAL ORDER IN HOLDER CLASSES ON THE RECTANGLE

© 2015 г. A.P. Chegolin

Chegolin Andrei Petrovich – candidate of physical and mathematical science, associate professor, institute of mathematics, mechanics and computeral science of the Southern Federal University, Milchakov st., 8a, Rostov-on-Don, 344090, Russia, e-mail: apchegolin@mail.ru

This paper is devoted to the study of integrals and derivatives of fractional order in Holder classes on rectangle in the two-dimensional case. These operators are introduced by analogy with the one-dimensional case. The semigroup property of the fractional integrals and representations in the Marco form for the fractional derivatives are proved. The action of these operators in Holder spaces and in specially inserted modified Holder classes is investigated. The main results are obtained on the basis of appropriate statements about the action of the operators with one zero component of the order. These statements are given in classes of Holder functions degenerated on a segments of the beams outgoing from a vertex of the rectangle and parallel to a coordinate axis.

Keywords: *fractional integral, fractional derivative, multiindex, Holder class, semigroup property, representation in Marco form.*

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