Semi-annual report of “Creeping theory” department of IMM ANAS for 2021

In “Creeping theory” department work 7 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. 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 2021 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: Vibrational failure of the body with the dependence of time on mechanical properties

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

There is a gap in the solution of the problems of destruction of bodies with time-dependent mechanical properties - rheonomic bodies. In the planned work, an attempt is made to fill this gap. A destruction criterion has been developed, which more correctly describes the loading of bodies in the form of vibration, at the same time, it is effective from the point of view of application. The proposed criterion makes it possible to determine the time until the destruction of rheonomic bodies under vibration loading. The destruction of bodies is understood as a violation of

its continuity. In the second half-year, an experimental verification of the proposed criterion will be carried out using experimental data published in the literature.

Work: Torsion of a viscoelastic circular bar with an external groove
Executor: cand.ph.m.s., lead.re.ass. M.A.Mammadova

The boundary value problem of the linear theory of viscoelasticity about torsion of a circular bar with an external circular groove is solved. The statement of the problem and the solution of the problem are given. The solution uses the solution of the corresponding elastic problem. This problem is also used as a test one solving such problems, the Volterra-Rabotnov method and the Ilyushin approximation method are usually used. In the second half-year, a comparison will be made of the solutions to this problem obtained by the noted methods.

Work: Elastoplastic problem for a stringer plate with a hole covered by a plastic zone
Executor: cand.ph.m.s., lead.re.ass. M.V.Mirsalimzade

Solved the problem of stretching an infinite plate with a hole. It is considered that the plate is deformed ideally elastic-plastic and the hole of the plate is completely covered by the plastic zone. In this formulation, the problem is solved - the stress-strain state of the considered plate is determined. In the second half-year, the analysis of the results and their geometric representations will be carried out.

Work: Wave dispersion of torsion in a hollow two-layer cylinder with an initial inhomogeneous temperature stress
Executor: sen.res.ass., E.T.Bagirov

A hollow two-layer cylinder is under non-uniform initial temperature stresses. The cylinder under consideration is subjected to dynamic torsion. The problem of wave dispersion in a given cylinder is solved. In the second half-year, the analysis of the results and their geometric representations will be carried out.

Work: Fatigue failure of a bar with a triangular cross section at variable elastoplastic torsion
Executor: sen.res.ass., N.M.Nagiyeva

The problem of fatigue fracture of a straight bar with a triangular cross section under variable elastoplastic torsion is solved. In the first stage, the problem of elastoplastic torsion of a bar from its natural state is solved. The relations of A.A.Ilyushin's theory of elastic plasticity was used. This task was planned work in 2020. In the second stage, the process of unloading the timber was investigated. It is assumed that the unloading process is accompanied by the appearance of secondary plastic deformations. Analytical formulas are obtained that determine the residual stresses and deformations at such a complete unloading. In the next third stage, using the residual deformations that were determined in the second stage, and using the fatigue fracture criterion, the number of variable torsions leading to fatigue failure of the bar, is determined.

Work: Corrosive failure of a normally loaded wedge at the boundary with a concentration in non-stationary aggressive environment
Executor: res.ass., H.A.Mammadova

A wedge, on the border of which is normally loaded with a uniformly distributed force, is in an aggressive medium. The concentration of the aggressive medium changes over time (non-stationary). The time until the corrosive failure of a given wedge is theoretically determined depending on the intensity of the acting force and the characteristics of the aggressive medium. In the second half -year, the results will be analyzed and the results will be submitted to a scientific journal for publication.

II. Scientific organizational activity

January-July 2021, employees of the “Creeping theory” department have continued their activities mainly in quarantine conditions associated with coronavirus infection.

Members of the department were published 11 scientific works - 5 papers, 1 monography, 1 conference material and 4 theses. 3 paper were published in Scopus.

M.A.Mammadova, M.V.Mirsalim-Zade, N.M.Nagiyeva, H.A.Mammadova made a presentation at the scientific conferences.

Head of the department Latif Khalil ogluTalybly 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 fatique” (Elsevier), “Simulation Modeling Practice and Theory” journals.

Head of Department doct.phys.math.sci., prof., L.Kh.Talybly