

Semi-annual report of “Mechanics of deformable solids” department of IMM ANAS for 2022

In “Mechanics of deformable solids” department work 10 collaborators:

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. Muradova Ayten Gadim – junior research associate
8. Mammadov Isgandar Gudrat – engineer
9. Bagirova Sema Asif – senior laboratory assistant
10. Rzayeva Vusala Bayazkhan – master

7 of these (six) are research associates and 1 (one) senior laboratory assistant, 1 master and 1 engineer. According to the research plan of 2022 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: Solution of the generalized Mirzajanzade -Ogibalov problem for estimating the delay time in transitional flow modes of viscoelastic medium

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

A.Kh.Mirzajanzade and P.M.Ogibalov solved the problem of determining the delay time in the transitional modes of the medium flow, expressed by the Voigt model. To solve this problem, the authors used the Laplace transform. First, the desired solution was determined by the authors in the Laplace transform, and then the original solution was constructed. In this planned work, physical linear equations of the theory of viscoelasticity were used more general than the Voigt model, and the solution was obtained by a qualitatively new method that does not involve the use of any of the methods of integral transformations.

Work: Deformation of an elliptic cross-section beam with viscoelastic-plastic mechanical properties

Executor: cand.ph.m.s., lead.re.ass. M.A.Mammadova; jun.re.ass. A.G.Muradova.

A beam with an elliptical cross section undergoes a torsional deformation. The beam material is expressed by the nonlinear equations of the viscoelastic-plastic theory. Such materials have a hereditary property, but permanent deformations are also observed during unloading. The problem statement is given. During the solution, the solution of the appropriate elastic-plastic problem is used. In the first half-year, residual stresses and strains were determined depending on time. In the second half-year, the asymptotes of these quantities with respect to time will be found.

Work: Elastic-plastic case for perforated stringer plate

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

The problem of stretching an infinite perforated plate from an ideal elastoplastic deformable material is solved. The plate is reinforced with stringers. It is assumed that the plate holes are completely surrounded by a plastic zone. In this setting, the stress-strain state of the plate is determined. As the defining equations of the plate material, the equations of the theory of flow of ideal elastic plasticity are used. In the second half-year, the results will be analyzed and geometric representations will be obtained.

Work: Torsional wave dispersion in a hollow two-layer cylinder with a non-uniform initial stress caused by internal and external radial

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

The two-layer hollow cylinder experiences initial mechanical stresses. In addition, it is subjected to dynamic torsional loading. The problem of the wave dispersion of the considered cylinder is solved. In the second half-year, an analysis of the solution will be carried out and the results will be illustrated in the form of graphs.

Work: Transverse vibration of a beam of circular cross-section

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

Almost any structural element can be a source of vibrations. The main reasons for the formation of vibration are associated with mechanical, sound and resonant phenomena. The problem of the transverse vibration of a circular beam is given and mathematically solved.

Work: Corrosion destruction of a torsional rectangular cross-section beam in an aggressive medium with non-stationary concentration

Executor: res.ass. H.A.Mammadova

A beam of rectangular cross section is twisted by a torque in a corrosive medium with a non-stationary concentration. Depending on the intensity of the impact force and the characteristics of the aggressive environment, the time to corrosion failure of the considered beam is theoretically determined. In the second half-year, the solution will be analyzed and the result will be presented as an article for publication in a journal.

II. Scientific organizational activity

Members of the department were published 19 scientific works – 8 papers, one of them was published in Scopus, 1 conference material and 10 theses.

Employees of the department (L.Kh.Talybly, M.A.Mammadova, M.V.Mirsalimzade, E.T.Bagirov, N.M.Nagiyeva, H.A.Mammadova, A.G.Muradova, V.B.Rzayeva) made scientific reports at various foreign and national conferences.

V.B.Rzayeva has successfully completed her master's degree.

Head of the department L.Kh.Talybly gave scientific reports at the plenary and all-institute seminars at the scientific conference held at Baku State University dedicated to the 99th anniversary of national leader Heydar Aliyev.

Head of the Department

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