# AZERBAIJAN NATIONAL ACADEMY OF SCIENCE
# INSTITUTE OF MATHEMATICS AND MECHANICS

Annual on the activities of the scientific and scientific organization of the "Wave Dynamics" department in 2021

## REPORT

During the reporting period, the department conducts research on 8 scientific works on " **Dynamics of fixed nets and inhomogeneous objects, the study of free oscillations of the layer** . The department has 9 employees. 8 of them are engaged in scientific work. In 2021, 6 articles were sent to print, 3 articles published, 2 articles were published.

**Work A.** Dynamics of the Reinforced Network

**Doct.phys.math.sci., prof. Agalarov J.H**

The equation of the network is given, adding the resistance of the elements to the relative rotation of the network, we obtain the equations for the reinforced network. The movement of the net in the plane is taken into account.

The following articles were prepared for publication during the reporting period:

1. "Агаларов Дж. Г., Мамедова Г.А. Подкреплённые сети " Механика твердого тела (Изв. РАН. МТТ) (Printed.)

**Social activities:** Participation in seminars of the institute and department.

**Work B.** Influence of structural properties of the earth's crust on waves generated by an earthquake.

**Doct.phys.math., sci, sen.res.ass Rasulova N. B.**

At the same time, for a specific case, the influence of the structure of the earth's crust on shock waves propagating during an earthquake was studied. The problem was first solved mathematically and then by a method based on analytical solutions. The facts given as reasons have been substantiated by the claims.

During the reporting period, 1 article was published.

1. Nazila Rassoulova, Effect of the features of the Earth's crust on wave processes during earthquake, Tran. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mechanics, 41 (7), (2021).p.7–13

**Social activities**: Participation in seminars of the institute and department.

Rasulova N.B., works in the expert council of the Higher Attestation Commission.

**Work D:** Investigation of the application of the generalized Canyar-Hoop method to three-dimensional dynamics.

**Candidate of Physics and Mathematics, Leading Researcher Rasulov M.B.**

One of the main problems arising in the application of the integral transformation method in solving three-dimensional problems of elastodynamics is the implementation of the inversion. The current Canyar-Hoop method requires a lot of complex mathematical transformations. In the proposed work, the inversion is carried out by applying the Etros theorem, changing the position of the variables.

During the reporting period, 1 article was published.

1. Mubariz B. Rassulov, Gulnar R. Mirzoeva. Functionally invariant method in solving three-dimensional problems of elastodynamics. Tran. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mechanics, 40 (8), 30–36 (2020).

http://transmech.imm.az/upload/articles/V-40(8)/Manuscript_Mubariz_Rassulov_Gulnar_Mirzayeva_Mech_40_8_2020_30_36.pdf

**Social activities**: Participation in seminars of the institute and department.

**Work E**: Study of waves propagating in a cylindrical lattice with mass.

**Candidate of Physics and Mathematics, Leading Researcher Rustamova M.A.**

The motion of a motionless cylindrical network is considered. It was found that compression shocks are formed during compression, and continuous waves are formed during tension.

The problem is solved by the method of characteristics in appropriate conditions. The results are presented in the form of reports and graphs.

The following articles were prepared for publication during the reporting period:

1. MehsetiRustamova, Investigation of waves propagation in a plane net, Tran. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mechanics, 41 (7), (2021).p.14–22
2. M.A. Rustamova, Investigation of free vibrations of a reinforced cylindrical shell filled with liquid. Rigid Body Mechanics (Izv. RAS. MTT) (Printed.)

**Social activities:** Participation in seminars of the institute and department.

**Teaching activities:** teaches at BSU.


**Work F:** Free two-dimensional fluctuations in the reservoir

**Candidate of Physics and Mathematics, Leading Researcher Mammadova G.A.**

The study investigates the formation oscillation, determines the oscillation frequency as a function of the wavelength.

A structure, as a free body in space, has six degrees of freedom and the corresponding vibration modes: three translational displacements (vertical and two horizontal) and three rotational displacements: pendulum oscillations, oscillations around the longitudinal axis; vibrations around the transverse axis; vibrations around the vertical axis. The vibrations of an arbitrary structure with a foundation are the result of the superposition of different vibration modes with natural vibration frequencies. The frequency of the earthquake can be used to estimate the length of the standing wave of soil vibrations.

The following articles was published during the reporting period.

1. Мамедова Г.А., Маммедли Т.Ш. **Свободные двумерные колебания пласта.** Высшая школа: научные исследования. Материалы Межвузовского междуна-родного конгресс.–Москва: Издательство Инфинити, 2021. – стр. 63-68
2. ”Агаларов Дж. Г., Мамедова Г.А. Подкреплённые сети " Механика твердого тела (Изв. РАН. МТТ) (printed)

**Social activities:** Participation in seminars of the institute and department.

**Teaching activities:** teaches at BSU.


**Work L**. Investigation of the problem of fracture of two-layer orthotropic materials.

**Candidate of Physical and Mathematical Sciences, Senior Scientist with Aliev I.Y.**

The study of the disintegration of two-layer orthotropic materials is being studied. A crack occurs at the edge of the material. The solution to the problem is reduced to singular integral equations. The edge intensity factor is at the end of the crack. The influence of the geometric and physical parameters of the problem on the intensity factor is investigated.

**Social activities:** Participation in seminars of the institute and department.


**WORK N:** Axisymmetric vibrations of an infinitely long cylindrical orthotropic shell incontact with an infinitely elastic medium and filled with a liquid.

**Can. of phys. and math. sciences, Seyfullayev F. A.**

In solving the problem, we used the theory of coatings, the system of equations of

motion of elasticity theory, the equations of motion of an ideal two-phase viscoelastic liquid, and the properties of Bessel functions.

The study of asymmetric and axisymmetric forced and free vibrations of a cylindrical coating modeled as an orthopropic coating in contact with the environment consists in studying the influence of physical and geometric parameters that characterize the environment on certain oscillation frequencies.

Published 1 article on this topic.

1. F.A.Seyfullayev, Ş.A.Kərimova Spatially-three-dimensional statement of the problem of hydro thermo dynamics of reservoirs, Aktual elm, 2020

**Public activities:** Participation in seminars of the Institute and Department, Chairman of the Council of young scientists.

**Teaching activity:** Azerbaijan University of architecture and construction.

**WORK M:** Investigation of frequency characteristics of a viscoelastic plate loaded with a liquid.

**Doct.phys.math.sci.prof. Zamanov A.D.**

**Social event:**

Member of editorial Board of international scientific journal "Mechanics of composite materials", published in Riga in Russian and English in new York, International Scientific Journal of Mechanics and Mechanical Engineering, Theoretical and Applied Mechanics, Diploma in University News of a series of pedagogical-psychological Sciences), Deputy editor-in-chief of journals, actual problems of musical science, culture and education, Deputy Chairman of the editorial Board of the journals of ICT in education, history, man and society, member of the editorial Board of the Azerbaijan school magazine. I am the scientific editor of the two volume collection "Materials of the XXII Republican scientific conference of doctoral students and young researchers" "Teacher inspires creativity".

I headed the organizing Committee of about 10 international and national scientific

conferences held in Azerbaijan. Currently , I am supervising the dissertation work of three doctoral students (E. Agasiev, A. Karimova, G. Alekperova). E. Agasiev (in the specialty of mechanics of deformable solid bodies) and A. Karimova (in the specialty of methods of teaching mathematics) have completed and discussed their dissertations.

**Scientific activity:**

Currently, he directs the dissertation work of two doctoral students (E. Agasieva, G.Alekperova).


**ABOUT THE SOCIAL ACTIVITIES**

1. doctor of physical and mathematical Sciences Rasulova N. B.

Works on the expert Council Higher attestation commission.

2.Candidate of physical and mathematical Sciences Rustamova M. A.

She teaches at the Azerbaijan University of architecture and construction.

3. Candidate of physical and mathematical Sciences Mamedova, G. A.

She teaches at the Azerbaijan University of architecture and construction.

4 Candidate of physical and mathematical Sciences Seifullaev F. A.

He teaches at the Azerbaijan University of architecture and construction.

Head of the

"Wave Dynamics" department          Doct. phys. math.sci.,dos. Rasulova N.B.