CONTENTS AND ABSTRACTS

According to the exercises K_{Δ}^{ω}–stability are being described the task of M. A. Aizermana that doing the task at the generalization condition The task of Aizermana insufficient for paying availability at all. So as for necking the second order: $\ddot{x}+\phi(x)\dot{x}+f(x)=0$ at the different $\phi(x)$ and $f(x)$ the construction of the function Lyapunov through which follow steadiness decision necking.

In this problem is considered the system from two dynamic objects, which realize plane motion and is required build optimal controls, providing transition of objects from arbitrary initial difference states in given final difference states at final time and excluding of collision in process of the joint motion.

The stability of the rectangular plate of the piecewise constant thickness, prepared from the composite material, hinge supported on two opposite longitudinal sides and free or hinge supported on the end edges, under the action of the evenly distributed compressive load, applied along the longitudinal sides of plate is examined. The optimum values of the geometric and physical parameters of plate, which ensure the maximum value of critical load with the fixed weight, equal to the weight of the plate of a constant thickness, and its assigned overall dimensions are determined.

In the paper a contact problem for a semi–infinite plate, fastened by two semi–infinite and one finite stringers is considered. The infinite plate is deformed under the action of the forces, applied on the infinity. With the help of Fourier transformation, the problem is reduced to the solution of the singular integral equations system relative to the deformation of the intermediate interval among the stringers and stresses acting under the finite stringer.

The plane contact problem on stamping of rigid punch into free side of compound infinite wedge, consisting of three elastic materials is researched. This problem considered under linear theory of elasticity. It is assumed that only normal stress is acting under punch, the continuity condition is satisfied along the splice line, and the second side is rigidly clamped.

On the basis of equations of space problem of elasticity theory for incompressible material, forced vibrations of rectangular plate are considered. It is regarded that on one face surface the vector of displacement is given which in time is changing harmonically, and on opposite face surface the mixed conditions are given.General asymptotic solutions of formulated problems are derived.In special cases mathematically exact solutions are derived.

parameters. Used the asymptotic method of integrating three-dimensional equations of micropolar elasticity theory in this case for an orthotropic body. Based on this internal problem, obtain general two-dimensional equations of bending of orthotropic micropolar elastic thin plates with independent fields of displacements and rotations; with constrained rotation, <<with small shift rigidity>>.In the future we will build boundary layer task micropolar orthotropic plate and examine the interaction of internal (two-dimensional) problem with a boundary layer problem.

research is the procedure of derivation of asymptotic approximations from the exact three-dimensional equations.

(square and cubic) and geometrical (cubic). It is shown that the account of aerodynamic nonlinearity (especially its asymmetrical square part) brings to the appearance of new types of dependences "amplitude-speed" as in up to critical stage, and the post-critical speeds.

We combine physical and mathematical simulation of the processes of impact and penetration of cylindrical rods to develop a computational-experimental method for identifying strain and strength characteristics of ground media in a wide range of pressure. The method of solving the oblique penetration problem on the basis of the plane section hypothesis is proposed. The results of verification show that one describes reasonably well both the resistance forces and the impact-induced trajectory deviation from the initial direction for a body of revolution. It is shown that, in comparison to the local interaction models known previously, the new algorithm provides a significant increase in the reliability of calculations of the oblique impact parameters and the penetration of bodies, which is due to taking into account the nonlinear dependences of the pressure on density and the yield strength on pressure, the irreversibility of bulk unloading, the separation character of the flow, and the unloading action of the free surface.

The plane elasticity theory problem for convex polygon weakened by unknown equi- strong holes is considered. It is supposed that absolutely smooth rigid stamps with rectilinear bases are attached to each link of the external boundary of broken line. External concentrated forces applied to the stamps acted perpendicularly to the boundary. Under the action of these forces the stamps are moved only forward. The unknown contours are free from external forces. At each link of broken line of the boundary the normal displacements are constant and tangential stresses are equal to zero. It is required to define the unknown boundaries of equi- strong holes and the body stressed state.

A problem on the questions of the interaction of periodic system of cracks, situated on one direct in the elastic infinite plate with thin walled inclusions is considered. With this the thin walled inclusions are interpreted in the form of linearly deformed continuously distributed springs of definite rigidness under the tension, connecting on the some parts of the cracks edges.

The equations of the cubic symmetry materials for class 23 are received in the analogy with known equations of the quasihiperbolic approximation of piezoelastic materials of the hexagonal symmetry. The solution of the problems of the reflection from semispace boundary are bringing on that equations base.

The reflection and refraction of a flat electroelastic shear wave at the smooth contact from border of a rhombic piezoelectric crystal of a class 222 and elastic dielectric izotrop media is considered. Are determined peak coeffition of arising waves. Is shown, that in a crystal there are accompanying superficial waves.

the optimization of their tribological characteristics. The coating consists of two layers, which are in perfect adhesion with each other and with the substrate material. Elasticity modulus of the upper layer is greater than the substrate modulus, the second layer is essentially thinner than the upper layer, and the material of this layer is the softest. Under assumption that the influence of friction on the distribution of contact normal stresses is negligible, axisymmetric contact problem is considered for an elastic counterbody; two models of the coating were used to solve the problem. The first model is a three-layered elastic half-space with the perfect adhesion between the layers. The mechanical characteristics and the thickness of the second layer make it possible to use the Winkler layer as a model. In this case an approximate model of two-layered elastic half-space with imperfect adhesion at the interface is considered. For both models we use the previously developed numerical-analytical method of solution based on Hankel integral transforms. The technique of the coating deposition makes it possible to vary the thickness and hardness of the upper layer. For different loads we compare the results of the contact problem solution based on two models of the coating. For some cases the difference between the contact pressure distributions is negligibly small. These results were used to calculate the subsurface stresses inside the upper layer for the case of sliding friction. This calculation of internal stresses is three-dimensional problem, which is solved using double Fourier integral transforms and the boundary element method. The influence of the value of friction coefficient on the stress concentration is considered.

The model to study the combined effect of the imperfect elasticity, microgeometry, and adhesion interaction on contact characteristics and friction force in sliding contact of rough bodies is developed. The model is based on the solution of the 2-D contact problem for the wavy indenter sliding over the viscoelastic foundation in the presence of the molecular adhesion in the gap between contacting surfaces. It follows from the model analysis that increasing of the molecular adhesion leads to increasing of the real contact area, to transition from the discrete contact to saturated one for the lower nominal contact pressure; and to increasing of the friction force.

The propagation of free internal waves in randomly stratified ocean and its decrements of damping are determined. Program based on the finite element approach solution of the homogeneous boundary value problem for determining the spectrum and the corresponding modes of vertical and horizontal components of velocity of free internal waves are developed. This program, which allows the on-line to find the characteristics of internal waves directly into the sailing, just after the "live" performance measurement aquatic CTD - sensing. Calculations of the characteristics of internal waves in the areas of extraction and transportation of hydrocarbons - North, Barents and Okhotsk Sea, seasonal and spatial characteristics of their distribution are studied.

The article presents a new method for definition of reinforcing bar anchorage distance, elaborated on the basis of research, conducted by the photo-elasticity. The presented new method allows to consider the influence of modules of elasticity for concrete and reinforcing bar on the anchorage length. In addition, the comparative analysis of an offered methodology with similar methods has been conducted.

In this paper deals with a mixed boundary problem for an elastic isotropic wedge of arbitrary angle opening in case of antiplane strain when the displacement component is given on an arbitrary finite set of segments on one side of the wedge and the component of tangential stresses on the remaining part of that side as well as on the other one.

A problem of diffraction of shear plane wave in piezoelectric media containing parallel semi-infinite crack and infinite metallic thin layer(electrod) is considered. The problem id reduced to solving functional equations of Riemmann's problem of the theory analytic functions. The problem closed solution expressing the wave elctroelastic field in piezoelectric space. It is shown that existence of semi – infinite crack leads to appearance of surface waves.

The possibility of formation of solitons and their periodic analogue is considered in the problem of propagation of nonlinear shear and rotation wave. In the problem of propagation of a nonlinear thermo elastic longitudinal and rotational wave study of evolution of a Riemann wave in the medium without damping in a medium with damping. Results depending on the coordinates of points overturning Riemann waves on the parameters of the material were found.

Studying shock-wave flows arising at supersonic flow deceleration till subsonic speed in the channel is the important problem of fluid mechanics. At the same time, the majority of such researches are conducted for stationary regimes. In this work possibility of active control of shock-wave flows is shown, using periodic influence on an air stream. For the first time speed of pseudoshock moving in plane and axisymmetric channels is measured. The ways of flow control and burning regimes in a supersonic air stream which can be used at the organization of effective heat supply in combustion chambers of perspective high-speed engines have been proposed and tested.

A mathematical model for thermoelastic deformation of seals is developed taking into account a cylindrical nature of anisotropy type of flexible graphite, experimental data for elastic, strength and thermophysical characteristics of materials (the properties differ in radial, hoop and generatrix directions). An initial operation mode of O-ring seals, produced on a large scale and used for rod seal in the gland cocks, has been considered. The influence of thermoforce loading conditions on the character of stress-strain distributions along cross-sections of seals and seal packs has been investigated using numerical FEM solutions of 3D stationary boundary value problems. Estimation of real damage mechanisms (i.e. damage from tension or compression in radial, hoop and axial directions, and from transversal and antiplane shear) affection on initial strength, a comparison of different loading modes (i.e. reciprocating motion in sealing bush or opposite direction, and torsion of the rod), height and conditions on contact surfaces (i.e. ideal contact, friction or slip) between seals on the maximum values of radial, hoop, axial and shear stresses have been calculated. The locations of damaged domains obtained from computational experiments are in a good agreement with the results of O-ring seals experience.

Using decomposition of hoop and radial components of displacement vector to the trigonometrical and generalized power series, the new exact analytical solutions to problems on equilibrium state of thick-walled heavy anisotropic central- and axial-symmetric bodies, which are fixed on the external surfaces and are subject to the action of uniform internal lateral pressure, are obtained. The estimation of an initial strength of cylindrical and spherical solid-cast mine working supports is carried out on the basis of a multicriteria approach taking into account real damage mechanisms (i.e. damage from tension or compression in radial, hoop and

axial directions, and from transversal and antiplane shear) of anisotropic axial- and central-symmetric bodies.

derive their basic mixed integral equation. The solution of this equation is constructed by using the Manzhirov generalized projection method [4].

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Magnetoelastic vibrations of perfect conductive transversely isotropic elastic layer in external longitudinal magnetic field
Within the framework of elasticity theory plane problem, the propagation of magnetoelastic waves in an transversely isotropic layer is considered. The layer surfaces are free from mechanical stresses. The layer is immersed in external constant magnetic field, direction of which coincides with direction of magnetoelastic wave. The layer has properties of perfect conductor.The dispersion equation is derived and in long wave approximation the equation of bending vibration of thin magnetoelastic plate is derived.

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The influence of symmetry infringement of the reinforcement on deformative behavior of glassplastic tubes under the axial tension
The influence of angle deviation from the given zero ($\varphi=0^0$) , caused by technological process and changing within limits $\varphi=6\text{-}8^0$, on the deformativibility of glassplastic tubes under the axial tension is considered. It is revealed that the relation of the axial deformations of samples with $\varphi=8^0$ and $\varphi=0^0$ practically doesn't depend on the level of stress under the short time tests and the duration of observation in case of creep. A qualitatively analogous phenomenon was detected in case of the relation shear and axial deformations for tubes with the deviating reinforcement, too.

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Contact Problem for the Elastic Half-Plane Strengthened by Heterogeneous Elastic Stringers of different length in the presence of the interlayer
This work observes contact problem for the elastic half-plane strengthened by the heterogeneous elastic stringers (overlays) which consists of two semi-infinite pieces and one separated finite piece with another elastic characteristics. It is supposed that contact interaction in all parts is realized through a thin layer of glue (another physicomechanical characteristics) and stringers are deformed under the action of horizontal forces. Using generalized Fourier transforms the determinational problem of unknown contact stresses are reduced to the systems of integral equations Fredholm second kind within the different intervals, which in the case of all admitable values characteristic parametrs of problem in the space of Banach may be solved by the method of successive approximations. The particular cases are observed and the character of the change contact stresses is illustrated in the different contact parts.

Kirakosyan R. M., Stepanyan S. P. 292
On the stability of orthotropic plate-layer, taking into account its own weight and trnansvers shear
The collocation method is used to solve the problem of stability of an orthotropic plate-layer, taking into account its own weight and transverse shear S.A.Ambartsumian`s precised theory of anisotropic plates is used. We consider two variants of boundary conditions. We present the dimensionless critical values of loads. Qualitative and quantitative conclusions. analyzing the results are made.

Kovaleva E.D. 297
Application of an asymptotic approach to problems of scattering acoustic waves by elastic spherical shells

Application of asymptotic models to problems of scattering of stationary acoustic waves by elastic spherical shells for different value of the relative thickness is considered. A procedure is proposed for constructing an approximate solution, based on matching the expansions of three different asymptotic models of the interaction of the elastic shell with the acoustic medium. In the vicinities of zero frequency the refined Kirchhoff-Love theory of long-wave low-frequency approximation of the elasticity equations is applied. In the vicinities thickness resonance frequency long-wave high-frequency approximations are employed. Outside the vicinities of zero spherical and thickness resonance frequency vibrations of a shell correspond to short-wave motions. Here a flat layer model is used. It is shown for enough small value of the relative thickness that the flat layer model has overlap regions both the refined Kirchhoff-Love theory and the theories associated with long-wave high-frequency approximations. The boundary of the field application of asymptotic models in dependence from value the relative thickness of the spherical shell is obtained. A comparison of numerical data corresponding to asymptotic and exact solutions for middle value the relative thickness shows that the proposed procedure is applicable in frequency regions to first the frequency thickness resonance.

Group analysis of the non-linear system of partial differential equations describing three-dimensional perfectly plastic equilibrium state is carried out. The Tresca yielding criterion is employed to formulate the system to be analysed. Stress state is presumed correspond to an edge of the Tresca prism thus allowing formally consider the static equations independently on the flow rule. The system of static equilibrium equations is represented in the stress principal lines co-ordinate net (isostatic net). By the aid of the standard algorithms of the group analysis of the partial differential equations the symmetry group of this system is obtained.

The corresponding Lie algebra and a first order optimal system of subalgebras of the symmetry group of three-dimensional partial differential equations of the mathematical theory of plasticity are studied. The optimal system in the three-dimensional case is shown consist of 1 three-parametric, 9 two-parametric, 45 one-parametric and 95 individual infinitesimal generators. It is proved that plane strain equations determine the seven-dimensional Lie algebra; a first order optimal system of its subalgebras consists of 1 two-parametric4., 7 one-parametric and 19 individual infinitesimal generators. In the case of axial symmetry the system of partial differential equations is characterized by the five-dimensional Lie algebra; a first order optimal system of its subalgebras consists of 1 one-parametric and 20 individual infinitesimal generators.

Shear model for accumulation of damage in solid bodies under irreversible strain is proposed. Irreversible strain is believed to be formed under in-plane shears. Normal strain varies proportionally to a respective shear at directions, normal to shear planes [1, 2]. This approach makes it possible to give due consideration of the fracturing and pore development without applying Kachanov –Rabotnov kinetic equation for damage [3, 4]. Material failure is initiated when the maximum shear reaches the critical value and results in the shear-strength loss. The model, based on the maximum shear stress and the exponential law, provided the grounds to solve the problems on strain and failure of an elastic-creeping body at the stages of nonstationary and stationary creep. The study objects are cylindrical and spherical cavities in an infinite body under internal pressure, pure bending of a rectangular cross section bar, and torsion of a round bar. Stresses, creep strains, fracture start time and complete failure time, as

well as the fracture front's position and velocity any time are determined for the considered structural elements.

Kolesnikov V.I., Bardushkin V.V., Sychev A.P., Chekasina I.I., Yakovlev V.B.....317
Effective elastic characteristics and anisotropy of inhomogeneous rocks of quartz matrix – biotit type
Numerical modeling of dependence of effective elastic characteristics of materials quartz matrix – biotit type from concentration and the shape of inclusion has been spent. Quartz crystallites have isometric shapes, inclusions of biotit were modeled by ellipsoids of revolution with a main semiaxis oriented in *z* direction. Isotropic orientations distribution function (ODF) was considered for quartz crystallites, axial ODF in *z* direction (coaxial with 6th order axis of biotit) was used for biotit inclusions. The calculated effective elastic modules were used for the determination of the parameter of anisotropy in *z* direction.

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Asymptotic theory of transient waves in thin shells
The paper devoted to mathematical modeling of transient wave propagation in thin shell by asymptotic methods based on exact three-dimensional elasticity. Longitudinal actions of tangential, bending and normal types are considered. An asymptotic model of wave propagation in a semi-infinite shell of rotation is used, which employs the two-dimensional Kirchhoff-Love (tangential and flexural) components, the solutions of the quasiplane problem of elasticity, the parabolic boundary layer near the quasifront, and the hyperbolic boundary layer near the expansion wave front.

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Kusnetsov S.I. 331
Analytical and numerical research of incompressible finite deformable solids
At this paper two methods for solving of problems for hyperelastic bodies are considering. The first method is to use the Ericsen universal deformations. The second method is to find minimum of energy functional. The Mooney-Rivlin potential for incompressible material is used. The experimental method for identification the material constants is proposed.

Kukudzhanov V.N., Kolomiets-Romanenko A.V. 335
On influence of thermo electrical pulse electroplastic effect under simultaneous and separately action of electrothermal field and mechanical loading
The properties material consisted from periodical representative elements with microdefects (cylindrical micropores, flat microcracks) is investigated. Firstly the separate elements is considered. The simultaneous and separate loading of thermoelectrical and mechanical is considered taking into account microdefects of material. The main defect is finding closing of the cracks under electric pulse on the first stage of loading and after due to thermomechanical localization on the ands of cracks and melting the material leads to increasing its porosity. It is shown that the presence of circular cylindrical defects under the influence of an electric current appears weak concentration of temperature, while for planar cuts (microcracks), this concentration is very essential. A further electric shocks to the representative element with cylindrical defects does not lead to their closure due to the small compressive displacement. This result is repeated for the sample with an ordered structure of representative elements. This phenomenon leads to an increase of the strength of the sample, but due to the application of electric current it leads to simultaneously thermal softening of the material. The material

ordered structure of the defects under simultaneous action of electric field and the tension is softening and the increase in the yield plateau. These results clarify the mechanism of change of material properties of termoelektroplastic model.