REPORT

of the "Differential Equations" Department on the scientific and social activities for the first 6 months of 2023

Executed scientific works

The “Differential Equations” department consists of 13 collaborators. There are 11 scientific workers, including 7 Doctors of Sciences and 4 philosophy doctors. The department conducts 10 research studies on one subject according to the plan in 2023.

Subject: "Some problems of the theory of partial differential operators".

Work № 1. Existence and finite time blow-up of local solution of the mixed problem with nonlinear boundary condition for nonlinear hyperbolic equations with a variable growth order. **Executer: d.ph.m.s., prof. A.B.Aliev**.

1. Akbar B. Aliev, Yeter M. Farhadova. **EXISTENCE OF A SOLUTION TO THE NONLINEAR BRIDGE PROBLEM WITH A TIME-VARYING DELAY, Advanced Mathematical Models & Applications, Vol.7, No.3, 2022, pp.351-360 (SCOPUS).**

Thesis

1. A. B. Aliev, Y. M. Farhadova. The behavior of solutions of nonlinear suspension bridge problem with time-varying delay as $t \to \infty$. Modern Problems of Mathematics and Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev, Baku, Azerbaijan, 26-28 April, 2023, pp. 55-57.

Work 2: Investigation of solutions of nonlinear equations with discontinuous coefficients. **Executor d.ph.m.s., prof. T.S.Gadjiev**.

1, **T.S. Gadjiyev.** Holder estimate of solutions of degenerate parabolic equations. CMDE, (WEB OF SCIENCE, in appear).

2. **T.S. Gadjiyev**. Thermal waters of Azerbaican sources of renewable alternative energy. Bioenergy and Bioresource, 2023, in appaear.

Work 3: Investigation of linear and nonlinear eigenvalue problems for second and fourth order ordinary differential operators and the canonical Dirac system. **Executers: d.ph.m.s., prof. Z.S.Aliyev, d.ph.m. H.Rzayeva.**

1. **Ziyatkhan S. Aliyev**, Yagut N. Aliyeva, Global bifurcation results for some fourth-order nonlinear eigenvalue problem with a spectral parameter in the boundary condition, Mathematical Methods in the Applied Sciences, 46(1) (2023), 1282-1294.
2. **Ziyatkhan S. Aliyev**, Nurida A. Ismayilova, Global bifurcation from zero in nonlinear Sturm-Liouville equation with a spectral parameter in the boundary condition, 2023; https://doi.org/10.2989/16073606.2022.2152398
3. **Ziyatkhan S. Aliyev**, Sevinj S. Hadiyeva, Nurida A. Ismayilova, Global bifurcation from infinity in some nonlinear Sturm-Liouville problems, Bulletin of the Malaysian Mathematical Sciences Society, v. 46, AN: 112 (2023); https://doi.org/10.1007/s40840-023-01490-6

Thesis

1. **Ziyatkhan S. Aliyev**, Nigar S. Aliyeva, On a spectral problem for the Dirac system with boundary conditions depending on the spectral parameter, Azərbaycan Xalqının Ümummilli Lideri heydər Əliyevin anadan olmasının 100 illiyinə həsr olunmuş "Riyaziyyat və Mexanikanın müasir problemləri" mövzusunda Beynəlxalq Elmi konfransın materialları, Bakı ş., 26-28 aprel 2023-cü il, s. 80-82.

Work 4: Solution of a boundary value problem with an unbounded operator boundary condition for a second-order elliptic operator-differential equation with a complex parameter. **Executors:d.m.s., prof. B.A.Aliyev, d.ph.m.s., prof. N.M.Suleymanov.**

1. B. A. Aliev. Problems of solvability of a boundary value problem with operator boundary conditions for an elliptic operator-differential equation of the second order. Bakı Dövlət Universitetinin Xəbərləri (çapdadır), 2023, sentyabr, 10 səh.)

Thesis

1. **B. A. Aliev**, Z. E. Ismayilzade. Problems of solvability of a boundary value problem with operator boundary conditions for an elliptic operator-differential equation of the second order. **Modern Problems of Mathematics and Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev, Baku, Azerbaijan, 26-28 April, 2023, pp. 61-63**.

Work 5: Direct and inverse problems of scattering theory for Schrödinger operator with the increasing potential. **Executor: d.ph.m.s., prof. Agil Kh. Khanmamedov.**

1. **Triangular Representation of the Solution to the Schrödinger Equation with an Additional Linear Potential// Azerbaijan Journal of Mathematics V. 13, No 2, 2023, July, pp.160-166**
2. **On transformation operators for the Schrödinger equation with an additional periodic complex potential// Bol. Soc. Mat. Mex. (2023) 29:36 https://doi.org/10.1007/s40590-023-00508-0**
3. **Обратная задача рассеяния для уравнения Шредингера с дополнительным растущим потенциалом на всей оси//Теоретическая и математическая физика, 2023, том 215, №3**.

Work 6: Investigation of parabolic fractional-integral operators in parabolic locally generalized Morrey spaces. **Executor: d.ph.m. , ass.prof. Sh.A.Muradova.**

1. **Muradova Sh.A.** "Investigation of parabolic fractional integral operators in parabolic local generalized Morrey spaces". Modern Problems of Mathematics and Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev, Baku, Azerbaijan, 26-28 April, 2023, pp. 302-304.

2. Мурадова Ш.А., Мустафаев Э.М. "Описание диссипативных расширений одного оператора с потенциалом в виде функции Дирака". АКТУАЛЬНЫЕ ПРОБЛЕМЫ МАТЕМАТИКИ И ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ Материалы IV Всероссийской конференции с международным участием (г. Махачкала, 7-9 февраля 2023 г.), сс. 108-110.

Work 7: The study of a one-dimensional mixed problem for a class of fourth-order nonlinear differential equations. **Executor: d.ph.m. ass.prof.A.G.Aliyeva.**

1. S.Aliyev, **A.Aliyeva** ; The study of mixed problem for one class fourth order differential equations, Austrian Journal of Technical and Natural Sciences, № 3-4,2023, p.3-5.

A.Aliyeva participated in the International conference dedicated to the 100th anniversary of National Leader Heydar Aliyev:

2. S.Aliyev, **A.Aliyeva**, The study of multidimensional mixed problem for one class of third order nonlinear equations, Modern Problems of Mathematics and Mechanics, April 26-28, 2023, Baku, p.83

A. Aliyeva participated in the ICOMA 2023 International Conference:

3. S.Aliyev, **A.Aliyeva**, Study of one dimensional mixed problem for one class of third order nonlinear pseudoparabolik equations, 6th International Hybrid Conference on Mathematical Advances and Appications, May 10-13, 2023,Yıldız Technical University, İstanbul, Türkiye, p.23.

Work 8: Solving the wave equation with a discontinuity point by the Fourier method. **Executor: d.ph.m. N.R.Ahmedzade.**

1. Bilal Bilalov, **Nigar Ahmadzadeh**, Tarlan Garayev. Different Versions of Dirichlet Problems for Laplace equation in Non-standard Function Spaces. 6th International HYBRID Conference on Mathematical Advances and Applications, May 10-13, 2023, İstanbul , TÜRKİYE, p. 242

2. Z.A. Kasumov, **N.R. Ahmedzadeh**. On some properties of the Riesz potential in the Grand Lebesgue space. Riyaziyyat və Mexanikanın Müasir Problemləri Ümummilli Lider Heydər Əliyevin 100-illik yubileyinə həsr olunmuş Beynəlxalq Konfrans. 26-28 Aprel 2023, Bakı, Azərbaycan, s. 222-223.

Work 9. Existence of a solution to the nonlinear bridge problem with time-varying delay. **Executors: d.ph.m.s., prof. A.B.Aliev, Y.M.Ferhadova**

Akbar B. Aliev, Yeter M. Farhadova. **EXISTENCE OF A SOLUTION TO THE NONLINEAR BRIDGE PROBLEM WITH A TIME-VARYING DELAY, Advanced Mathematical Models & Applications, Vol.7, No.3, 2022, pp.351-360 (SCOPUS).**

Thesis

1. A. B. Aliev, Y. M. Farhadova. The behavior of solutions of nonlinear suspension bridge problem with time-varying delay as $t \to \infty$. Modern Problems of Mathematics and Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev, Baku, Azerbaijan, 26-28 April, 2023, pp. 55-57.

Work 10. Approximate distribution of solutions of Stochastic differential equation.. **Executor: prof. A.Kh. Shamilov.**

A.Kh. Shamilov. One approach to approximate solutions of stochastic differential equations. Modern Problems of Mathematics and Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev, Baku, Azerbaijan, 26-28 April, 2023, pp.374-376.

SOCIAL ACTIVITY OF COLLABORATORS OF THE "DIFFERENTIAL EQUATIONS" DEPARTMENT

Every Wednesday, at 12.00, the scientific seminar named "Modern problems of the theory of differential equations" is held under the guidance of prof.A.B.Aliev. Allcollaborators of department, including doctoral and post-graduate students participated in the seminar.

The collaboratos of the department, prof. Akbar Aliev, prof. Ziyatkhan Aliyev, prof. Tahir Gadjiev, prof. Agil Khanmamedov, prof. Bakhram Aliev, ass.prof. Shamsiya Muradova teaches at the universities of the Republic for bachelors and masters.

Professor Tahir Hajiyev, an employee of the department, made a plenary report at the online conference Ukraine PDMU 2023.

Sh. A. Muradova, an employee of the department, was a member of the working group of the Modern Problems of Mathematics and Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev, Baku, Azerbaijan, April 26-28, 2023.

Total – 22 work

Article - 11 (published, prepared and submitted for publication)

Thesis – 11.

Head of Department **prof. Akbar B. Aliev**