

# **Annual Report of Functional Analysis department of IMM 2017.**

“Functional Analysis ” department consists of 20 collaborators.

In 2017 according to the plan, 18 works on the themes "Investigation of some problem of operator algebra" and "Probability theory and spectral analysis of differential equations” are carried out."

- 1.Aslanov Hamidulla I.** d. ph.m.s.prof.s.r.a.
- 2.Aliyev Soltan A.** d. ph.m.s.prof.s.r.a.
- 3.Mirzoyev Sabir S.** d. ph.m.s.prof.s.r.a.
- 4.Huseynov Hidayet M.** d. ph.m.s.prof.s.r.a.
- 5.Gurbanov Veli M.** d. ph.m.s.prof.s.r.a.
- 6.Nabiyev Ibrahim M.** d. ph.m.s.prof.s.r.a.
- 7.Aliyev Araz R.** d. ph.m.s.prof.s.r.a.
- 8.Jabrailova Afet N.** c.ph.m.s.s.r.a.
- 9.Ibadova Irade A.** c.ph.m.s.s.r.a
- 10.Latifova Aygun R.** c.ph.m.s.r.a.
- 11.Vahabov Nazim G.** s.r.a.
- 12.Guliyev Namiq J.** r.a.
- 13.Khalilov Vuqar S.** s.r.a
- 14.Jafarov Ilqar J.** r.a.
- 15.Alimardanova Kamilla A.** r.a.
- 16.Osmanli Jalala A.** r.a.
- 17.Safarova Aynur N.**

**Theme: “Investigation of some problems of operator algebra and probability theory.”**

- a) Work:** “ Limit theorems for branching stochastik processes with immigration" Executor:doct.ph.m.s. prof. s.r.a. **S.A.Aliyev.**

In the report year four papers and four abstracts were published.

#### The Papers.

1. Принятие решений при выборе режимных параметров бурения в зависимости от характера исходной информации. Geoinformatika, N 3(59), 2016, s. 30-39.
2. Well placement as a method for control of oil field development. Вестник Львовского Университета, серия механики, 2016, N 82, pp. 21-29.
3. Removable sets for nonlinear degenerated elliptic equations. Вестник Львовского Университета, серия математики, 2016, N 81, pp. 32-38.
4. On stability of the solutions of matrix game and the capital preservation problem to the perturbations of initial date, Transactions of NAS of Azerb., ser. phys. thechn. and math., science, 2017, XXXVII, N 1, pp. 30-36.

#### Abstracts.

1. The mathematical modeling of filtration problems in the land and swampy areas. XXIX Intern. Conf. PDVU-2017, Mukachevo, Abstracts, 2017, p. 16.
2. Holder estimates for the solutions of degerate quasilinear elliptic non divergence equations, XXIX Intern. Conf. PDMU -2017, Mukachevo, Abstracts, 2017, p. 15.
3. The solutions of stochastic differential equations connected with nonlinear elliptic equations. Intern. Conf. "Operators on Morrey type spaces and applications" (OMTSA-2017), Kirşehir, Turkey, 2017.
4. On estimation of branching random processes with many types of particles, Int. conf. on multidisciplinary, Engineering, Educations and Technology (IMESE - 17), July 12-14, 2017, Baku.

#### **Scientific-organizational activity.**

In report year he has participated at 3 international Conferences:

1. The XXIX International Conference. RDMI, 2017, Mukachevo, Ukrain.
2. Intern. conf. "Operators on Morrey type spaces and applications" (OMTSA-2017), Kirşehir, Turkey.

3. Intern. conf. on Multidisciplinary engineering, Educations and technology (IMESET 17), Baku, Azerbaijan.

-In report year two times was on a professional trip.(Turkey, Ukrain)

-Was a chairman of the State Exams in Seki branch of Azerbaijan State Pedagogical University(2017).

-Was a member of the expert commission at HAC at the President of the Republic of Azerbaijan.

-Is a participant of a grant of Science Development Foundation at the President of the Republic of Azerbaijan.

-Now i am a supervisor of one phd dissertation.

a) **b) Work:** "Bracket expansion in eigen and adjoint vectors for the system multi-parametr operators in Hilbert space". Executor : c.ph.m.s.s.r.a.**A.N.Jabrailova**.

One paper and abstracts was published.

1. Джаббарзаде Р.М.,Джабраилова А.Н. "Крайтная полнота собственных и присоединенных векторов двупараметрической системы операторов в гильбертовых пространствах ". Евразийский Союз Ученых, 2017, Москва стр.71-74.

2. Джаббарзаде Р.М.,Джабраилова А.Н. " О разложении со скобками по собственным и присоединенным векторам многопараметрической системы операторов в гильбертовом пространстве ", " Riyaziyyatın nəzəri və tətbiqi problemləri" Beynəlxalq elmi konfransın materialları, Sumqayıt şəh., 25-26 may 2017 il,şəh 76.

**Work:** " Growth of Rezolvent and properties of clan of operators in Banach space". Execuator: s.r.a.**N.G.Vahabov**.

The paper "On theory of Izabell operators in Banach space " was prepared for publication.

**ç) Work:** “ Limit theorems for random walk described by first order autoregression process. ” Executor :c.ph.m.s.s.r.a. **I.A.Ibadova.**

1. İ.A.İbadova .,V.S.Khalilov., A.D.Farhadova.“Strong law of large numbers for a class of first passage time in the first order autoregression (AR (1)) scheme” Trans. of NAS of Azerb., 2017, №1, v.XXXVII, pp.121-125.
2. И.А.Ибадова., Ф.Г.Рагимов., А.Д.Фархадова “Об усиленном законе больших чисел для семейства моментов первого выхода за уровень в случайном блуждании, описываемом нелинейной функцией от процесса авторегрессии первого порядка (AR(1))”. “Riyaziyyatın nəzəri və tətbiqi problemləri” mövzusunda Beynəlxalq elmi konfrans. 25-26 may 2017-ci il,Sumqayıt, s.87-88.
3. İ.A.İbadova .,F.H.Rahimov.,V.S.Khaliliv.,A.D.Farhadova. Limit theorems for the passage time of the level by random walk described by nonlinear function of autoregression process of order one. Akif Cəfər oğlu Hacıyevin 80 illik yubleyinə həsr olunmuş “Riyaziyyat və Mexanikanın müasir problemləri” adlı Beynəlxalq konfrans 6-8 dekabr.

**d) Work:** “Investigation of linear and nonlinear boundary value problems for random walks.” . Executor: **V.S.Khalilov**

1. V.S. Khalilov., I.A.Ibadova.,A.D. Farhadova . “Strong law of large numbers for aclass of firs passage time in the firs order autoregression(AR(1))scheme.” // Transaction of NAS of Azerbaijan XXXVIII, N 1, 121-125 (2017).
2. N.M.Suleymanov., D.E.Farajli., V.S.Khalilov. “Prabability method and Wiman-Valiron type estimations for differential equations”. // Transactions of NAS of Azerbaijan.(məqalə çapa verilmişdir)
3. S.A. Aliyev, Y.A. Rustemov, V.S. Khalilov. "On Estimation of Parameters of Branching Random Processes with Many Types of Particles."
4. Ragimov F.G., Ibadova I.A., Khalilov V.S., Farkhadova A.D. " Limit theorems for the first passage time of the level by random walk described by a nonlinear

function of autoregression process of order one . Akademik Akif Cəfər oğlu Hacıyevin 80-illik yubileyinə həsr olunmuş konfrans materialı.

**Theme: “Spectral analyses of differential operators ”**

**e) Work:** “Operator-differential equations and some related spectral problems.”  
Executor : d. ph.m.s.prof.s.r.a. **S.S. Mirzoyev.**

1. S.S.Mirzəyev.,S.F.Babaeva. "On solvability of a class of boundary value problems for an operator -differential equation in Hilbert space." Proceedings of the Institute of Math. and. Mechanics NASA. vol.43, №1, 2017, p.116-122
2. . S.S.Mirzəyev. “Estimates of norms of operator Intermediate derivatives and their Applications”. Mathematical Notes, 2017, vol.102, p.125-128
3. S.S.Mirzəyev., S.F.Babaeva. “ On a Double-point boundary-value problem for a second order operator-differential equation and Its application”// Appl. Comput., Math., Vol. 16, No 3, 2017.
4. S.S.Mirzəyev., “ On multiple completeness of eigen and associated Vectors of Class of Operator Pencil” // Proceeding of the Institute of Mathematics and Mechanics NASA, 2017,
5. Mirzoyev S., Aliyev A. “On solvability of third order Operator-Differential Equations in Weighted space” // Journal of Function Spaces.
6. Mirzoyev S.S., Hasanov Z.I. “On Generalized solutions of a boundary-value problem for operator-differential equations on a Finite interval”. // Applied, Mathematical Sciences, vol. 11, 2017, N 29, 1405-1411.

**ə) Work:** “ Investigation of discreteness of the spectrum of higher order operator equations.” Executor: d. ph.m.s.prof.s.r.a. **H.I.Aslanov.**

On may 25-27, 2017 in the proceeding of the International Conference held by Sumgayit State University and IMM ANAS, abstracts of his four papers were published.

Prof. H.I.Aslanov is the chairman of State Attestation Commission at the Ganja State University.

1. H.İ.Aslanov, N.A.Gadirli. "On discreteness of negative part of spectrum and estimates for the number of eigenvalues of second order equations with operator coefficients on the semi- axis." Proceedings of IMM. volume 43, №1 , 2017, p.132-145.
2. H.İ.Aslanov, N.A.Gadirli. "On asymptotic distribution of negative eigen values of second order equation with operator coefficients on a semi –axis," Transactions of NASA, №1, 2017 p.44-52

3. Г.И.Асланов, Н.С.Абдуллаева. "О резольвенте операторного уравнения высокого порядка на конечном отрезке." "Riyaziyyatın nəzəri və tətbiqi problemləri" Beynəlxalq elmi konfransın materialları, Sumqayıt – 2017. s.61
4. Г.И.Асланов, Н.А.Гадирли. "Оценки для числа отрицательных собственных значений операторно- дифференциального уравнения второго порядка на полуоси +." "Riyaziyyatın nəzəri və tətbiqi problemləri" Beynəlxalq elmi konfransın materialları, Sumqayıt – 2017. с. 61-62
5. Г.И.Асланов, Ф.М. Гасанов, С.Е. Сулейманов. "Об асимптотическом поведении решений операторно- дифференциальных уравнений с частными произвольными в гильбертовом пространстве." "Riyaziyyatın nəzəri və tətbiqi problemləri" Beynəlxalq elmi konfransın materialları, Sumqayıt – 2017. s.63-64.
6. Г.И.Асланов, З.Г.Гусейнов. "О полноте одной системы функций." "Riyaziyyatın nəzəri və tətbiqi problemləri" Beynəlxalq elmi konfransın materialları, Sumqayıt – 2017. s.64-65.
7. Г.И.Асланов, Ф.М.Гасанов, Р.Гамидов. " О единственности обобщенного решения задачи Неймана для эллиптических уравнений второго порядка в неограниченных областях типа слоя." "Ali təhsildə keyfiyyətin təminatı" Respublika Elmi Konfransının materialları, Lənkəran (23-24 dekabr) 2016
8. Г.И.Асланов. " Orta məktəbin riyaziyyat kursunda vektor anlayışının tədrisinin əhəmiyyəti haqqında ." "Ali təhsildə keyfiyyətin təminatı" Respublika Elmi konfransının materialları. Lənkəran (23-24 dekabr) 2016.
9. H.I.Aslanov. " Investigations of the Green function and discreteness of spectrum of Higher order differential equations on semi axis." International Journal of Mathematical Analysis and Applications. 2018 :4(6), pp.1-12.

**f) Work:** "Investigation of the invese problem for nonlocal Dirac operator ." Executor: d. ph.m.s.prof.s.r.a.**H.M.Huseynov.**

The published papers:

1. И.М.Гусейнов., А.Ф.Мамедов. "Обратная задача рассеяния для одномерного оператора Шредингера с дополнительным линейным» Proceeding of IAM, v. 6, № 1, 2017, pp. 109-122.
2. И.М.Гусейнов., А.Ф. Мамедов. "К спектральной теории одномерно уравнения. Шредингера с бесконечно растущим потенциалом типа ступеньки." Journal of Contemporary Applied Math. V. 7, № 1, 2017, pp. 120-125.
3. И.М.Гусейнов. "Задача рассеяния для возмущенного ангармонического уравнения." The scientific and pedagogical news of OdlarYurdu 2017, № 46, ISSN 1682-9123, p. 11-18.
4. И.М.Гусейнов., Ф.З. Достуев. "On determination of Shturm-Lionvelloper." With disc. Condit. With respet to spectral data." Proc. Of the Inst. Math. and Mex. V. 42, № 2, 2016, pp. 143-153.

5. И.М.Гусейнов., Л.И Мамедов. “Достаточные условия разрешимости ОЗ для ур-я диффузии с сингулярнымпотенц.” Вестник БГУ сер.физ. Мат. Наук 2016, № 3, с. 69-76.
6. И.М.Гусейнов. “Задача рассеяния для ангормонического уравнения тезисы конф. Sumqayıt -2017, s. 74-75.
7. И.М.Гусейнов. “Восстановление оператора Ш-Л с условием разрыва по спектральным данным.”.Материалы международной конференции современия матем.и ее приложения. г.Уфа 2017 с.891-296.
8. И.М.Гусейнов., А.Х.Ханмамедов."The inverse scattering problem for a diskrete Dirac system on the whole axis."

**g) Work:** “Convergence of expansion in eigen function of third order differential operators .” Execuator: d.ph.m.s.prof.s.r.a. **V.M.Gurbanov**

1. Курбанов В.М., Буксаева Л.З. О риссовости корневых вектор-функций разрывного оператора Дирака с суммируемым коэффициентом. "Riyaziyyatın nəzəri və tətbiqi problemləri" Beynəlxalq elmi konfransın materialları, sumqayıt - 2017, səh. 80. (tezis)
2. V.M. Kurbanov, E.B. Akhundova, "Absolute and uniform convergence of spectral expansion of the function from the class in eigenfunctions of third order differential operator." Publications de L' Institut Mathematique. N.S. 101 (115), 2017, pp. 169-182.
3. В.М. Курбанов, Ю.Г. Аббасова. Сходимость спектрального разложения функции из класса , по собственным вектор-функциям дифференциального оператора третьего порядка. Укр. Мат. Журн. 2017, т. 69, N 6, стр. 2-16.
4. V.M. Kurbanov, Kh.R. Gojayeveva. “ Convergence of biorthogonal expansion of a function from the class in eigen and associated functions of even order ordinary differential operator.” Proc. Of the Institute of Matjematics and Mechanics NAS Azerbaijan, 2017.
5. V.M. Kurbanov, Kh. R. Gojayeveva. “On influence of modulus of continuity of the coefficient on uniform equiconvergence rate for an even order differential operator.” Trans. Of NAS of Azerbaijan, 2017, XXXVII, No 4, pp. 1-8.
6. V.M. Kurbanov, E.J. Ibadov, G.R. Hajieva. “On Bessel property and unconditional basicity of the systems of root vector-functions of a Dirac type operator.” Azerbaijan Journal of Mathematics, v. 7, N 2, 2017, pp. 21-32.
7. V.M. Kurbanov, A.M. Abdullayeva. “Bessel property and basicity of the system of root vector-functions of Dirac operator with summable coefficient.” SYLWAN, journal, 2017, 161 (9), pp. 2-17.

**ğ) Work:** “Reconstruction of diffusion operator with a spectral parameter in the boundary condition. ” Exacuator: d. ph.m.s.prof.s.r.a. **I.M.Nabiyev**

I.M.Nabiyev has participated in two International Conferences with a talk. Two papers and abstracts was published. (one of them is ISI impact factor journal)

1. И.М. Набиев. “Обратная задача для оператора Штурма-Лиувилля со спектральным параметром в граничном условии // .” “Modern mathematics and its applications” Papers of the International scientific-practical conference, Part II, 18–20 May 2017, Ufa , p. 103-107.
2. Ч.Г. Ибадзаде, И.М. Набиев. “О разрешимости одной обратной задачи спектрального анализа Межд. конф. по теории функций.” посв. 100-летию чл.-корр. АН СССР А.Ф. Леонтьева. Сборник тезисов (г. Уфа, 24-27 мая 2015 г.), с. 61-62.
3. Ч.Г. Ибадзаде, И.М. Набиев. “Восстановление оператора Штурма-Лиувилля с неразделенными граничными условиями и соспектральным параметром в граничном условии // .Укр. мат. журн. 2017.
4. Ч.Г. Ибадзаде, И.М. Набиев. “Асимптотика и взаимное расположение собственных значений операторов диффузии с неразделенными граничными условиями и со спектральным параметром в граничном условии // Вестник БГУ, сер. физ.-матем., 2017, № 2.

**h) Work:** “Initial conditionless problem for a class of invense parabolic operator-differential equations.” Execuator: d.d.ph.m.s.prof.s.r.a. **A.R.Aliyev.**

#### **The papers published in the Web of Sciences journals:**

1. On wave operators for the multidimensional electromagnetic Schrodinger operator in the divergent form // Ukrainian Mathematical Journal, 2017, vol. 68, no. 8, pp. 1153-1164 (E.H.Eyvazovla birgə), impakt-faktor 0,228.
2. On solvability of third order operator-differential equation with parabolic principal part in weighted space // Journal of Function Spaces, vol. 2017, 15 pages, 2017 (S.S.Mirzəyev və M.A.Söylemezo ilə birgə), impakt-faktor 0,451.
3. On approximate solution of impedance boundary value problem for Helmholtz equation // Azerbaijan Journal of Mathematics, 2017, vol. 7, no. 2, pp. 169-179 (R.C.Heydərovla birgə).



### **Editor in chief of journals**

A.R.Aliyev is the editor in chief of the International scientific journal Journal of Contemporary applied mathematics (Azerbaijan), a manager editor-in-chief of Journal of Mathematics(Azerbaijan), is the member of editorial board of the journals Proc.IMM ANAS(Azerbaijan), trans.ANAS(Azerbaijan) trans of Azer.Inst of Technology(Azerbaijan) and Mathematics and Statistics (ABS)

### **Personnel training**

In the report period he has supervised two philosophy doctor dissertation and a consultant of one doctor of sciences dissertation.

**x) Work:** “Studying solvability of a class of the second order partial differential equations .” Exacuator:r.a **I.J.Jafarov**

#### The published abstract

1. Jafarov I. "The Sufficient Conditions on The Regular Solvability of A Boundary-Value Problem for a Second-Order Partial Differential Operator Equations on a band". (Sumqayıt Dövlət Universitetinin yaradılmasının 55 illiyinə həsr olunmuş “Riyaziyyatın nəzəri və tətbiqi problemləri” beynəlxalq elmi konfransın materialları, Sumqayıt – 2017, səh.120-121. )

**1) Work:** “Direct problem of scattering for different asymptotic potential Sturm-Liouville equation . ” Execuator: r.a.**J.A.Osmanli**.

**i)Work:** “ Solution of direct scattering problem on a semi-axis for a system of first order hyperbolic equations in the case of there scattering wave. Exacuator: r.a **K.A.Alimardanova**.

1.Н.Ш.Искендеров, К.А.Алимарданова “Прямая задача рассеяния для системы пяти гиперболических уравнений первого порядка на полуоси с тремя заданными рассеянными волнами” , “Riyaziyyatın nəzəri və tətbiqi

problemləri” Beynəlxalq elmi konfransın materialları, Sumqayıt ş., 25-26 may 2017 seh 78-79.

**k) Work:** “Definition of a nonlocal boundary value problem for second order parabolic equations.” Exacuator: **A.N.Safarova.**

1. Я.Т.Мегралиев, А.Н.Сафарова. «Об одной нелокальной обратной краевой задаче для параболического уравнения второго порядка» Вестник Ю.Ур.Гу. Серия « Математика. Механика. Физика.» 2017, том9 №2, с. 13-21

2. А.Н.Сафарова. «Обратная задача восстановления правой части в параболическом уравнении с интегральным условием второго порядка» АМЕА-ның мүхбир үзвү Q.Т.Әһмәдовун анадан олmasının 100 illik yubileyi münasibəti ilə “Riyaziyyat və Mexanikanın aktual problemləri” adlı Respublika elmi konfransının materialları.2017-ci il.BDU.

3. A.N.Safarova. “On iverse boundary Value problem for a second order hiperbolic equation with nonclassical boundary conditions,” Transactions of NAS of Azerbaijan, Issue Mathematics series of Physical-Technical and Mathematical Sciences, vol, 37,№4, pp.1-12.

**q) Work:** “ Investigating certain conditions in the solution of invense problem for Sturm-Liouville equation with discontinuity coundition at the inner point” **Exacuator:** c.ph.m.s.r.a.**A.R.Latifova**

Has given a talk at the international Conference organized by Sumgayit State University and IMM ANAS

1. Hüseyinov H.M., Lətifova A.R “Birtərtibli qeyri-lokal diferensial operatorlar üçün iz düsturu”. Riyaziyyatin nəzəri və tətbiqi problemləri beynəlxalq elmi konfransının materialları 2017, seh 25.

**l) Work:** “Sturm-Liouville problems with spectral parameter in both boundary conditions.” Exacuator: r.a **N.J.Guliyev**

## **PUBLISHED SCIENTIFIC PAPAERS**

The department collaborators have published 36 papers and 22 abstracts.20 papers and 4 abstracts were published in foreign journals, 4 of these papers are in impact factor journals.

## **PARTICIPATION AT SCIENTFIC SEMINARS**

All the collaborators hald participated at the institute and department seminars.

## **SCIENTIFIC-SOCIAL ACTIVITY**

The department collaborators S.S.Mirzoyev, I.M.Nabiyev are the members of the Defence Council.

H.I.Aslanov , H.M.Huseynov, V.M.Kurbanov, S.S.Aliyev are the members of expert commission of Supreme Atestation Commission.

A member of collaborators are the members of editorial board of different journals.

H.I.Aslanov is the chairman of Ganja State University .

**Heard of department:**

**d.ph.m.s.prof.s.r.a.H.İ.Aslanov**