Semi-annual Report of "Differential Equations" Department on scientific and social activities for 2021

The department consists of 15 collaborators. There are 13 scientific workers, including 8 doctors of sciences and 4 philosophy doctors. The department conducts 10 research studies on one subject according to the plan in 2021.

Executed scientific works

Work 1. The mixed problem with nonlinear dissipative boundary condition for non-linear hyperbolic system that has a variable growth order. **Executer: d.ph.m.s., prof. A.B.Aliev.**

1. **A. B. Aliev**, and G. Kh. Shafieva1, Blow-up of Solutions of a Mixed Problem for Systems of Wave Equations with Boundary Dissipation and with an Interior Nonlinear Focusing Source of Variable Growth Order, , Differential Equations, 2021, Vol. 57, No. 3, pp. 291–303.©Pleiades Publishing, Ltd., 2021. Russian Text©The Author(s), 2021, published in Differentsial'nye Uravneniya, 2021, Vol. 57, No. 3, pp. 313–325.

2. **Aliev AB**, Shafieva GK. Mixed problem with dynamical transmission condition for a one-dimensional hyperbolic equation with strong dissipation. *Math Meth Appl Sci*. 2021;1–13. Volume 44, Issue8, 30 May 2021, Pages 7121-7133

https://onlinelibrary.wiley.com/doi/10.1002/mma.7248

3. **A. B. Aliyev** and G. R. Gadirova, The well-posedness of the mixed problem for one system

of termoelasticity with singular coefficient,

4. **А.Б. Алиев**, Г.Х. Шафиева Разрушение решений смешанной задачи для волновых уравнений с граничной нелинейной диссипацией и внутренним нелинейным фокусирующим источником переменного порядка роста , Актуальные проблемы математики и информационных Технологий. Материалы II Всероссийской конференции с международным участием (г. Махачкала, 5-7 февраля 2021 г., стр. 20 – 22.

5. **A. B. Aliev**, and G. Kh. Shafieva "Blow-up Solutions of Mixed Problem for a Nonlinear One-dimensional Wave Equation with Variable-exponent Nonlinearities, Dynamical Transmission Condition and Boundary Damping" , "4th International Conference on Mathematical Advances and Applications" , 26-29 May 2021, Istamdul.

Work 2: The problem with spectral parameter at the boundary for the fourth order differential operator equation. **Executors: prof. M.Bayramoglu, d.m.sc., prof. N.M.Aslanova**.

The results are prepared for sending to the journal.

Work 3: The qualitative properties of solutions of nonlinear elliptic equations in non-smooth domains. Executor **d.ph.m.s., prof. T.S.Gadjiev.**

In 2021, all goes according to plan. Two articles were prepared and one thesis was published at the conference of BSU. And two articles should be published by the end of the year.

Work 4: Structural properties of solutions of linear and nonlinear boundary value problems for some differential equations with definite and indefinite weights**. Executers: prof. Z.S.Aliyev, d.ph.m. H.Rzayeva**

The results are reflected in the following published articles and theses:

1. Z.S. Aliyev, N.A. Neymatov, H.Sh. Rzayeva, Unilateral global bifurcation from infinity in nonlinearizable one dimensional Dirac problems, International Journal of Bifurcation and Chaos, **31**(1) (2021), 1-10.

2. Z.S. Aliyev, X.A. Asadov, Global bifurcation from zero in some fourth-order nonlinear eigenvalue problems, Bulletin of the Malaysian Mathematical Sciences Society, **44**(2) (2021), 981–992.

3. Aliyev, Z.S., K.F. Abdullayeva, Uniform Convergence of Spectral Expansions in the Terms of Root Functions of a Spectral Problem for the Equation of a Vibrating Beam, Journal of Mathematical Study, 54(4), (2021), 435-450.

4. Aliyev, Z.S., Mehraliyev, Y.T., Yusifova, E.H. Inverse boundary value problem for a third-order partial differential equation with integral conditions. Bull. Iran. Math. Soc. (2021). https://doi.org/10.1007/s41980-020-00464-9

5. Алиев З.С., Мехралиев Я.Т., Юсифова Э.Г. Об одной обратной краевой задаче для уравнения с частными производными третьего порядка с интегральными условиями, Материалы Международной конференции “Воронежская зимняя математическая школа”, 28 января-2 февраля 2021 г., Воронеж, Россия, с. 33-34.

6. Алиев З.С., Абдуллаева К.Ф. О равномерной сходимости разложений по собственным функциям дифференциального оператора четвертого порядка со спектральным параметром в граничном условии, Материалы Международной конференции “Воронежская зимняя математическая школа”, 28 января-2 февраля 2021 г., Воронеж, Россия, с. 34-35.

7. Алиев З.С., Мехрабов В.А. Некоторые спектральные свойства одной краевой задачи на собственные значения со спектральным параметром в трех граничных условиях, Материалы Международной конференции «Некоторые актуальные проблемы современной математики и математического образования. Герценовские чтения-2021», Россия, Санкт-Петербург, 05-10 апреля 2021г., с. 21-23.

Accepted for publication

1. Aliyev, Z.S., Mehraliyev, Y.T., Yusifova, E.H. On some nonlocal inverse boundary problem for partial differential equations of third order, **Turkish Journal of Mathematics**, 2021.

2. Aliyev, Z.S., Mamedova G.T. Spectral properties of a beam equation with eigenvalueparameter entering via linearly to the boundary conditions, **Proceedings of the Royal Society of Edinburgh Section A,** 2021.

3. Z.S. Aliyev, L.V. Nasirova, Bifurcation from zero or infinity in nonlinearizable Sturm-Liouville problems with indefinite weight, **Electronic Journal of Qualitative Theory of Differential Equations,** (2021).

Work 5: Investigation of the solution of some boundary value problems for the second-order elliptic differential-operator equation with quadratic complex parameters. **Executors: d.m.s., prof. B.A.Aliyev, d.ph.m.s., prof. N.M.Suleymanov**.

In the second quarter of 2021, I submitted two articles to the publication, and a thesis was published

1. In the "Proceedings" journal of the Institute of Mathematics and Mechanics of ANAS (with Ya. Yakubov və V.Z. Kerimov).

2. In the "Transactions" journal of the Institute of Mathematics and Mechanics of ANAS (with V.Z. Kerimov).

These articles are still under review.

Б.А.Алиев, В.З.Керимов. О собственных значениях одной краевой задачи для эллиптического дифференциально-операторного уравнения второго порядка со спектральным параметром в условиях сопряжения. Актуальные проблемы математики и информационных Технологии. Материалы II Всероссийской конференции с международным участием (г. Махачкала, 5-7 февраля 2021 г., стр. 23-25).

Work 6: Applications of one-dimensional Schrödinger operator with exponential potential in the theory of Bessel functions. **Executor: d.ph.m.s., prof. Agil Kh. Khanmamedov.**

A.A. Khanmamedov. On zeros of the modified Bessel function of the first kind // Azerbaijan Journal of Mathematics V. 11, No 2, 2021, July, pp.160-166.

Work 7: Investigation of elliptic-parabolic operators in generalized anisotropic Morrey spaces. **Executor:** d.ph.m. , ass.prof. Sh.A.Muradova.

Shemsiyye A. Muradova. On boundedness of anisotropic singular operator in anisotropic generalized Morrey spaces. Актуальные проблемы математики и информационных Технологий. Материалы II Всероссийской конференции с международным участием (г. Махачкала, 5-7 февраля 2021 г., стр. 116-118).

Ş.Ə.Muradova, L.Ş.Əlizadə. Ümumiləşmiş Morri fəzalarında kompleks Riss çevirməsinin məhdudluğu. Ümummilli Lider Heydər Əliyevin 98-ci ildönümünə həsr olunmuş "Riyaziyyat, Mexanika və Tətbiqləri" mövzusunda respublika virtual elmi konfransı, 24-25 may, 2021, Bakı, Azərbaycan, səh.66-67.

Work 8: The study of multidimensional mixed problem for one class of third order diff erential equations with nonlinear operator on the right-hand side. **Executor: d.ph.m. ass.prof. A.G.Aliyeva.**

The article reflecting the obtained results were accepted for publication:

1. S.Aliyev, **A.Aliyeva.** The investigation of correctness of multidimensional mixed problem for one ciass of third order non-linear differential equations,Austrian Jouenal of Technical and Natural Sciences,№1-2, 2021,p.20-23.

2.С.Дж.Алиев, **А.Г.Алиева,** Исследование многомерной смешанной задачи для одного класса нелинейных дифференциальных уравнений третьего порядка, BDU-nun xəbərləri,fizika-riyaziyyat elmləri seriyası,№1,2021, s.5-14.

Work 9: Solvability of the Dirichlet problem for harmonic functions with the boundary values from grand Hardy classes. **Executor: d.ph.m. N.R.Ahmedzade.**

She is the executor of the project "Methods of spectral theory and non-harmonic Fourier analysis in some issues of classical and quantum mechanics" of the Science Development Foundation under the President of the Republic of Azerbaijan.

Published articles:

1. **Nigar Ahmedzade**, Zaur Kasumov. On the solvability of the Dirichlet problem for the Laplace equation with the boundary value in grand-Lebesgue space. Nakhchivan State University. Scientific works. The series of Physical, mathematical and technical sciences.2020 №5 (106), pp 62-69.

Prepared for publication:

1. Bilal T. Bilalov, **Nigar R. Ahmedzadeh**, Tarlan Z. Garayev, Some remarks on solvability of Dirichlet problem for Laplace equation in non-standard function spaces.

2. Z.A. Kasumov & **N.R. Ahmedzade**. О некоторых свойствах потенциала Рисса в пространствах гранд Лебега и гранд-Соболева

Published Theses:

1. Z.A. Kasumov & **N.R. Ahmedzade**. On Some Properties of the Riesz Potential in Grand-Lebesgue and Grand-Sobolev Spaces. **4th** International Conference on Mathematical Advances and Applications (ICOMAA-2020), 26-29 May, 2021, Turkey, p. 217

2. **Nigar Ahmedzadeh** and Tarlan Garayev. Some Remarks on Solvability of Dirichlet Problem for Laplace Equation in Non-standard Function Spaces. **4th** International Conference on Mathematical Advances and Applications (ICOMAA-2020), 26-29 May, 2021, Turkey, p. 162

Work 10: Mathematical analysis of the oscillations of suspension bridge in the case when the tensioning cable has one common point with the roadbed. **Executors: d.ph.m.s., prof. A.B.Aliev, Y.M.Ferhadova**

A.B. Aliev, Y.M. Farhadova, Existence of Global Attractors for the Coupled System of Suspension Bridge Equations when the tensioning cable has one common point with the roadbed., Azerbaijan Journal of Mathematics,Vol. 11, N 2 (2021).

SOCIAL ACTIVITY OF COLLABORATORS OF THE "DIFFERENTIAL EQUATIONS" DEPARTMENT

All collaborators have been actively participated (before the pandemic) in the Institute's general works, including the Institute Seminar.

Before the pandemic, every Wednesday, at 12.00, the scientific seminar named "Modern problems of the theory of differential equations" guided by A.B.Aliev, had being conducted. All collaborators of department, including doctoral and post-graduate students participated in the seminar.

Akbar Aliev is the member of the Expert Commission under the HAC. He is also a member of the "Scientific Council on Mathematical Problems" under the "Coordinating Council of Republican Scientific Research."

The collaboratos of the department, prof. Akper Aliev, prof. Mammad Bayramogly, prof. Ziyatkhan Aliyev, prof. Tahir Gadjiev, prof. Agil Khanmamedov, prof. Bakhram Aliev, ass.prof. Nigar Aslanova**,** ass.prof. Shamsiya Muradova teaches at the universities of the Republic (Azerbaijan Technical University, BSU, ASPU, AACU) for bachelors and masters.

There are scientific relations with some scientific centers and educational institutions of the country.

At the international level, there are contacts with the following scientific educational institutions

- Moscow State University (prof. A.V.Furskov, prof. L.Krichkov);

- Dagestan State University

-Tbilisi State University and Razmadze Institute of Mathematics;

- Some Universities in Turkey (Hacattepe University, Sivas University, Tokat University, Koç University, Kütahya University);
- Frans. Prof. Mokhtar Kirane **(**Mathematician, Professor at University of La Rochelle, Fransa, Khalifa University, United Arab Emirates);
- İsrael,Tel- Aviv , Tel- Aviv Universitety, prof. Yakov Yakubov;
- -Almaniya , prof. Efendiyev M**.** Institute of Computational Biology Helmholtz Zentrum Muchen, 85764 Neuherberg, Germany.

The collaborator of the department, **d.ph.m. N.R.Ahmedzade** is the executor of the project "Methods of spectral theory and non-harmonic Fourier analysis in some issues of classical and quantum mechanics" of the Science Development Foundation under the President of the Republic of Azerbaijan(2021/2022)

Total – 22+11=33 work

Article - 22 (published, prepared and submitted for publication)

Thesis – 10.

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