CONTENTS AND ABSTRACTS

We consider several boundary-value problems for the Euler equations describing flows of an ideal incompressible fluid in a bounded domain: the problem NP with nonpenetration condition at the boundary as well as so called through flow problems describing flows of the fluid through the domain, with different types of boundary conditions (then three problems appear, we call them TF.I, TF.II and TF.III). We are interested in global (i. e., "in the whole" in time and input data) existence and uniqueness theorems for these problems formulated in the widest possible classes of solutions. Such interest if stimulated by well-known global existence problem for three-dimensional Euler equations, where solutions become nonsmooth even if they are smooth at the initial moment of time, so the named problem seems to meet its solution only in the classes of extremely irregular functions. In the other words, we have to study nonsmooth solutions of the Euler equations and prove their existence and uniqueness. We present two main results. The first result consists in uniqueness of solutions to the problems NP, TF.II and TF.III (for any dimensions of the flow) in the classes with unbounded vorticity. These classes are presented using the Orlicz classes and seem to be easy to verify in applications since they are formulated in a rather clear form as against well-known results. The second result consists in global existence theorem for the two-dimensional problem TF.I in the classes of solutions with unbounded vorticity that belongs to the Lebesgue spaces L_p with $p>4/3$. Our methods discover curious relations of the named problems with the theory of integral transforms.

We consider a three-dimensional problem of propagation of magnetoelastic waves along the boundary. The problem is investigated for a model of isotropic perfectly conducting material. The new dispersion equation is obtained and solved.

Asymptotic method of constructing two-dimensional and one-dimensional equations of micropolar elastic isotropic plates and bars is developed in [1-4]. In this paper two-dimensional dynamic equations, boundary and initial conditions of generalized plane stress orthotropic micropolar elasticity of the body in a thin rectangular area are considered. On the base of the internal problem the dynamic equations of bending of orthotropic micropolar elastic bar with free rotation, with constrained rotation, with small shift rigidity are obtained. Micropolar boundary layers on the coordinates (quasistatic) and on time are constructed and studied. On the base of studying the problem of interaction of one-dimensional problem and micropolar boundary layers boundary and initial conditions of one-dimensional theory are defined.

In this work, the problem of bending of a plate under the action of tangential loads is considered on the base of classical theory, theory of Reissner-Genki-Mindlin by Vasilyev variant, and theory of Ambartsumyan. The comparisons between deflections, crosscutting forces and moments by refined theory of first-order and by higher-order refined theory are then obtained.

In this article elongated elastic plate hinged along the long edges in supersonic gas flow is considered. The influence of structural friction in the hinges on its stability is investigated.

Hovhannisyan E. K. .....

Strained-deformed condition of two rugged underthe corner of lines in field of gravity force.

Considered in field of gravity force body limited by two lines and situated in position when the line of crossing these stripes perpendicular by direction of self weight vector. The problem dares a method of finite elements. Schedules normal and tangent pressure in studied surfaces are resulted.

Hovhannisyan H. V. .....

A Contact Problem for a Elastic Piecewise Homogeneous Infinite Plate Strengthened with a Non-homogeneous Infinite Elastic Stringer

In the present paper, a contact problem is considered for a piecewise homogeneous infinite elastic plate consisting of two semi-infinite plates with different elastic characteristics and strengthed with an infinite elastic stringer. The problem is formulated as a singular integral equation, with a kernel consisted of a singular and regular parts. The solution of the above-mentioned singular integral equation is based on the generalized Fourier integral transformation, which is reduced to a solution of a functional equation, which solution is reduced to a solution of Fredholm integral equation of second order.

Ohanyan G.G., Sahakyan S.L. .....

On approximation in theory of axialsymmetric vibrations of shell with monodispersive gas–fluids mixture

The vibrations of infinite circular cylindrical shell, filled by mixture of ideal fluid with isentropic gas bubbles are investigated. The dispersion equation is obtained, which is solved numerically. It is shown, that in axial symmetric system shell–mixture with the big bubbles, for the short waves we have effect of dispersion, while in case of a small bubbles the dispersion is absent. In case of pure fluid it takes place for every wave. The taking into account of bubbles in fluid brings to reducing of frequency of vibrations of shell.

Odintsev I.N. .....

Coherent optics methods in experimental mechanics of materials

The presentation considers some problems and results of practical applications of coherent optics methods in material mechanical testing including study of deformation as a process. Common techniques updated with holographic interferometry or speckle interferometry are presented. Nonstandard approaches to study of elastic-anisotropic bodies and double-modulus materials based on the special mathematical interpretation of experimental data are proposed. Approaches to study of dissipative properties of materials under vibration loading are described separately.

Osipov M.N. .....

Application of the "sandwich" speckle interferometry with the ring aperture and holographic interferometry for determination of the displacement fields

In work the application simultaneously of the methods speckle interferometry with ring apertures and holographic interferometry for determination of full field displacements at deformation of objects is described.

Parshin D. A. .....

Modelling a process of accretion of a radially inhomogeneous elastic spherical body in the field of self-gravitation

A process of centrosymmetrical accretion of a radially inhomogeneous elastic spherical body in the field of self-gravitation is investigated. It is given a statement of a nonclassical initial-boundary value problem of solid mechanics that describes a quasistatic process of deforming the accreted solid under consideration in the case of small strains. The solution of this problem is built. The obtained stress state of the considered accreted body is compared with the state of an instantly formed self-gravitating spherical body which is analogous to the accreted one in size

and properties. The second state is found by solving the corresponding classical problem of the elasticity theory for a solid of constant composition.The results of the work can be used in particular as a basis for construction of a geomechanical model that takes into consideration the process of the Earth gradual forming due to spherical accretion.

Petrosyan T.L......
Dependence of form and area of hysteresis loop from kind of change of stress in time
The theoretical data of hysteresis according to theory of heredity at different change of external loading are presented in the work. For the theory of heredity the exponential relations are applied as the creep kernels. There is considered the influence of constant component (characteristic of asymmetry) of periodic stress on form and area of hysteresis loop.

Pogosian A.K., Meliksetyan N.G. .....
Influence of frictional transfer on mechanics of contact of brake materials
It is shown that the process of frictional transfer is constantly operating factor at a high-temperature friction for brake frictional materials irrespective of composite structures as well as influence on mechanics of contact for rough surfaces and define workability of a friction pair. It is established, that at new frictional materials creation it is necessary to develop compositions capable to form a transfer film on a counterbody surface at rather heats of frictional contact as thus the maximum value of a friction coefficient moves to the more heats area.

Pogosian A.K., Saroyan W.V., Boniatian C.R. .....
Additives influence upon the wear characteristics under boundary lubrication
Tribological characteristics' dependences upon the content of various additives in lubricants have been studied. On the basis of the exploration of the experimental results the dependences of the additive content, normal load, linear wear and friction coefficient interactions from each other has been represented, which gives possibility to select the best composition and type of additives for the lubricants.

Poghosyan D.M. .....
One limiting transitions in the theory Stability of rectangular plates beyond the elastic
In this paper given problem of incompressible infinite rectangular plate stability beyond the elastic. On one edge acting compressive stress, the other edges are free. And are prove, that the principle Sen-Venanan in some sense inapplicable for this type plates.

Romashov G.A. .....
Wedging of the elastic material with formation of tearing zones
The problem of movement of a solid body in jelastic material in the presence of a possible tearing zone of material in body's nasal part in asymmetry case is considered on subsonic and transonic velocity range. On all range of considered speeds the scheme of a flow of the body is determined for contours in the form of a wedge and ogive. An analytical solution of the problem is found and the analysis of dependence of the length of the tearing zone on the parameters of the problem is provided. It is shown when the body moves with velocity higher than the velocity of transverse waves there exists a limiting value of the velocity at which the tearing zone in the nasal part of the body disappears. Determined the forces acting on the body from the continuum, and dependence of these forces on the parameters of the problem is investigated.

Rudoy E.M. .....
On an asymptotic analysis of energy functional for elastic bodies with rigid inclusions and cracks: two-dimensional problem
The equilibrium problem of the elastic body, containing a rigid inclusion is considered. There exists a crack between the rigid inclusion and the body. The problem is formulated as variational one. We investigate asymptotic of the energy functional under the general perturbation of the domain with the cut and the rigid inclusion. The main result of the work is the deriving of the formula for a derivative of the energy functional with respect to parameter of

the perturbation. The received results have practical interest in various areas of engineering: mechanical engineering, construction, etc. They are useful at designing and the analysis of behavior of bodies and designs with cracks or technological cuts.

Sahakyan A.V.

Quadrature formulas for calculation of the integral with a variable upper limit

Quadrature formulas for calculation of the definite integral with a variable upper limit when integral density is presented as bounded continuous function and Jacobi weight function composition are built. The obtained formulas allow us to solve singular integro-differential equations, which contain the primitive function of unknown function as a term, by the method of discrete singularities. On the other hand, the same formulas allow to define measure of crack disclosing in problems of elasticity theory for bodies with cracks, especially, in the case when for solution of problem the method of discrete singularities is used.

Sanoyan Yu. G.

Stress deformed state of a compound rectangle

Superposition method solved biharmonic problem of the thermoelastic stress state of the compound rectangle for different additional boundary conditions on its adjacent corners. The effect of additional conditions on the behavior of elastic characteristics in the neighborhood of the vertices adjacent angles has been researched.

Sargsyan A.M.

The influence of the boundary conditions type, given on the arch part of the round sector boundary, on the behaviour of the stresses in the conditions of the smooth contact on the radial sides

We discuss a plane stress state of a round sector with unique radius and arbitrary angle of $\alpha\ (0<\alpha<2\pi)$, when on the arch part of the contour normal stresses $\sigma_r(1,\varphi)=f_1(\varphi)$ and tangential displacement $u_\varphi(1,\varphi)=f_2(\varphi)$ are given, and on the radial sides the condition contact with rigid punch (stamp) without friction is realized. A closed solution of the problem is obtained with the help of Fourier method. The singularity of the stresses in the vicinity of the sector top is considered. Between the first coefficients of Fourier decomposition of the function $f_1(\varphi)$ and $f_2(\varphi)$ a condition is established, under which the stresse in the vicinity of the sector top tend to infinity only when $\alpha>\pi$. In paper [1] based on the results [2], an elastic equilbrium of the circular sector, when on its arch part normal and tangential stresses are given, is investigated. It was shown, that when tending of the angle α to 2π, the stresses singularity order tends to –1, and the coefficient with such singularity in the conditions of general loading of the boundary $r=1$ is different from zero. Here is analysed another case of loading of the arch part of the sector boundary.

Sargsyan M.Z.

Free vibrations in the zone of boundary layer of orthotropic plate in the presence of viscous resistance

The free vibrations in the zone of boundary layer of orthotropic plate freely lying on the rigid substrate are investigated under condition of viscous resistance. On the upper plane of plate are given either the boundary conditions of free edge or constrained fastening. The asymptotic solutions corresponding to the boundary layer are obtained. The damping of values in the boundary layer at removal from a lateral surface is investigated.

Sargsyan A.H. .....

Free vibrations of micropolar elastic thin bars, rectangular plates and cylindrical shells

In work on the basis of the general dynamic theories of micropolar elastic thin bars, plates and shells with independent fields of transitions and rotations at which deformations are completely considered cross-section shift and related by it, free vibrations of hinge supported bars, rectangular plates and cylindrical shells (axisymmetric problem) are studied. For tasks in view

exact decisions are constructed. Frequencies and forms of free vibrations of micropolar bars, rectangular plates and cylindrical shells are as a result defined. The results of numerical calculations showing specific features of free vibrations of thin bars, plates and shells from a micropolar elastic material are resulted.

Sargsyan S.H., Sargsyan L.S. .....
Magnetoelasticity of Micropolar Electro Conducting (Non-ferromagnetic) Thin Shells
In the present paper we aim at considering the three-dimensional equations, boundary and initial conditions of micropolar theory of magnetoelasticity with independent fields of transition and rotation. For the beginning, the hypotheses of straight line (supplanted by static hypothesis) and magnetoelasticity for electromagnetic values are applied. The mentioned hypotheses are of asymptotic approximation. On the basis of the mentioned hypotheses, depending on the values of sizeless physical parameters, the general theory of magnetoelasticity of micropolar elastic electro conducting thin shells with independent fields of transition and rotation; with constraint rotation; with "small shift rigidity". In the constructed theories of magnetoelasticity of micropolar shells all the lateral shift and related thereof deformations are taken into account.

Sargsyan S.H., Farmanyan A. J. .....
The theory of micropolar layered plates, consisting of odd numberof layers, symmetrically located in relation to mid-plane.
In the present paper with the application of the qualitative results of the asymptotic method of integration of the boundary problem of micropolar elastic layered medium there are formulated hypotheses, on the basis of which, depending on the values of sizeless physical parameters, there are constructed the applied theories of micropolar layered plates (containing odd number of layers, symmetrically located in relation to mid-plane) with independent fields of transition and rotation; with constraint rotation; and with small shift rigidity**.**

Sarukhanyan A.A., Manukyan A.A. .....
Laminar flow of viscous fluid in a cylindrical pipe of rectangular cross-section
The paper presents laminar flow of incompressible viscous fluid in a cylindrical pipe of rectangular cross-section. A mathematical model of the problem has been developed in dimensionless form. Solution of the problem is given in the form of Fourier infinite series. It has been proved that the suggested solution is reduced to the solution of the problem of torsion of a bar of rectangular cross-section. Formulae for velocity distribution, per second volume flow and average velocity in the effective cross-section in dimensionless and dimensional forms have been obtained.

Seyranian A.P., Mailybaev A.A. .....
Multiparameter stability problems. Theory and applications in mechanics (presentation of the book)
A new book of the authors published in Russian by Fizmatlit deals with fundamental problems, concepts, and methods of multiparameter stability theory with applications in mechanics. It presents recent achievements and knowledge of bifurcation theory, sensitivity analysis of stability characteristics, general aspects of nonconservative stability problems, analysis of singularities of boundaries for the stability domains, stability analysis of multiparameter linear periodic systems, and optimization of structures under stability constraints. Systems with finite degrees of freedom and continuous models are both considered. The book combines mathematical foundation with interesting classical and modern mechanical problems.

Seyranyan S.P. .....
Limiting transition from locally distributed uniform loading to concentrated force in expression for the components of the gradient of the deflection of a simply supported rectangular plate
Limiting transition in components of the Navier solution for a simply supported plate, locally loaded on a rectangular platform by uniform external pressure, to the Navier solution for the

same plate but the concentrated loading is discussed. The extreme values for the first partial derivatives of a deflection on variables x and y by tending the sides of the rectangular of loading platform to zero with remaining the total force constant are obtained. The continuity of these values in the closed rectangular of the plan of a plate as a function of two variables is proved. It is established that partial differentiation on x or y and limiting transition from local to concentrated loading, successively applied to a deflection, are permutable. The theorem of differentiation of the sums of slowly converging sine trigonometric series is proved.

Simonyan A.M. .....

Some questions of analysis of creep theories

Four theories of creep (theory of aging, theory of flowing, theory of heredity and theory of hardening) are examined. Their analysis is based on prediction of some appearance which can be verified by the experimental way. There are the reverse creep the violation of commutation and the succession. The question of generalization of creep operator on cases of complex stress states is considered too. It is shown that the proportionality of deviators of strains and stresses can be used for the theory of aging only, for the other considered theories of creep it can not be used.

Smirnov A. V......

Stress state of a piecewise-homogeneous plate supported by two semi-infinite stringers

The reinforcement problem for a piecewise-homogeneous elastic semi-infinite plate with two different stringers rigidly attached to the plate along the line of materials separation is considered. It is assumed that under the influence of external forces applied to the stringers the plates realized generalized plane stress. The problem is reduced to the Prandtl equation with piecewise-constant coefficient, which is firstly converted to a system of difference equations and then - to the scalar Riemann boundary value problem for a two-sheeted Riemann surface whose solution is constructed explicitly in quadratures. The behavior of the contact stresses near the junction point of stringers under various external loads is studied.

Sosnovskiy L.A......

From tribology to tribo-fatigue

Friction – a surprising phenomenon of the nature; wear process – the artful enemy of moving and deformable systems; fatigue – a terrible scourge of modern technics. Tribo-fatigue – whole, conceivable as much (a friction, wear process, fatigue). In the report is presented ehe short review of some researches on a way from tribology to tribo-fatigue.

Sosnovskiy L.A., Sherbakov S.S. .....

New class of contact problems and methods of their solution

Fields of stresses and strains in the system subject to the action of contact and non contact forces. Stress state was obtained by superposing the fields of stresses conditioned by action of normal and tangential elliptically distributed contact forces and by non contact bending. A significant change of the stress-strain state in comparison with the solution for the pure contact problem is shown.

Stepanyan A. A. .....

On one problem of meeting of several controllable objects The problem of meeting of several linear dynamic objects is considered at unfixed final position. Optimal controll and movements of objects are constructed in the cases of the controll with minimal force and minimal energy.

Stepanyan S.P. .....

On the problem of two-layered orthotropic circular plates with allowance for transverse shear

In this paper the plane problem and the problem of bending of the plate, composed of two different orthotropic circular layers are solved. In solving the problem of bending the précised theory of anisotropic plates is applied. The hypothesis of a linear distribution of tangential

displacement for the package as a whole is accepted. A numerical analysis is performed qualitative and quantitative conclusions are made.

Tokmajyan L. .....
The analysis of the basic characteristics of the filtration through the body of homogeneous dam of tailing dump of liquid waste
In this article the process of unsteady filtration through a homogeneous dam, when there is a drain of the certain depth in lower pool and the depth of water is changed by the cosinus law in lower pool, is considered.

Torosyan V.S., S.Sahakyan S. .....
On one problem for a rectangular membrane
With help of Fourier double trigonometric series solution of Dirichlet problem for a second order elliptic equation is obtained, when the domain is a rectangle. Solution of the problem is reduced to an infinite system of linear algebraic equations. A numerical example is considered.

Trubchik I.S. .....
The analytical solution of the contact problem for the functionally graded wedge of complicate structure
A procedure for reduction of the contact problem for a radiance inhomogeneous wedge to dual integral equations is described. The variation of the elastic wedge characteristics over radial co-ordinate in the wedge is of the arbitrary function simulating mechanical properties of general nature. Here a method of modeling functions will used to construct kernel transform of the integral equation. The numerically constructed kernel transform is approximated by the expression of special type, so that it is possible to obtain a closed solution of the approximate integral equation. It is shown that the resulting approximate solution is asymptotically accurate for as small as large evaluations of the dimensionless parameter. Influence of inhomogeneity law oscillation to the kernel transforms and the problem solution is investigated.

Tumanov N.V. .....
Mechanics and physics of fatigue crack propagation
Technique for modeling of stable fatigue crack growth has been developed which are based on the theory of local high-energy-type fracture mechanism acting at a crack front in the second stage of fatigue crack kinetics. The technique has been verified with the use of 3D finite element modeling and microfractographic reconstitution of fatigue crack growth.

Tupukin A.V. .....
Application of the weak electrical fields for control of propane flames
In hydrocarbon-air flames there is significant amount of the charged particles, i.e. electric fields are effective means of influence on burning processes. Mechanisms of interaction of fields and flames are studied for a long time, but till now there is not common opinion about influence on kinetics of burning processes. In this work results of experimental researches of influence of weak electric field on combustion are presented. Influence of parameters of DC and pulse-periodic electric field on stabilization conditions and flame distribution velocity was studied. It is shown that electric fields are effective way of combustion management.

A.A. Khachanyan.....
The vibrations of elastic orthotropic unmoment open cylindrical shell with free and simple support ends, when boundary generatrices are riged-clamped
The problem of existence of free vibrations of an elastic orthotropic open cylindrical shell (with arbitrary directional curve) with free and simple support ends, when boundary generatrices are riged–clamped is studied.

Khachatryan L. S.
On the reflection of flexural waves from an elastic fixing

To problems of the reflection of the curved waves from flet border of the ambience dedicated to the multiple studies. Relativly littie works are connected with questions of the reflection curved waves from flet edge of the fine plate. In this work happen to the decisions of the problem of the plate under complicated border condition. For partiat case of the free edge, as limiting case of the adsence of the reflected wave, is got decision of the problem localized bending variations.

Shavlakadze N.N. .....

The contact problem for piecewise homogeneous orthotropic plane with finite inclusion

It is considered a piecewise homogeneous elastic orthotropic plate strengthened by the finite inclusion, which emerges on the border of the partition at right angle and is loaded with tangential forces. Contact stresses along the line of contact are determined, the behavior of contact stresses in the neighborhood of singular points is established. By use of methods of the theory of analytic functions the problem is reduced to the integral differential equation on the finite segment. By help of the integral transformation it is obtained the Riemann problem, whose solution is represented explicitly.

Shahinyan S.G., Darbasyan A.T., Andreasyan L.A. .....

About one problem of optimal stabilization of the mathematical pendulum having mobile hanging point.

In this work the problems of optimal stabilization of the small fluctuations of the mathematical pendulum around and at the bottom and the top positions of balance are considered when the pendulum hanging point moves according to the set law in a vertical direction. The operating moment arises by means of the device which is in the pendulum hanging point. Problems are led to the problem of optimal stabilization of the system of the differential equations of the second order with variable factors which in its turn is solved by Lyapunov-Bellman's method. Lyapunov's optimal function is got in the form of the square-law form with variable factors for the definition of which the system of the nonlinear differential equations is got. The solutions of these equations are received by means of computer program. Optimal operating influence is formed.

Shahinyan S.G., Rezaei M. .....

About of Stabilization of Rotational Movement of a Rigid Body whit Integrally Small Perturbations.

The problem of stability and optimal stabilization of rotational movement around a point on the axes of dynamic symmetry of an absolute solid body, when integrally small perturbing forces act during an infinitive interval of time, is considered. It is suggested that the point around which the body rotates moves on the horizontal plane.The problem has been solved with both classical and suggested in work methods and a comparisons of values of functional has been carried out. This comparison revealed that in case of acting force optimal stabilization the energy consumption is less than in case of classical stabilization method.

Shekoyan A.V. .....

The acoustic waves in the clauds atmosphere The propagation of acoustic in media containing gas, vapor and drops is considered. The effects of coagulation of drops and condensation of vapor on the drops are taken into account. The linear dispersion equation is derived. The more accurate condition of infrasonic generation is obtained.

Shekyan H.G., Nazaryan E.A., Ogannisyan H.V. .....

Oscillations of rotor on rolling contact bearings with zero radial clearance

Non linear oscillations of rotor on rolling contact bearings placed on the shaft and in the body without preliminary stretch with zero radial clearance is considered in the paper. The systems of non–linear differential equations of the rotor oscillations which solution is realized by the method of harmonic linearization are obtained. It is discovered that amplitude–frequency curves have a resonance character, i.e. because of non–linear pliability of bearings the resonance regime of oscillation take the place, and amplitude–frequency curves have a non–linear

character. It is shown that for horizontal flexible rotor the resonance frequencies are depended on the value of non–steadiness and on static loading. Moreover the critical velocities can be essentially less than own frequency of rotor on rigid support, and the increase of the radial clearance in the bearing brings to the bifurcation of resonance peak in horizontal and vertical directions. In comparison with the vertical rotor the non–linearity of system with statically loaded horizontal rotor is expressed considerably less, moreover derangement of amplitudes take the place for flexible and for strongly loaded rotors only.

Sherbakov S.S., Komissarov V.V. .....
Volume measure of damage by stress intensity criterion at contact problem
The method of determining of dangerous volume as measure of damage interreacting bodies in friction pair is stated. Formation of dangerous volumes by stress intensity criterion in conditions of three-dimensional stress state is shown for the contact between two deformable rigid bodies.

Babeshko V.A., Pavlova A.V. .....
Factorization methods for solving dynamic mixed problems for structural-inhomogeneous media
Using differential factorization method the steady vibrations of an elastic medium layered structure containing internal defects such as rigid inclusions and cavities are investigated. The systems of integral equations which bind the stresses and displacements in the planes of the layers with the jumps of stresses on the boundaries of inclusions and displacement jumps on the banks of the cracks have been found. Solutions of received integral equation's systems for particular cases of areas occupied by defects constructed in closed form with integral factorization method of Wiener–Hopf or fictitious absorption.

Bagdoev A.G., Martirosyan A.N., Dinunts A.S., Davtyan A.V.....
The solution of problems of closing of crack in thermoelastic media and of stamps on halfplane in presence of wear
The problem on closing of thin semiinfinite crack in presence on its surface of layer of particles, containing in fluid, entering in crack, is solved by method of Wienner-Hopf with application to biology. The stresses on crack are calculated numerically, and the region in which crack is closed is clarified.

Banshchikova I.A.....
Shaping of panels in view of behaviour features of metal alloys at creep
The properties of anisotropy on directions (longitudinal, transverse, normal to the plate) and different resistance to a tension and compression, hardening and softening at creep have the majority of the sheet materials. That makes mathematical simulation of process of shaping very difficult. In case of the shaping plane panels at creep special interest for testing is represented by the problems of a bending of a square plate, which can realized experimentally. Calculation by finite element method in three-dimensional statement and analytical estimations in one-dimensional statement for the problems of plate bend testify to essential influence of anisotropy on normal direction to sheet in comparison with calculation in isotropic statement: delay of deformation process for a problem of plate torsion in a saddle surface and acceleration of process of deformation for problems of plate bend in a cylindrical surface. Not taking into account of real properties of creep at the decision of applied problems of details shaping and forecasting of their further exploitation can result in essential mistakes.

Barakat M. S., Asatryan V. M, Belubekyan E. V.....
Plate flexure, strengthened by additional layer or stiffening ribs
The problems of the rectangular plate flexure, strengthened by additional layer of another more strength material and strengthened by the four symmetrically located oblique stiffening ribs equal to it by weight are investigated. The comparison of the obtained results shows that strengthening plate by stiffening ribs leads to a notable increase in its rigidity and strength in comparison with the two-layered plate of the same weight.

Modes of plastic collapse and phenomenon of large deformation of thin walled structures under impact loading – a perspective

The paper presents an overview of the plasto-mechanics of large deformation of thin walled structures subjected to external impact loads and resulting collapse modes in relation to absorption of kinetic energy of an external impact or a crash as in road or air accidents. Despite several studies that have appeared in recent years, mechanics involved in such phenomenon and its dependence on various parameters like strain rate, inertia, history of loading, annealing and thermal processes, and the geometry are still not fully understood. Structured experiments become necessary to study the phenomenon in its varied aspects, and provide plausible description, assumptions and parameters needed for realistic analysis of such problems based on the mechanics observed. Several studies have appeared in literature in recent years which present formulations that describe large deformations and attempt to bring together various facets affecting the deformation. However, many problems relating to the deformation modes and their dependence on various parameters remain unresolved. In this paper, an over view of observations in some large deformation studies, which are of interest, involving thin walled structures of varying geometry and size and subjected to impact of a drop hammer, projectiles of different features and air and underwater blast loading, is presented in a hope that plausible explanation for these having been found, would help in further understanding of the phenomenon and its dependence on different parameters.

Jaiani G. .....

Cusped prismatic shells and beams

The present paper is devoted to up-dated exploratory survey in the field of cusped prismatic shells and beams.

Jenabi J., Khazaeinejad P. .....

The effect of combined loading on buckling loads of functionally graded cylindrical shells surrounded by an elastic medium

The first order shear deformation theory is developed to examine the effect of combined load interaction parameter on elastic buckling loads of combined-loaded functionally graded circular cylindrical shells with properties varying continuously in the thickness direction. A load interaction parameter is appropriately defined to express the ratio of applied axial compression and lateral pressure. To model the elastic foundation, the Winkler and Pasternak foundations are used. The elastic foundation reacts in compression as well as in tension. The stability equations are established using the equilibrium equations and the adjacent equilibrium criterion method. Approximate solutions are assumed to solve these equations to obtain the buckling loads. Critical loads are obtained for a given load interaction.

Jenabi J., Najafizadeh M.M. .....

The buckling of axially compressed non-homogeneous cylindrical shells embedded in an elastic medium

An analytical solution is presented for the buckling problem of non-homogeneous cylindrical shells embedded in an elastic medium subjected to axial compression. To model the elastic foundation, the Winkler and Pasternak foundations are used. The elastic foundation reacts in compression as well as in tension. The analysis is based on the first order shear deformation theory including the shear correction factor with the nonlinear strain-displacement relations. The shell properties vary continuously through the thickness direction. Suitable displacement functions that identically satisfy the boundary conditions and stability equations are employed to determine the buckling loads. Numerical results reveal that the non-homogeneity parameter and coefficients of elastic foundations significantly affect the critical buckling loads of non-homogeneous cylindrical shells embedded in an elastic medium.

Lychev S.A. .....

Finite deformations of accreted elastic globe

The centrally symmetric problem for an accreted elastic globe is considered. The deformations are supposed to be finite and the material is to be incompressible. The constitutive equations are formulated with respect to complete distortion tensor which may be representing as the composition of initial distortion and compatible deformation gradient. The initial distortion induces the linear connection on the material manifold which becomes a flat space of affine connectivity with nontrivial torsion.

Lyubashevskaya I.V......

High-temperature creep of rod elements and estimations of its intensity

Processes of creep in the conditions of high-temperature modes of stress are considered. As the defining equations parities of a power variant of the theory of creep in which frameworks a measure of intensity of process is capacity of dissipated energy at irreversible deformation of the creep, which size at the steady state inversely proportional time before destruction of an element of a design are used. It is experimentally shown that for a non-uniform stress state average on volume capacity of dispersion well characterizes intensity of process of creep and duration before destruction of an element of a design as a whole. Using analogy between behavior of typical design elements in problems of ideally plastic environment and high-temperature creep, on a number of examples possibility of reception of estimations of intensity of creep process of design elements is illustrated at the set external thermo-power parameters. Comparison of behavior of elements of designs is offered to be spent, comparing among themselves the external generalized forces with some weight factors (equivalence factors), reducing these forces to equivalent size of the same dimension for various kinds of stress. The top and bottom estimations of factors of equivalence are received at the set size of external loading. The received results prove to be true conformity to experimental data.

Manzhirov A.V. .....

New results in mechanics of growing solids

Basic fundamentals of the mathematical theory of growing solids are under consideration. The classification of various methods of solids accretion is presented. Special attention is paid to the accretion of 3D solids by 2D surfaces. The constitutive equations are formulated with respect to complete distortion tensor which may be representing as the composition of initial distortion and compatible deformation gradient. The initial distortion induces the linear connection on the material manifold which becomes a flat space of affine connectivity with nontrivial torsion. In the majority of papers which deal with the mechanics of growing solids the theory is constructed as some special replicas of solid mechanics in three-dimensional Euclidean space. Nevertheless the geometric properties of Euclidean space are not enough to describe the stress-strain state of a solid which was formed by the continuous joining of pre-stressed parts. It is extremely important that the growing solid can be considered as a special class of inhomogeneous body, in which inhomogeneity arises because of nonholonomic distortion, caused by the joining of incompatible stressed parts. From this point of view the mechanics of growing solids have much in common with the theory of defects, in particular with the theory of continuously distributed dislocations. The theory of fiber bundles of differentiable manifolds is taken as the geometric foundation of mathematical theory of growing solids. Analytic properties of differentiable manifolds are determined without utilization of prescribed connection. This allow to formulate a boundary value problem in terms of quiet general geometrical properties of reference configuration and determine the particular type of connectivity taking into account specific kinematic and static characteristics of the accretion process.

Melkonyan A. V., Sarkisyan S. V.

To a space problem of propagation of waves in a layer in presence of magnetic field

The space problem of propagation of waves in an elastic perfect conductive layer is considered in presence of an external constant magnetic field. On planes limiting a layer, the conditions of the constrained free edge are given. For phase speed of symmetric and antisymmetric vibrations the characteristic equations are received. The limiting cases are considered: length of a wave is very great and is very small in comparison with thickness of a layer.

Minnetyan, L., Janoyan, K.D., Rocheleau, J.A. .....
Transverse cracking of composite bridge decks
Cracking of reinforced concrete bridge decks is a major issue in the transportation infrastructure durability as it opens the door to many other potential detrimental effects. The ability to control the amount of cracking in bridge decks has been sought by countless professionals, ranging from those who design the structures to those who physically construct the bridge. A majority of transverse cracks on the deck develop due to early-age behaviors of concrete. A drastic temperature increase occurs during the curing process, which creates thermal stresses inside the concrete. Shrinkage and creep also cause stresses to build. The severity of these effects heavily depends on the concrete mix design and also on the physical dimensions of the deck. The objective of this paper is to develop a method to evaluate residual stresses because of temperature increase during the hydration of concrete. The method combines finite element methods and composite mechanics analyses to simulate the stresses developed in the deck at early ages due to thermal effects.

Minnetyan, L., Marzocca, P. .....
Aerostructural design of composite windmill blades
Methods and computer codes are discussed for the design of composite windmill blades for durability and damage tolerance. Damage progression is computationally simulated with increasing number of load cycles. Effects of constituent material and fabrication parameters on the response are computed to assess failure. The sensitivity of response to design variables is evaluated. The method is demonstrated for a polymer matrix composite airfoil specimen under lateral pressure cyclic loading. Suggested improvements of design variables based on analysis are discussed.

Najafizadeh M.M., Khazaeinejad P., Sharifian R. .....
The stability of non-homogeneous cylindrical thin shells subjected to combined loading The aim of the present paper is to study the buckling problem of non-homogeneous circular cylindrical thin shells under combined lateral pressure and axial compression. As is common for functionally graded cylindrical shells, the shell properties are assumed to vary continuously across the thickness direction. The analysis is presented using the first-order shear deformation theory. The stability equations are derived by the adjacent equilibrium criterion method. To solve the resulting equations and to obtain the critical loads, the closed-form solution is applied. The critical loads are obtained for cylindrical thin shells with non-homogeneity properties. The results reveal that by carefully choosing the material properties, the buckling capacity of shell will be increased.

Podio-Guidugli P......
On a scale-bridging mechanical model of carbon nanotubes
In this expository paper, intended as a short account of the contents of [1], a bottom-up method to model the mechanical behavior of carbon nanotubes is presented. This method is meant to bridge between three different scales: the *microscopic* scale of *molecular mechanics*; a *mesoscopic* scale, at which concepts from *discrete structure mechanics* apply; and the *macroscopic* scale of *continuous structure mechanics*.

Sharifian R., Belubekyan V.M. .....
Comparative study of non-conservative and conservative problems of stability of a rectangular plate
In the present paper buckling a plate is considered, when, in contrary to [1], the plate is loaded along the edges which are free in terms of displacement and rotation angle. In such case it is possible to consider both problem when the load is conservative, as well as a problem when the load is a non-conservative follower force. For these problems critical loads are determined for limit cases of narrow and very wide plates.

Sumbatyan M.A., Brigante M. .....

Algorithms for crack reconstruction in three-dimensional inverse elastic problems of the scattering theory

We study the 3d inverse reconstruction problem for a plane crack of penny-shaped geometry located in the linear homogeneous material. It is assumed that the process is harmonic in time. The direct problem is reduced a boundary integral equation, and a numerical collocation technique is developed to solve this equation. The inverse reconstruction problem is formulated on the basis of far-field back-scattered amplitude, known for all observation angles at a certain fixed frequency. The formulated inverse problem is reduced to a minimization of the discrepancy functional by methods of global random search.

Tamužs V., Valdmanis V.

The use of composite for strengthening and rehabilitation of concrete columns

The strength, deformability and stability of concrete columns confined by carbon composite sheets is considered at axial compressive loading. The formulas for prediction of ultimate strength, ultimate strain, and the tangent modulus above the limit of nonlinearity are given. Confined reinforced concrete columns also are considered. The loss of stability of columns above the strength of plain concrete is analyzed and it is proved that FRP confinement is efficient only for columns having low or moderate slenderness ($\lambda<40$).