A. K. Prykarpatsky, O. H. Bihun

CONSTRUCTION OF FINITE-DIMENSIONAL REDUCTIONS ON FUNCTIONAL MANIFOLDS

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In this paper we state the basics of the finite reductions scheme in terms of modern mathematical language using the objects of jet analysis. We list the main properties of the scheme and illustrate it on the concrete applications.

G. M. Pipa

ON RESOLVENT OF PERTURBATION CHANGING THE DOMAIN OF DEFINITION OF PROPER EXTENSION OF POSITIVELY DEFINED OPERATOR

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The connection between the resolvents of proper extension of the given positively defined operator in the Hilbert space (*this extension is interpreted as an unperturbated operator*) *and some other operator, which is interpreted as the perturbated one, is established. It should be noted that the mentioned operators have distinct domains of definition.*

N. M. Diakiv, R. A. Zators'kyy

ON F -PARADETERMINANTS AND F -PARAPERMANENTS OF TRIANGULAR MATRICES

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It is proved that F -paradeterminants and F -parapermanents are particular cases of paradeterminants and parapermanents. The relation between the upper and lover F -paradeterminants and upper and lover F -parapermanents is established. Certain important statements on F - parapermanents, being counterparts of the known facts about F - parapermanents, are proved.

S. M. Mentynsky

BILATERAL APPROXIMATION TO PERIODIC SOLUTIONS OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS

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A new bilateral analogue of Samojlenko's numerical-analytical method of consecutive approaches for determining the periodic solutions of systems of ordinary differential equations is constructed and investigated. The consecutive approaches construction and conditions of their convergence to solutions of the problem are based on the property of B -monotonicity (*by J. V. Pokorny*) *of the right parts of the respective equations.*

B. M. Podlevs'kyi

VARIATIONAL APPROACH TO SOLUTION OF TWO-PARAMETER EIGENVALUE PROBLEMS

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On the basis of gradient procedure for two-parameter eigenvalue problem in the finite-dimensional real Hilbert space, the numerical method for determination of its eigenvalues and eigenvectors is proposed.

I. D. Pukals'kyj

CAUCHY PROBLEM FOR SINGULAR PARABOLIC EQUATIONS

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The existence and uniqueness of solution to the Cauchy problem for singular parabolic equations without limitation on the power order of the coefficient degeneration, are proved in the spaces of classic functions with the power weight. Estimation of solutions to the problem in the corresponding spaces is determined.

M. M. Symotyuk

TWO-POINT PROBLEM FOR PSEUDO-DIFFERENTIAL EQUATIONS

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The notions of $(+\infty,+\infty)$*- and* $(\alpha,\beta;\checkmark,\checkmark)$*-correctness of the two-point problem for pseudo-differential equations are introduced. The criterion of* $(+\infty,+\infty)$*-correctness of this problem is proved. For the* $(+\infty,+\infty)$*-correct problem the solving operator is constructed. The relation between* $(\alpha,\beta;\checkmark,\checkmark)$*-correctness of the problem and existence of continuous closure of its solving operator is obtained. The conditions of existence of continuous closure of its solving operator are established. The metric theorems about fulfilling theses conditions are proved.*

A. D. Polishchuk

SOLUTION OF BILATERAL DIRICHLET – NEUMANN PROBLEMS FOR THE LAPLACIAN IN $\mathbf{R}^3$ BY POTENTIAL THEORY METHODS

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The conditions of correct solvability of bilateral Dirichlet –Neumann problems for the Laplacian in $\mathbf{R}^3$ *and equivalent to them integral equation systems for simple and double potentials sum are determined in the Hilbert spaces, the elements of which, as well as their normal derivatives, have a jump through the boundary surface.*

V. A. Halaziuk, A. Ye. Krupnyk

METHOD OF LAGUERRE POLYNOMIALS FOR SOLUTION OF LAMB PROBLEM

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Two methods for solution of classical Lamb problem are proposed: the Laplace integral transformation and the method of Laguerre polynomials. In the first case it was possible to obtain the analytical expression for vertical displacement of elastic half-space. The effectiveness of using the second method is also proved.

B. V. Prociuk

GREEN'S FUNCTIONS OF PROBLEMS OF STATICS FOR LAYERED BODIES WITH PLANE-PARALLEL INTERFACES

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Green's functions – with marked properties – for 2D axisymmetric and 3D static elasticity problems are constructed for an isotropic layered half-space and a layer under four main versions of boundary conditions and for a layered space, which (*for the given regions of the corresponding problems*) *are defined on the basis of the same key relations. The regular summands are presented in the form of improper integrals from the exponentially decaying functions.*

M. M. Kundrat, G. T. Sulym

COMPOSITION WITH INCLUSION AT TENSION BY CONCENTRATED FORCES

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Limit equilibrium of composition with a rigid fiber inclusion at tension by concentrated forces under conditions of plane problem is studied. The localized zones of prefracture (*weakened contact*) *develop along the plate-inclusion boundary from its ends to the central part. Analytical solution of the problem by means of complex potentials is obtained. The influence of load on development of prefracture zones, distribution of contact stresses, and axial forces in the inclusion is analyzed. Limiting loads of possible separation of the inclusion or its rupture are found using the strain criterion of rupture.*

I. V. Kharun, S. V. Kozinov

INTERACTION BETWEEN INTERFACE CRACKS AND CONTACT ZONES IN ANISOTROPIC BIMATERIAL IN TENSION-SHEAR FIELD

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98-108. – Ref.: 19 names. – Ukr.

A closed-form solution to the plane elasticity problem for an infinite anisotropic bimaterial plane or space with a set of interface cracks in the presence of small frictionless contact zones near the crack tips by means of the complex function theory methods is obtained. As a result of numerical analysis of the derived solution, carried out for the case of two cracks, the dependence of magnitudes of contact zones and stress intensity factors on the crack lengths and the distance between them are investigated.

B. Rogowski

ON STRESS INTENSITY FACTORS FOR TRANSIENT THERMAL LOADING IN ORTHOTROPIC THIN PLATE WITH CRACK

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The paper deals with the transient thermal stress problem in an orthotropic plate, containing Griffith crack, perpendicular to the surfaces of the plate. It is assumed that transient thermal stress is caused by application of heat flow to the crack faces and the heat flow due to convection from the plate surfaces. The problem is formulated in terms of displacement potentials and the analytical solution is found for the stress intensity factor. Numerical results illustrate the dependence of stress intensity factor on thermal and elastic constants of orthotropic material.

V. L. Bogdanov

LINEARIZED PROBLEM ON FRACTURE OF SEMI-INFINITE ELASTIC MATERIAL WITH HARMONIC-TYPE POTENTIAL

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In this paper, the problem for a near-the-surface circular crack in a semi-infinite elastic solid is considered within the framework of the three-dimensional linearized mechanics of deformable bodies. The analysis involves two non-classical mechanisms of fracture, namely, fracture of materials under compression along the cracks and fracture of solids with initial stresses. The critical parameters of compression corresponding to the local stability loss are obtained for material with harmonic-type elastic potential. For a crack under radial shear (*Mode II*) *the representations of the stress intensity factors are obtained. The dependences of these stress intensity factors on the initial stresses are investigated.*

Y. Z. Povstenko, I. Kubik

CONCENTRATED LOADING IN TWO-DIMENSIONAL NONLOCAL ELASTIC MEDIUM

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According to the nonlocal elasticity theory, the stress at a reference point in the body depends not only on the strains at this point but also on the strains at all other points of the solid. Using the fundamental solution of the Helmholtz equation as an appropriate nonlocal modulus (the weight function in the integral relation between stresses and strains), the stress distribution in a two-dimensional nonlocal elastic medium has been found under the concentrated loading. The nonlocal stress does not contain nonphysical singularities, in contrast to the solution obtained within the frame-work of classical elasticity.

V. A. Osadchuk, I. B. Prokopovych, L. M. Senkiv, V. F. Chekurin

DISLOCATION MODELLING OF CONCENTRATION OF WELDING RESIDUAL STRESSES IN THIN-WALLED ELEMENTS OF DESIGN

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An approach is proposed to dislocation modelling the bi-axial distribution of weld stresses in the vicinity of bounded welds in thin-walled elements of design and to their calculation using the procedure of crack theory. As an example the calculation of the above stresses around a circumferential weld in a cylindrical shell is made.

V. G. Karnaukhov, V. I. Kozlov, Yu. V. Revenko

DISSIPATIVE HEATING OF VISCOELASTIC CYLINDER AND LAYER, CAUSED BY STEADY-STATE MOTION OF ARBITRARY SURFACE LOADINGS

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135-145. – Ref.: 7 names. – Ukr.

The plane quasi-static problem about stationary oscillations and dissipative heating of viscoelastic cylinder and layer under polyharmonic deformation, caused by steady-state motion of arbitrary surface loadings, has been considered. Analytic solution of the problem has been obtained under the assumption that the material is linearly viscoelastic, its characteristics don't depend on temperature, and Poisson's ratio is real. Basing on the numerical results, influence of the main factors, such as body sizes, width of loading area, heat boundary conditions on thermomechanical behavior of the bodies has been investigated. Numerical results for the cylinder and layer have been compared.

V. S. Popovych, H. Yu. Harmatiy

STRESS-STRAIN STATE OF THERMOSENSITIVE SHALLOW SPHERE UNDER CONVECTIVE HEAT EXCHANGE WITH ENVIRONMENT

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The solution to the heat conduction problem for a thermosensitive shallow sphere, where the convective heat exchange with environment (*of linearly time-varying temperature*) *take place, is constructed. The influence of temperature dependence of sphere material characteristics on the value and character of distribution of stressed-strained state components is studied.*

A. V. Yasinskyi

IDENTIFICATION OF THERMAL LOADING AND THERMAL STRESS STATE OF LAYER ACCORDING TO SURFACE STRAINS

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The problem of identification of the non-stationary one-dimensional temperature field as well as thermal stress state of a layer according to the temperature and thermal strains of one of the outer boundary surfaces is formulated and solved. It is shown that determination of the unknown temperature on the other boundary surface is reduced to the solution of inverse thermoelasticity problem. The well-posedness of the inverse problem is investigated. On the basis of solution to the direct thermoelasticity problem, the numerical verification of the proposed method of solution to the inverse problem is carried out.

K. V. Maksymenko-Sheyko, T. I. Sheyko

MATHEMATICAL MODELLING AND SIMULATION OF INCOMPRESSIBLE VISCOUS LIQUID MOTION IN CYLINDRICAL TUBES HAVING PERIMETER HELICAL INSERTS BY THE *R*-FUNCTION METHOD

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In the paper the mathematical models of incompressible viscous liquid motion in the cylindrical tubes having perimeter helical inserts are developed. For laminar motion the 3D problem is reduced to 2D. The influence of twisting parameter on the velocity profile formation is investigated.

O. Yu. Lozynsky, S. V. Shcherbovskykh

CLASSIFICATION, SYNTHESIS AND PROPERTY ANALYSIS OF SIMPLE PHASE-TYPE DISTRIBUTIONS

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In this paper the phase-type distributions laws classification system is proposed. According to this classification, the synthesis is made for analytical expressions of such distribution laws «up to three transitions – up to three phases», including. The property of convertibility is found by means of synthesized phase-type distribution expressions analysis.
