

Annual report of “Creeping theory” department of IMM ANAS for 2020

The staff of “Creeping theory” department consist of 7 (seven) employees:

1. Talybly Latif Khalil – head of department
2. Mir-Salim-zade Minavar Vagif – leading research associate
3. Mammadova Mehriban Ali – leading research associate
4. Bagirov Emin Telman – senior research associate
5. Nagiyeva Nigar Miryashar – senior research associate
6. Mammadova Hijran Ali – research associate
7. Bagirova Sema Asif – senior laboratory assistant

6 of these (six) are research associates and 1 (one) senior laboratory assistant. According to the research plan of 2019 in the department were carried out research on the topic "Variable load of bodies of irreversible deformation". The plan provided for six works on the subject. Scientific works are carried out according to the plan.

I. Scientific activity

Work: The solution of the contact problem of the theory of viscoelasticity

Executor: doct.ph.math.sci., prof. L.Kh.Talybly

The general formulation of the contact problem of the theory of viscoelasticity is formulated; the corresponding determinant equations - the relationship between the components of deformation and stress are written, which are added the equilibrium equations connecting the components of stress and the Cauchy relation connecting the deformations and displacements. The boundary conditions are as follows: forces are applied to one part of the surface of contacting objects, and displacement components are applied to another part. The relationship between displacements and stresses on the contact surface is given. It is believed that the contact surface can change over time. The solution of the problem of the theory of viscoelasticity, posed in this general form, lead to the solution of the problem of the corresponding theory of elasticity.

Work: A method for solving the problem of the theory of elasticity of mechanically compressed bodies to the corresponding problem of mechanical compression and application of this method.

Executor: cand.ph.m.s., lead.re.ass. M.A.Mammadova

It is known that there are more effective solutions for problems of the theory of elasticity for mechanically incompressible bodies, and this is easier than solving the corresponding problems for mechanically compressible bodies. Taking this into account, the solution of the problem of the theory of elasticity for mechanically compressed bodies is lead to solving the problem for mechanically incompressible bodies. The proposed solution method was used to solve specific problems: the problem of deformation of a hollow cylinder under the action of internal pressure was solved.

Work: The inverse problem of fracture mechanics of a perforated stringer plate

Executor: cand.ph.m.s., lead.re.ass. M.V.Mirsalimzade

Based on the principle of equal strength, the problem of the theory of elasticity is solved to determine the optimal shape of the hole contour of a perforated stringer plate, weakened by two straight cracks. The criterion for determining the optimum shape of the hole is a condition for the absence of stress concentration on the contour of the hole and the requirement that the stress intensity factor at the crack tip was zero.

Work: Dynamics of the moving ring load acting in the system “Hollow cylinder + Surrounding medium” with inhomogeneous initial stresses

Executor: sen.res.ass., E.T.Bagirov

Under the influence of the dynamic ring load acting of the system “Hollow cylinder + Surrounding medium”, is solved. Environment and cylinder materials are made of elastically deformable materials. It is believed that the environment has certain initial stresses. The problem is solved, the appropriate frequencies are found. The solution was analyzed, a large number of graphs were built, and the result was published as an article.

Work: Secondary plastic deformations during elastoplastic torsion of a rectangular bar

Executor: sen.res.ass., N.M.Nagiyeva

The problem of determining the secondary plastic deformations in the elastic-plastic twist of a rod with a rectangular cross section is solved. First of all,

the issue of twisting elastic plastic from the initial position of the rod is considered. The approach of the theory of elastic plasticity by A.A. Ilyushin. At the second stage, the process of unloading the rod is studied. It is believed that the process of unloading the bar is accompanied by the formation of secondary plastic deformation. Analytical formulas for residual stresses and deformations during unloading are obtained on the considered rod. The results obtained and prepared for publication as an article.

Work: Corrosive failure of a semi-infinite plane under the action of a tangential force in an aggressive medium of non-stationary concentration.

Executor: res.ass., H.A.Mammadova

It is placed in an infinitely flat corrosion medium with elastic deformation under the influence of a force acting on the boundary. Depending on the force of the impact and the characteristics of the aggressive medium, the time to corrosion collapse of the considered infinite plane is theoretically determined. The solution of the corresponding problem of the theory of elasticity and the formula of stress corrosive failure given by the author are used. Solution analysis was conducted and the result was sent to the journal for publication as an article.

II. Scientific organizational activity

Since March 2020, employees of the “Creeping theory” department have continued their activities mainly in quarantine conditions associated with coronavirus infection.

IV course students of Mechanics-mathematics faculty of Baku State University did practical work in “Creeping theory” department. The head of the practice was cand.ph.m.s., lead.re.ass. M.A.Mammadova. Students were informed about the scientific research work carried out in the department.

Members of the department were published 6 scientific works - 4 papers and 2 theses. 2 paper were submitted for publication.

M.V.Mirsalim-Zade made a presentation at the scientific conference "Actual problems of construction and construction industry", held in Tula, Russia (June 29-30, 2020), and E.T. Bagirov made a presentation at the II International Conference of Young Scientists and Specialists “Multidisciplinary approaches in solving modern problems of fundamental and applied sciences” dedicated to the 75th anniversary of Azerbaijan National Academy of Sciences”, held in Baku on March 3-06, 2020. He also took part in “The 7th International Conference on Control and

Optimization with Industrial Applications”, was held in Baku on August 26-28, 2020.

In the reporting period, there were references to the scientific article of L. Kh. Talibla by a foreign scientist. Head of the department Latif Khalil oglu Talybly is a member of Academic Council and editorial staff of the journal “Proc.of IMM”. At the same time, he is a reviewer of “International Journal of fatigue” (Elsevier), “Simulation Modeling Practice and Theory” journals.

Head of Department

doct.phys.math.sci., prof., L.Kh.Talybly