

MINISTRY OF SCIENCE AND EDUCATION
INSTITUTE of MATHEMATICS AND MECHANICS

**Annual report on the activities of the scientific and scientific- organizational of
the department "Wave dynamics" in 2023**

Scientific direction: Deformable solid mechanics.

Topic: "Dynamics of fixed mesh and non-homogeneous bodies, study of free oscillations of layer".

About scientific activity: 2 theses, 4 articles were published during the reporting period. 2 article has been accepted for publication.

About individual cases:

Work A: Investigation of non-stationary waves propagating in elastic semi-infinite space and overlying elastic layer system.

Ph.D , head of department Rasulova N.B.

The reactions of non-homogeneous media to dynamic processes are investigated. For this purpose, the appropriate version of the Lamb's problem for two mediums, a half-plane and a layer with another elastic property located on it, is studied by analytical methods.

During the reporting period, 4 articles and 2 thesis were published

1. N.B. Rasulova, T.M. Mahmudzade. The solution of the Lamé dynamic problem. Известия Российской Академии Наук, Механика твердого тела, 2023, №5, DOI: 10.31857/S00572329922600542, стр. 236-242.

Impact factor РИНЦ – 0.854.

2. N.B. Rassoulova, T.M. Mahmudzade. The solution of the dynamic problem Lamé. Mechanics of Solids. 2023, No. 5, pp. 131-137

WoS, JCR impact factor – 0.549, Q3. 2023

DOI: 10.3103S0025654423600137

3. N.B. Rassoulova, T.M. Mahmudzade. Investigation of non-stationary processes of an elastic half-space with a built-in elastic cylinder. Transactions of NAS of Azerbaijan, Issue Mechanics, 2023, vol.43, №7, pp. 51-59.

10.30546/2706-7734.43.7.2023.

WORK B. Investigation of the change in compression ratio of internal combustion engines.

prof. Agalarov C.H.

The change of parameters in internal combustion engines (as a function of pressure and volume) was calculated for two different rotation speeds of the gear wheel (2000 revolutions/min and 4000 revolutions/min). It has been shown that a large pressure drop during an increase in speed also causes a decrease in the useful work coefficient. In the future, it is planned to report with an increase in compression ratio. 1 article has been published.

1. Agalarov D.G., Gasanova T.D. The influence of the degree of compression on the efficiency of the internal combustion engine. "Izvestia of higher educational institutions." Машиностроение», rubric «Машиностроение и машиноведение», issue #8 (761), 2023, p.16-22.

DOI 10.18698/0536-1044-2023-8-16-22

WORK C: Study of three-dimensional elasto-dynamics problems.

Lead. researcher, phd. Rasulov M.B

One of the methods used in solving elastodynamics problems is the integral transformation method, and one of the difficulties that arise at this time is to implement the inverse transformation. Therefore, finding new methods remains an urgent issue.

1. M.B. Rassoulov, N.B. Rassoulova, T.M. Mahmudzade. The Lamb problem for an elastic system layer and half-plane. An international conference "Modern problems of mathematics and mechanics" dedicated to the 100th anniversary of the great leader Heydar Aliyev, Baku, April 26-28, 2023, p.330

WORK D: : Stability of rod-reinforced cylindrical bodies and oscillations with environment.

Lead. researcher, phd **Seyfullayev F.A.**

The issue of forced oscillations of circular cylindrical covers reinforced with initial tension rods with the environment was studied, the effect of reinforcement with initial tension rods and forced oscillations of the environment on the amplitude and frequency of oscillations was determined.

1. F.A. Seifullayev. Influence of effect of a sliding frictional characteristic of natural frequencies of the longitudinally supported cylindrical envelopes with filter at an axial compression. An international conference "Modern problems of mathematics and mechanics" dedicated to the 100th anniversary of the great leader Heydar Aliyev, Baku, April 26-28, 2023, p.365.

2. Unsymmetrical forced oscillations of an orthotropic cylindrical coating under internal pressure in an infinite medium. Transactions of NAS of Azerbaijan, Issue Mechanics, 2023, accepted for publication.

WORK E: Investigation of fracture problems in orthotropic materials

Senior Researcher, **Aliyev I.Y.**

In this work, the problem of central crack located in orthotropic materials is studied. The material has an edge crack. The solution of the problem is reduced to singular integral equations. The stress intensity factor at the crack tip is found. The influence of geometrical and physical parameters of the subject on the intensity factor is studied.

About scientific organizational activity:

During the reporting period, department head, f.r.e.d. N.B. Rasulova at the all-institute seminar He spoke on the topic "A new method of solving problems of automodel plane dynamics". N.B. Rasulova delivered a wide report on "Propagation of non-stationary waves in inhomogeneous media" at the international conference "Modern Problems of Mathematics and Mechanics" dedicated to the 100th anniversary of the national leader Heydar Aliyev, organized by the Institute of Mathematics and Mechanics. Department head,. N.B. Rasulova is a member of the expert council on Mathematics and Mechanics at AAK, and directs doctoral training 1 Doctor of Philosophical Sciences, 1 Doctor of Sciences. Doctor of Philosophical Sciences, the leading researcher of the department. F.E. Seyfullayev is engaged in teaching at the Azerbaijan Institute of Architecture and Construction.

Head of department:

associate prof. N.B. Rasulova