N. I. Bilusiak, B. Yo. Ptashnyk

**BOUNDARY-VALUE PROBLEM FOR WEAKLY NON-LINEAR EQUATIONS WITH LINEAR PART, UNSOLVABLE WITH RESPECT TO THE HIGHEST DERIVATIVE**

*The conditions of existence of unique solution to the problem with Dirichlet conditions on the marked variable $t$ and periodic conditions on the rest coordinates $x_1, K, x_p$ for weakly non-linear equations with a linear part, unsolved with respect to the highest derivative with respect to time, are established.*

A. M. Bocenyuk

**ON TIME DECAY ESTIMATES OF SOLUTIONS TO MIXED PROBLEM FOR ONE QUASI-LINEAR PARABOLIC SECOND-ORDER EQUATION**

*The mixed problem for one quasi-linear parabolic second-order equation in the unbounded domain is considered. The decay estimates which depend on the geometry of domain are established.*

I. D. Pukalsky

**PROBLEM WITH DIRECTIONAL DERIVATIVE AND PROBLEM OF OPTIMUM CONTROL FOR LINEAR PARABOLIC EQUATION WITH DEGENERATION**

*The existence and uniqueness of the problem with directional derivative for linear parabolic equations with a free power order of degeneration of coefficients with respect to time and space variables has been proved in terms of spaces of classical functions with power order. The estimation of solution to the problem in the corresponding spaces has been found. The problem of choice of optimum control by systems, circumscribed by the problem with directional derivative with limited control is examined. The functional of quality is determined by the sum of volume and surface integrals.*

B. M. Podlevs'kyi

**ONE BILATERAL ANALOG OF INVERSE ITERATION METHOD FOR SOLUTION OF NONLINEAR EIGENVALUE PROBLEMS**

*The bilateral analog of the inverse iteration method for solution of the eigenvalue problems with nonlinear entrance of a spectral parameter is offered. The iterative processes of bilateral approximations to the simple eigenvalue of spectral problem are constructed and justified. The conditions on the initial approximation which guarantee quadratic velocity of convergence of iterative process of alternating approximations to the eigenvalue are obtained.*

O. S. Gavryliv

**REPRESENTATION OF SOLUTIONS TO NONLINEAR OPERATOR EQUATIONS AND SYSTEMS IN THE FORM OF ABSTRACT WIENER INTEGRAL**

*The formulas which present the solutions to the nonlinear operator equations of a sufficiently wide class in the Banach space are defined in the form of abstract Wiener integral. The result is generalized for the finite systems of nonlinear operator equations in Banach space and on Cartesian products of Banach spaces.*

E. Yu. Leonchik, N. A. Malaksiano

**EXACT INEQUALITIES FOR REARRANGEMENTS OF FUNCTIONS FROM $A_\infty$ CLASS**

The exact estimates for the rearrangements of functions from $A_\infty$ class are obtained in the one-dimensional case.

A. Ya. Bomba, I. M. Prysjazhnjuk

**ASYMPTOTIC APPROXIMATION OF SOLUTIONS TO SINGULARLY PERTURBED BOUNDARY-VALUE PROBLEMS OF CONVECTIVE HETERODIFFUSION**

The algorithm for asymptotic approximation of solutions to the singularly perturbed boundary-value problems of convective heterodiffusion for two-coherent curvilinear domains, bounded by the equipotential lines, is constructed.

O. D. Polishchuk

**CHOICE OF OPTIMAL REGIMES FOR FUNCTIONING OF COMPLEX DYNAMIC SYSTEMS**

The methods for choice of optimal regimes for functioning of complex dynamic systems on the base of scalene, multilevel and multicriterion analysis of its main characteristics behavior are proposed. The problems of rehabilitation practice for invalids are used as an example.

Ya. Yo. Burak, M. A. Sukhorolsky

**SEQUENTIAL APPROACH TO CONSTRUCTING GENERALIZED SOLUTIONS TO BOUNDARY-VALUE PROBLEMS OF ELASTICITY THEORY FOR ORTHOTROPIC BODY**

The system of fundamental solutions to the equations of the elasticity theory for an orthotropic body is constructed in the form of limits of sequences of generalized sums of trigonometrical series. The conditions of their uniform convergence are investigated.

G. Ya. Popov

**SPECIFICATIONS AND ADDITIONS TO THE PAPER «ON ONE METHOD FOR OBTAINING INTEGRAL TRANSFORMS USING IN CONSTRUCTION PRECISE SOLUTIONS TO MATHEMATICAL PHYSICS BOUNDARY-VALUE PROBLEMS»**

In the work [4] at obtaining new integral transformations it was necessary to solve the singular Sturm – Liouville problem. Its solution is obtained by passing to the limit in the suitable regular (solved there also) Sturm – Liouville problem. However, this transition was done there formally without a strict proof. In the present work the strict proof of the made limit passing is given with some specifications.

N. O. Horechko, R. M. Kushnir

**ESTIMATE OF QUASI-STATIC THERMOSTRESSED STATE FOR SEMI-INFINITE CONTACTING BODIES**

An approach for determination of transient temperature field and stress state due to it in two semi-infinite contacting bodies, based on the multiple error function expansion, is proposed. Thermostressed state in an external load-free composite thin cylindrical shell, caused by heat exchange with the surrounding, is calculated.

V. I. Ostrik

**CONTACT OF ELASTIC AND RIGID WEDGES WITH REGARD FOR FRICTION AND ADHESION**

88-100. – Ref.: 8 names. – Ukr.

*The interaction between elastic and rigid wedges in the presence of friction and partial adhesion is studied. Using the Wiener − Hopf method, the analytic solution to the problem is found. The distribution of contact stresses is obtained.*

R. M. Martynyak, N. I. Malanchuk, B. Ye. Monastyrskyy

**ELASTIC INTERACTION BETWEEN TWO HALF-PLANES UNDER LOCAL SHEAR
OF BOUNDARIES IN THE REGION OF INTERFACE GAP**

*The contact interaction between two elastic isotropic half-planes from identical materials, one of which has a shallow surface groove under incremental loading is studied. During loading the ratio of normal and shear forces remains constant. The plane problem is posed, based on the «frozen» deformation principle, i.e. there is a forbidden relative shear of points of boundaries which have contacted. The problem is reduced to a set of integral equations: 1) a singular integral equation for tangential displacements jump of the gap's surfaces and 2) Abel's integral equation for tangential stresses appearing on the sub-region of the initial groove which surfaces have contacted. For a specific form of the groove the solution is obtained in a closed form. The analysis of contact parameters of the contacting couple versus the applied loads is carried out.*

O. F. Kryvyy, K. M. Arkhipenko

**CRACK, WHICH LEADS TO THE JOINING LINE OF TWO DIFFERENT
ANISOTROPIC HALF-PLANES**

*We have solved the problem about the inhomogeneous plane, composing of two ideally contacting anisotropic half-planes, in one of which there is a crack leading to the joining line of these half-planes. The problem is reduced to a system of singular integral equations, which has been solved numerically by the offered boundary element method. We have analyzed the dependence of singularity index in the crack's tip, which is on the joining line, and the stress intensity factor in another tip on the crack's location and material properties. The exact solution has been obtained for the crack lying on the joining line of anisotropic half-planes.*

I. A. Prokopyshyn, D. H. Khlebnikov

**PLANE DEFORMATION OF ELASTIC TRANSVERSALLY-ISOTROPIC LAYER
BY PERIODIC ARRAY OF RIGID SMOOTH PUNCHES**

*The Fredholm second-kind integral equation for contact pressure is obtained on the base of Lekhnitsky operational solution of the elasticity problem for transversally-isotropic layer. Numerical solution to the equation is found by means of the Mehler quadrature rule. Influence of the geometric and anisotropy parameters on the maximum of contact pressure and punch load is analyzed. The error estimate of the solution by the refined Timoshenko plate theory taking into account the effect of transversal compression is obtained.*

O. V. Maksymuk, A. O. Chernega

**INFLUENCE OF ROUGHNESS OF CONTACTING BODIES ON CHARACTER
OF THEIR STRESS STATE**

*The mathematical model of the problem about interaction between a rigid rough surface (microprotrusions in the form of a cut wedge) and elastic half-space is proposed. The formulas for contact pressure and real contact region are obtained. Mutual influence of microprotrusions and influence of distribution of maximum tangential stresses in a half-space are studied.*

M. Yu. Shvajko

**ON SLIDING THEORY WITH SMOOTH AND SINGULAR LOAD SURFACES**

*The results for the sliding plasticity theory* [9, 19] *using some particular types of hardening functions are briefly stated. The obtained results are compared with the similar ones for the known* [1, 3–5, 27] *plasticity theories with smooth and singular load surfaces.*

O. P. Havrys', P. R. Shevchuk

**INFLUENCE OF SURFACE CURVATURE AND MODE
OF BASE FASTENING ON CHARACTER OF FORMING RESIDUAL
STRAIN BY HIGH-TEMPERATURE SPRAYING**

*On the basis of solution to the nonlinear boundary-value heat conduction problem for a circular shallow cylinder, the results of calculation of temperature regimes and residual stresses in the system cylindrical body – coating under high-temperature spraying, are presented. Using the obtained numerical results, the influence of temperature regimes, curvature of sprayed surfaces and other defining parameters on change of residual strain in the process of the system cooling, and also the particularities of forming such stresses under coating spraying on the non-planar surfaces has been analyzed.*

M. M. Kundrat

**FRACTURE ANALYSIS OF ORTHOTROPIC REINFORCED HALF-PLANE**

*Limiting equilibrium and fracture of an orthotropic semi-infinite plate, reinforced by flexible not extensible rupture finite-strength stringer are investigated under the conditions of plane problem. Localized zones of prefracture (weakened contact) are developed in the vicinities of the stringer ends along its boundary with plane. They can correspond to the regions of damages, plastic deformation, partial break of connection etc. Two variants of fracture development are studied: **a**) rupture of stringer and **b**) debonding of stringer. The analytical dependence between the values of limiting (critical) load and physico-mechanical parameters of the half-plane material are obtained using the criterion of deformation. The critical length of stringer for the change of fracture nature is determined, which together with elastic and mechanical properties defines the mechanism of possible fracture in the composition.*

I. I. Dyyak, N. P. Kukharska

**NUMERICAL ANALYSIS OF HEAT CONDUCTION PROBLEMS
BY DIRECT BOUNDARY-ELEMENT METHOD**

*The numerical aspects of using a boundary-element technique for initially boundary-value heat conduction problem with the mixed boundary conditions are considered. In particular, the effectiveness of application of different modes of time integration are investigated.*

M. V. Demydyuk, B. A. Lytvyn, B. M. Holub

**PARAMETRIC OPTIMIZATION OF BIPEDAL ROBOT GAIT**

*The optimal control problem for a nine-link nonlinear mechanical system, that models the bipedal walking robot gait, is investigated. The motion of the system has to satisfy the basic rhythmic, cinematic and dynamic restrictions of anthropomorphic type. A quadratic objective functional (on the control torques in the joints) is used. The algorithm for approximate solution of the given problem in the class of symmetric gaits (on the double stride period) is proposed. This algorithm is based on the parameterization of the system generalized coordinates by the cubic smoothing splines, inverse dynamic approach and numerical methods of nonlinear mathematical programming.*