Annual report of "Mechanics of deformable solids" department of IMM ANAS for 2021

In "Mechanics of deformable solids" department work 8 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

8. Rzayeva Vusala Bayazkhan – master

6 of these (six) are research associates and 1 (one) senior laboratory assistant and 1 (one) master. 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 fracture 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. Experimental verification of the proposed criterion is carried out using experimental data published in the literature.

1. LatifKh. Talybly, Mehriban A. Mamedova. Study on the Method for a Solution to Some Class of Quasi-Static Problems in Linear Viscoelasticity Theory, as Applied to Problems of Linear Torsion of a Prismatic Solid /*Recent Advances in Mathematical Research and Computer Science Vol. 1,* 15 October 2021, Page 63-72.
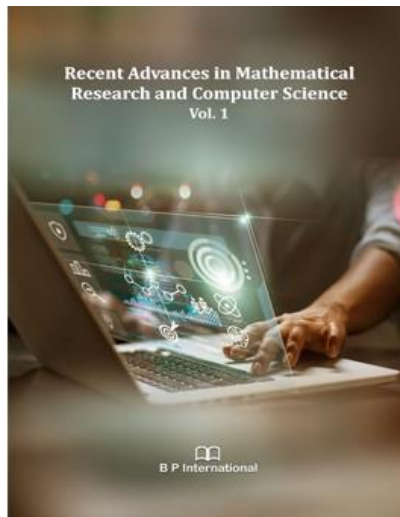
Work: Torsion of a viscoelastic circular bar with an external groove
Executor: cand.ph.m.s., lead.re.ass. M.A.Mammadova

The boundary value problem of the linear theory of viscoelasticity about torsion of a circular bar with an external circular groove was solved. The statement of the problem and the solution of the problem were given. The solution used 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 were usually used.

1. Mammadova M.A. DELAYED FRACTURE OF A THICK PIPE FROM VARIABLE INTERNAL PRESSURE// SYLWAN. English Edition, 165(7)]. ISI Indexed, Jul 2021, p.101-109.
2. Mammadova M.A. Scattered Destruction of a Twisted Shaft// IOSR Journal of Engineering (IOSRJEN) // Vol. 11, Issue 5, May 2021, ||Series -I|| PP.46-49

3. Mammadova M.A. Torsion of a viscoelastic beam in the form of a circular truncated cone / International Symposium On Current Developments In Science, Technology And Social Sciences April 12-13, 2021, Gaziantep University, Nizip Faculty Of Education, Gaziantep, Turkey, p.60-62.

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

The problem of stretching an infinite plate with a hole is solved. It is assumed that the plate is deformed ideally elastic-plastic and the hole of the plate is completely covered by the plastic zone. The relations of the flow theory are used as the governing equations. In this formulation, the problem is solved - the stress-strain state of the considered plate is determined. The analysis of the results is carried out and geometric representations are obtained.

1. Mir-salim-zadehM.V. Elastic-Plastic Problem for a Stringer Plate with a Circular Hole//Journal of Mechanical Engineering, 2021, vol. 24, no. 3, p. 61-69.
2. Мирсалимзаде М.В. Повышение несущей способности стрингерной пластины/ XXII Межд. научно-техн. конф. «Актуальные проблемы строительства и строительной индустрии», Тула, 28-29 июня 2021 г., с. 114-117.
3. МирсалимзадеМ.В..Обратная упругопластическая задача для пластины, усиленной регулярной системой стрингеров / XI Межд. научно-практ.конф«Проблемы безопасности на транспорте»,25-26 ноября2021 г., Гомель, с.

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. The analysis of the results and their geometric representations will be carried out.

1. S.D. Akbarov, E.T.Bagirov. The dispersion of the axisymmetric longitudinal waves propagating in the bi-layered hollow cylinder with the initial

inhomogeneous thermal stresses // Waves in Random and Complex Media, 2021, p.1-39.

2. S.D. Akbarov, E.T.Bagirov Dispersion of Torsional Waves in a Hollow Bilayered Cylinder with Initial Inhomogeneous Thermal Stresses / Mechanics of Composite Materials, 2021, **57**, p.161–180 .

3. Surkay D. Akbarov, Emin T. Bagirov. Torsional wave dispersion in a bi-layered hollow cylinder with inhomogeneous initial stresses caused by internal and external radial pressures / Structural Engineering and Mechanics, 2021, Vol.77, Issue 5, p.571-586.

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.

1. Nigar M.Nağıyeva. Çubuq və lövhələrin yorğunluq dağılması //"Elm" nəşriyyatı, 2021, p.144
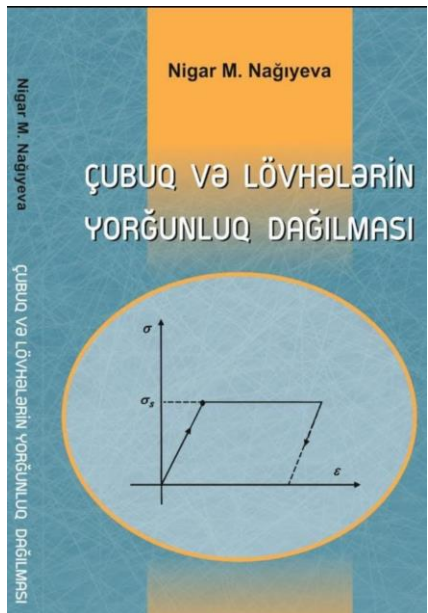
2. N.M.Nagiyeva. Residual stresses and deformations of an annular plate / Journal of Contemporary Applied Mathematics, 2021, №1, v.11, p.81-89.

3. N.M.Nagiyeva. Вторичные пластические деформации кольцевой пластины, нагруженной по внутреннему контуру распределенным моментом / ''Actual trends of modern scien. research'' Proc. of IX intern. sc. and practical confer. Munich, Germany, 11-13 april 2021, p. 243-247.

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. The results are analyzed and will be submitted to a scientific journal for publication.

1.Mammadova H.A. On A Universal Function of Long-Term Corrosive Strength / IOSR Journal of Engineering (IOSRJEN) // Vol. 11, Issue 2, February 2021, ||Series -I|| PP 58-62.

2.Mammadova H.A. One of formula for time to corrosive failure of metallic bodies under stress/ International Symposium On Current Developments In Science,

Technology And Social Sciences / April 12-13, 2021, Gaziantep University, Nizip Faculty of Education, Gaziantep, Turkey, p.57-58.

3.Mammadova H.A. Corrosive failure of materials under non stationary change of temperature / International Symposium On Current Developments In Science, Technology And Social Sciences / April 12-13, 2021, Gaziantep University, Nizip Faculty of Education, Gaziantep, Turkey, p.59.

II. Scientific organizational activity

On October 01, 2021, on the basis of the department of Creeping Theory, Mechanics of deformable solids was organized.

Members of the department were published 16 scientific works - 8 papers, 5 of them were published in Scopus, 1 monography (Nigar Nağıyeva. Çubuq və lövhələrin yorğunluq dağılması. Bakı: Elm, 2021, -144s), 1 chaphter in monography (LatifKh. Talybly, Mehriban A. Mamedova. Study on the Method for a Solution to Some Class of Quasi-Static Problems in Linear Viscoelasticity Theory, as Applied to Problems of Linear Torsion of a Prismatic Solid /*Recent Advances in Mathematical Research and Computer Science Vol. 1*, 15 October 2021, Page 63-72), 6 conference materials.

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.

L.Kh.Talybly made a scientific report at the institute seminar.

Seminar of the department is held on Fridays.

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