

## Report of “Differential Equations” Department for 2018

The Department consists of 14 collaborators. From the 12 scientific workers, there are 8 doctor of sciences and 3 philosophy doctors. According to the plan of 2018, 10 scientific research works are conducted on one subject in the department.

### EXECUTED SCIENTIFIC WORKS

**THEME:** “Some problems of Theory of Partial Differential Operators”.

**Work 1.** “Existence and non-existence of global solutions to Cauchy problem and mixed problem for a one class Timoshenko system”. **Executer: d.ph.m.s., prof. A.B.Aliev.**

#### Published works:

1. **Akbar B. Aliev, Nigar A. Rzayeva,** The mixed problem for nonlinear Tymoshenko systems, Transactions of NAS of Azerbaijan, Issue Mathematics, 38 (1), 13–21 (2018) Series of Physical-Technical and Mathematical Sciences.
2. **А.Б.Алиев, С.Э.Исаева,** Существование и поведение глобальных решений смешанной задачи с акустическими условиями сопряжения для нелинейных гиперболических уравнений с нелинейной диссипацией, Доклады РАН, 483, №2, 2018.
3. **Akbar B. Aliyev, Sevda E. Isayeva.** Exponential stability of the nonlinear transmission acoustic problem, **Mathematical Methods in the Applied Sciences.,41, issue 16. 2018. Hh.7055-7073**
4. **Алиев А.Б.** Задача Коши для нелинейных систем Тимошенко, **СОВРЕМЕННЫЕ МЕТОДЫ ТЕОРИИ КРАЕВЫХ ЗАДАЧ,** Материалы Международной конференции, посвященной 90-летию Владимира Александровича Ильина, **ПОНТРЯГИНСКИЕ ЧТЕНИЯ ХХІХ** (2–6 мая 2018 г.) Москва Изд.-во МАКС-Пресс, стр. 33.
5. **Akbar B. Aliev, Asif F. Pashayev,** Global nonexistence of solutions for a system of nonlinear wave equations with  $p$ -Laplacian operators, “Riyaziyyat və mexanikanın aktual problemləri” adlı Respublika elmi konfransının Materialları (17-18 May 2018- ci il) Bakı 2018, səh. 6.
6. **Akbar B. Aliev, Gulshan Kh. Shafiyeva,** Investigation of the potensial well for some system Klein Gordon equations, “Riyaziyyat və mexanikanın aktual problemləri” adlı Respublika elmi konfransının Materialları (17-18 May 2018- ci il) Bakı 2018, səh. 7.
7. **Akbar B. Aliev.** Effect of weight functions in nonlinear part on global solvability of Cauchy problem for semilinear pseudo-hyperbolic equations with structural damping. XXXI International Conference problems of decision making under uncertaines (PDMU – 2018) July 3-8, 2018, Lankaran- Baku
8. **Akbar B. Aliev, Asif F. Pashaev,** The Mixed Problem for a System of Nonlinear Wave Equations with  $q$ -Laplacian Operators ,IX International Conference of the Georgian Mathematical Union,

Dedicated to 100-th Anniversary of Ivane Javakhishvili Tbilisi State University BOOK OF ABSTRACTS, Batumi – Tbilisi, p. 72, September 3 – 8, 2018.

**Accepted works for publication:**

1. **Akbar Aliev**, Existence and nonexistence of global solutions for nonlinear transmission, **Turkish Journal of Mathematics**
2. **А.Б.Алиев, С.Э.Исаева** ”Аттракторы для полулинейных волновых уравнений с акустическими условиями сопряжения“, **Дифференциальные уравнения**
3. **Akbar Aliev and Gunay Gadirova**, The well-posedness of the mixed problem for one system of thermoelasticity with singular coefficient

**Work 2.** “Investigation of Some spectral properties of boundary problem that boundary condition dependentrationaly on spectral parameter”. **Executers: d.ph.m.s., prof. M.Bayramogly, d.m.s., ass.prof. N.M.Aslanova**

**Published work:**

1. **Nigar M. Aslanova, Mamed Bayramoglu And Khalig M. Aslanov** "Some spectral properties of fourth order differential operator equation", Operators and Matrices Volume 12, Number 1 (2018), 287–299
2. **Nigar Aslanova, Mamed Bayramoglu, Khalig Aslanov** “On some spectral problems of boundary value problem with boundary condition containing spectral parameter” 5th INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN PURE AND APPLIED MATHEMATICS, TRABZON, TURKEY, 23-27 JULY 2018.
3. **Nigar M. Aslanova, Mamed Bayramoglu And Khalig M. Aslanov** Eigenvalue problem associated with fourth order differential operaor equation, Rocky Mountain journal of Mathematics. Volume 48, Number 6, 2018  
<https://projecteuclid.org/euclid.rmjm/1517648421>
4. **Nigar M. Aslanova.** **Функциональные пространства. Дифференциальные операторы. Проблемы математического образования», посвящённую 95-летию со дня рождения члена-корреспондента РАН, академика Европейской академии наук Л.Д. Кудрявцева. Москва, Россия, 26-29 ноябрь, 2018.**

**Work 3.** “One probability method for Wiman-Valiron-type estimations of differential equations” (continuation). **Executer: d.ph.m.s., prof. N.M.Suleymanov.**

One article and one thesis have been published on the subject.

1. **N.M.Suleymanov, D.Farajli.** “Об оценках типа Вимана-Валирона для степенных рядов с конечным радиусом сходимости”. Journal of Contemporary applied Mathematics. (2018, V 8, № 1, pp. 62-68.)

2. **Н.М.Сулейманов, Д.Э.Фараджли.** “Об оценках типа Вимана-Валирона для эволюционных уравнений”. Moskva Dövlət Universitetində akademik V.A.İlinin 90 illik yubileyinə həsr olunmuş konfransının materialları.(2-6 may 2018, стр. 216).

**Work 4.** Smoothness of solutions of degenerate elliptic equations.**Executer: prof. T.S.Gadjiev.**

1. **Tahir Gadjiev.** Fractional integral associated to Schrodinger operator in generalized Morrey spaces. Journal of Nonlinear Science and Applications, 2018, 6, 152-161.

2. **Tahir Gadjiev, T.Maharramova.** Holder estimates for the solutions of degenerate nonlinear elliptic equations of nondivergence type. Висник Львівського Університету, 2017, 25, pp.64-68.

3. **Tahir Gadjiev, S.A.Aliyev, G.Gasanova.** The solutions of initial boundary problems nonlinear elliptic-parabolic equations Proceeding of Institute Applied Mathematics, 2018,V.7,№1, p. 52-68.

4. **Tahir Gadjiev.** Poliharmonic equations in generalized Morrey spaces.Turkish World Mathematical Sociality journal of pure and applied mathematics, 2018,V9,№2, p.43-56.

5. **Tahir Gadjiev.** Some apriori estimates for the solutions degenerate nonlinear elliptic equations. Transactions IMM, 2018,V.38, 2 (in press).

6. **Tahir Gadjiev, Sh. Galandarova, S. Aliyev.** The boundary problem for the Elliptic Equations in Generalized Weighted Morrey Spaces. IX Inter. Conf. of the Georgian Mat.Un., 2018, Batumi, p.118.

<http://www.gmu.ge/Batumi2018/ENG/index.html>

7. **Tahir Gadjiev, T.Maharramova.** The solvability of problem Dirichlet for nondivergence degenerate elliptic equations. Problem of Decision of Mathematics under Uncearting, 2018, Ukrayna p.61.

8. **Tahir Gadjiev, A.Yagnalieva.** The solutions of degenerate quasilinear nondivergence equations, PDMU-2018, Ukrayna p.62.

9. **Tahir Gadjiev, Y.Rustamova.** The optimal irrigation underwater use decisions, PDMU-2018 p.63.

10. **Tahir Gadjiev,** Holder estimates of solutions degenerate parabolic nonlinear equations. PDMU-2018 p.64.

11. **Tahir Gadjiev,** The boundary problem for the elliptic equations in generalized Morrey spaces. PDMU-2018 p.65.

**Work 5.** Structural properties of linear and nonlinear Dirac operators and second and fourth order Sturm-Liouville operators. **Executers: d.m.s., prof. Z.S.Aliyev, H.Rzaeva.**

The obtained results were reflected in the following papers:

**Published works:**

1. **Z.S. Aliyev and N.A. Mustafayeva**, On bifurcation of solutions from infinity of certain nonlinear eigenvalue problems for ordinary differential equations of fourth order, *Electron. J. Differential Equations*, **2018** (2018), No. 98, pp. 1-19.

2. **Z.S. Aliyev and R.A. Huseynova**, Global bifurcation from infinity in some nonlinearizable eigenvalue problems with indefinite weight, *Proceedings of the Institute of Mathematics and Mechanics, National Academy of Sciences of Azerbaijan*, **44**(1) (2018), 123-134.

3. **З.С. Алиев, Н.Б. Керимов**, Базисные свойства одного дифференциального оператора четвертого порядка со спектральным параметром в граничных условиях, *Современные методы теории краевых задач, Материалы Международной конференции, посвященной 90-летию Владимира Александровича Ильина, Понтрягинские чтения-XXIX, 2–6 мая 2018 г., Москва, МГУ*, с. 34-36.

4. **Z. S. Aliyev and S. B. Guliyeva**, Spectral properties of a fourth order eigenvalue problem with spectral parameter in the boundary conditions, *Filomat*, 32 (7) 2018, 11 p. (IF - 0.695).

**Work 6.** Solving a boundary problem for the second order elliptic differential operator equation when the spectral parameter included to the equation itself and boundary condition linearly. **Executer: d.m.s., ass. prof. B.A.Aliev.**

1. **Б.А.Алиев, Н.К.Курбанова, Я.Якубов**. Вопросы разрешимости одной краевой задачи для эллиптических дифференциально-операторных уравнений второго порядка со спектральным параметром в уравнении и в краевых условиях. *Диф. Урав.*, 2018, том 54, №1, с.69-87.

2. **Б.А.Алиев, Н.А.Аджалова**. "Коэрцитивная разрешимость одной краевой задачи для эллиптического дифференциально-операторного уравнения второго порядка с комплексным параметром". *Azərbaycanın Ümummilli Lideri Heydər Əliyevin anadan olmasının 95-ci il dönümünə həsr olunmuş "Riyaziyyat və Mexanikanın aktual problemləri" adlı Respublika Elmi Konfransının materialları*". 17-18 may, Bakı-2018. səh. 124-126. (tezis)

3. **Б.А.Алиев** Асимптотическое поведение собственных значений одной краевой задачи для эллиптического дифференциально -операторного уравнения второго порядка со спектральным параметром квадратично входящим в граничное условие «Дифференциальные уравнения» 2018, том 54, №9, Москва. с.1282-1286.

4. **Bahram A. Aliev , Nahida A. Adjalova** Asymptotic behavior of eigenvalues of a boundary value problem for Sturm-Liouville operator equation with a spectral parameter in one of the boundary conditions *Transactions of NAS of Azerbaijan, Issue Mathematics*, 38 (4), 10–14 (2018) *Series of Physical-Technical and Mathematical Sciences*

**5. B. A. Aliev** Solvability of a Boundary Value Problem for a Second Order Differential-Operator Equation with a Complex Parameter IX International Conference of the Georgian Mathematical Union Dedicated to 100-th Anniversary of Ivane Javakhishvili Tbilisi State University BOOK OF ABSTRACTS Batumi – Tbilisi, September 3 – 8 , 2018 s.73 (tezis).

**Work 7.** Inverse problem of spectral analysis for one-dimensional Shredinger equations with infinitely increasing potential.**Executer: d.m.s., prof. A. Xanmammadov.**

**Published works:**

1. **А.Х.Ханмамедов.** Обратная задача рассеяния для уравнения Шредингера с дополнительным квадратичным потенциалом на всей оси// Теоретическая и Математическая Физика, 2018, том 195, номер 1, страницы 54–63.
2. **A.Khanmamedov.** On an inverse spectral problem for a perturbed harmonic oscillator// Azerbaijan Journal of Mathematics, vol 8, no 2 (2018): july, pp. 181-191.
3. **А.Х.Ханмамедов.** К обратной задаче рассеяния для одномерного уравнения Шредингера с растущим потенциалом, *Укр. мат. журн.*, 2018, т. 70, № 10, с. 1390-1402.

**Work8.** Estimates for elliptic-parabolic operators in Morrey-type spaces.**Ex.:ass.prof. Sh.A.Muradova.**

1. **Muradova Sh.** “Parabolic Fractional Integral Operators with Rough Kernels in Parabolic Local Generalized Morrey Spaces”. IX International Conference of the Georgian Mathematical Union Dedicated to 100-th Anniversary of Ivane Javakhishvili Tbilisi State University, Batumi – Tbilisi, September 3 – 8, 2018, p.174
2. Muradova Sh. “Parabolic fractional maximal operator in anisotropic local Morrey-type spaces”, INTERNATIONAL CONFERENCE DEDICATED TO THE 90th anniversary of ACADEMICIAN AZAD MIRZAJANZADE, Baku, Azerbaijan, December 13-14, 2018, p.255-256.

**Work 9.**Investigation of the multidimensional mixed problem set for one class third order differential equation with right-hand side non-linear operator.**Executer: d.ph.m. ass.prof. A.G.Aliyeva.**

1. **S.Aliyev, A.Aliyeva, G.Abdullayeva.** The study of mixed problem for one class third order differential equations. Advances in Differences Equations, 2018 (3),1-10(2018). (Thompson Reut., Impact Factor 1,066).

**2. A.Aliyeva** The study of one-dimensional mixed problem for one class of nonlinear fourth order equations of Sobolev type. International Conference Dedicated to the 90th Anniversary of Academician Azad Mirzajanzade, 13-14 December, 2018, Baku, Azerbaijan, p.129.

**Work 10.** Solvability of Dirichlet problem for Laplace equation in the Weighted Morrey-type spaces.**Executer: d.ph.m. N.R.Ahmedzade.**

1. **Telman Gasymov, Selim Yavuzand, Nigar Ahmedzade,** Eigenparameter Dependent Discontinuity Condition in Weighted Lebesgue Spaces. International Conference on Mathematical Advances and Applications, May 11-13, 2018, Istanbul / TURKEY, p. 153.

2. **N.R. Ahmadzade, Z.A. Kasumov,** On the Dirichlet problem for the Laplace equation with boundary value from the Morrey space. International conference dedicated to the 90th anniversary of Academician Azad Mirzajanzade, Baku, Azerbaijan, December 13-14, 2018.

3. N.R. Ahmadzade, Z.A. Kasumov, On the Dirichlet problem for the Laplace equation with boundary value from the Morrey space. EURASIAN MATHEMATICAL JOURNAL(Scopus), 2018, vol.9, no3, p.1-12.

#### **SOCIAL ACTIVITY OF COLLABORATORS OF THE “DIFFERENTIAL EQUATIONS” DEPARTMENT**

Prof. Akbar Aliev, prof. Mammed Bayramogly, prof. Nadir Suleymanov and prof. Tahir Gadjiev are the members of Dissertation Council of IMM and they regularly participate in the meetings of the Council.

Prof. Mammad Bayramogly, prof. Tahir Gadjiev and ass.prof.Nigar Aslanova are members of the Specialized seminar on the Council.

Collaborators of the department are the members of Editorial Boards of the following journals of the Institute:

- Proceedings of IMM - prof. Akper Aliev, prof. Mammad Bayramogly, prof. Tahir Gadjiev, prof. Ziyatkhan Aliyev;

- Transactions of IMM - prof. Akper Aliev, prof. Mammad Bayramogly, prof. Tahir Gadjiev;

- Azərbaycan Riyaziyyat Jurnalı - prof. Akper Aliev, prof. Ziyatkhan Aliyev;

- Caspian Journal of Applied Mathematics, Ecology and Economics - prof. Akper Aliev, prof. Mammad Bayramogly, prof. Ziyatkhan Aliyev, prof. Agil Xanmammadov, ass.prof. Nigar Aslanova.

All collaborators actively participated in the Institute's general works, including the Institute seminar. Namely, the following members of the department made presentations at the seminar of Institute:

January 24, 2018 prof. Ziyatkhan Aliyev made a report on the topic: "Global bifurcation of solutions of nonlinear problems with eigenvalues",

June 22, 2018 prof. Bahram Aliyev made a report on the topic: "Coercive solvability of a single boundary value problem for an elliptic operator-differential equation of second order with a complex parameter",

November 7, 2018 prof. Agil Khanmamedov made a report on the topic: "The inverse distribution problem for the Schrödinger equation with an additional quadratic potential on the entire axis."

Every Wednesday, at 12.00, the scientific seminar on "Modern problems of theory of differential equations" guided by A.B.Aliyev, is conducted. All collaborators of department, including doctoral and post-graduate students participated in the seminar. During this period, several scientific works and dissertations were discussed at the department.

On March 16, 2018, to get a scientific name "doctor of mathematical sciences", doctorate of the department Musa Almammadov successfully defended his dissertation work entitled "The structure of the spectrum of multi-parameter problems and the investigation of the traces of duplicate differential operators" at the Dissertation Council of Institute. On May 11, 2018 the post-graduate student of the department Humay Sh. Rzayeva (supervisor: prof. Ziyatkhan Aliyev) successfully defended dissertation work entitled "The Local and Global Structure of Solutions of eigenvalue problems for Some Differential Operators" at the Dissertation Council of Institute to get a doctor of sciences in mathematics.

On June 7, 2018, the master of the department, Yetar Farkhadova (supervisor: prof. Akper Aliyev), defended his dissertation work entitled "Asymptotic of solutions of a mixed problem for one class dissipative Tymoshenko system"

2 (two) projects submitted by the Department to the Grant Project "Science and Integration of Education", announced by the Science Development Fund in 2017, have won: 1) project leader: prof. Akper Aliyev, Ex. ass.prof. Sh.Muradova, ass.prof. Sh.H.Bagirov (50 000 man), 2) project leader: ass.prof. Nigar Aslanova, Ex. prof. M.Bayramogly, ass.prof. B.A.Aliyev (40 000 man).

**Total – 74**

**Article - 31 (5 papers in print, 14 papers accepted for printing)**

**Thesis- 24**

**Head of Department**

**prof. Akbar B. Aliyev**