

## **Annual Report of Functional Analysis department on scientific and scientific activity for 2019**

The staff of “Functional Analysis” department consists of 21 employees including 18 research associates. 8 of them doctor of sciences, professor.

- 1.Aslanov Hamidulla I. doct. ph.m.s.,prof.sen.r.a.
- 2.Aliyev Soltan A. doct. ph.m.s.,prof.sen.r.a.
- 3.Mirzoyev Sabir S. doct. ph.m.s.,prof.sen.r.a.
- 4.Huseynov Hidayet M. doct. ph.m.s.,prof.sen.r.a.
- 5.Gurbanov Veli M. doct. ph.m.s.,prof.sen.r.a.
- 6.Nabiyev Ibrahim M. doct. ph.m.s.,prof.sen.r.a.
- 7.Aliyev Araz R. doct. ph.m.s.,prof.sen.r.a.
- 8.Eyvazov Elshad H. ph.m.s., lead.r.a.
- 9.Mukhtarov Fekhreiddin Sh. c.ph.m.s.,lead.r.a.
- 10.Jabrailova Afet N. c.ph.m.s.,lead.r.a.
- 11.Ibadova Irade A. c.ph.m.s.,lead.r.a.
- 12.Latifova Aygun R. phd in math.,chief.r.a.
- 13.Vahabov Nazim G. chief.r.a.
- 14.Guliyev Namiq I. c.ph.m.s.,r.a.
- 15.Khalilov Vuqar S. phd in math.,chief.r.a.
- 16.Alimardanova Kamilla A. c.ph.m.s.,chief. r.a.
- 17.Osmanli Jalala A. phd in math.,chief. r.a.
- 18.Safarova Aynur N.j.r.a.
- 19.Iskenderli Guller Z.sen.lab.ass.
- 20.Bayramova Aygun F.sen.lab.ass.
- 21.Dadashova Nigar Y.lab.ass.

### **I. Scientific part.**

In 2019, 18 scientific works on “Studying some problems of operator algebras and probability theory” and “Spectral analysis of differential operators” were carried out.

**Theme: “Studying some problems of operator algebras and probability theory.”**

**a) Work: “Limit theorems for branching processes with immigration”.**

**Ex: doct. p.m.s. prob. sen.res.ass. S.A. Aliyev.**

In the report period, a more complex scheme, branching processes with immigration were considered, the characteristics of the process were studied under more hard conditions on a generating function and limit theorems were obtained.

1. S.A.Aliyev., Ya.I.Rustamov, T.S.Gagjiev. A mathematical models the optimal irrigation under optimal water resourcers. Intern Journal of modern trends in engineering and research, vol. 05, issue 10, 2018, p. 26-32.

2. Aliyev S.A., Ibadova .I.A. On convergence to branching process with continuous state space. Scientific works of. Nakhchivan University, 2018, № 2(9), p. 255-261.

3. Aliyev.S.A., Ragimov F.H., Khalilov V.S. Limit theorems for the family of first passage time of the level by random walk described by a nonlinear function of the autoregressive process of order one (AR(1)). Uzbek Mathematical Journal, 2019, № 1, pp.4-14.

4. Aliyev S.A., Yeleyko Y.I., Zhernovyi Y.V. Calculating steady-state probabilities of the G/M/n/m gueueing systems. Caspian Journal of applied mathematics, Ecology and ekonomics, v.7, № 1, 2019, p.46-55.

5.Aliyev S.A., Khalilov V.S. Modeling of Bellman-Harris branching processes with random noizes. Operators functions and systems of mathematical physics conf., int. conf., 2018, Baku, p. 61-62.

6. S.A.Aliyev., Ya.İ.Rustamov. Constructing forecasting model of reliability of pump stations. “Modern problems of innovative texnologies in oil and gus production and applied mathematics.” Procidings of the int. konf., Baku, 2018, p.348.

7. С.А.Алиев., В.С.Халилов. Дифференциальные уравнения для ветвящихся процессов с непрерывным временем и миграцией. Конф. Посвящ. 80-му юбилею проф. Н.Алиева, Ленкоран, 2018, с.103.

8. Aliev.S.A., Gadjiev T.S. The boundary problem for the elliptic equation in generalized weighted Morrey spaces. IX int. konf. of the Georgian Mathematical Union. Abstract, Batumi, Georgia, 2018, p. 117 .

9. Aliev.S.A., Alieva S.S., Convergence of Sequence of Bellman-Harris branching processes to Jirina process. XXXIII int. konf. PDMU-2019, Abstract, Hurgada, Egypt, 2019, p.10.

10. Aliev S.A. Continuous state space branching process as limit of sequence of Bellman-Harris processes. Operators in general Morrey type spaces and applications (OMTSA-2019), Kutahya, Turkey, 2019, p.98.

11. Aliev S.A., Khalilov V.S Branching process with one and infinite variance. XXXIV int.conf. PDUM-2019, Abstracts, Lviv, Ukraine, 2019, p.10.

**b)Work: “Number domain and spectrum of  $\alpha$ -operators in Banach space”.**

**Ex: sen.res.ass. N.G. Vahabov.**

Spectral properties of operators in the Banach space with minimum norm of resolvent are considered. The example of operator of P class from  $G_1 \cap R$  when the exposed points of numeral image don't belong to the point spectrum of the operator.

**c) Work: “Limit theorem for the first crossing time of parabola by a random walk described by the sum of squares of first order autoregression processes”.**

**Ex: cand.ph.m.s. ass.prof.lead.res.ass. I.A. Ibadova.**

The law of strong numbers and central limit theorem were proved for the first crossing time of parabola by a random walk described by the sum of squares of first order autoregression process.

1.S.A.Aliyev., İ.A.İbadova. Branching process with special generating function. International Conference "Modern Problems of Mathematics and Mechanics" devoted to the 60th anniversary of the Institute of Mathematics and Mechanics 23-25 October, 2019, Baku, Azerbaijan pp.94-96.

2. F.H. Rahimov ., A.D. Farhadova., İ.A.İbadova. Central limit theorem for perturbed Markov random walk described by the autoregressive process of order one (AR(1)) Akademik Mirabbas Qasimovun 80 illiyinə həsr olunmuş beynəlxalq seminar 7-8 iyun 2019-cu il Bakı şəhəri,səh.144-145)

3.F.H. Rahimov ., A.D. Farhadova., İ.A.İbadova. Central limit theorem for a family of the first passage times of the level by a random walk described by the autoregression process of order one AR(1)). International Conference “Modern Problems of Mathematics and Mechanics” devoted to the 60th anniversary of the Institute of Mathematics and Mechanics 23-25 October, 2019, Baku, Azerbaijan.pp.423-424.

4. F.H. Rahimov ., A.D. Farhadova., İ.A.İbadova. Limit theorems for a family of the first passage times of a parabola by the sums of the squares autoregression process of order one (AP(1)). Uzbek Mathematical Journal, 2019, №2, pp.81-88 DOI: 10.29229/uzmj.2019-2-10

5. S.A.Aliyev., İ.A.İbadova. On convergence to a branching process with a continuous phase space. Scientific works Nakhchivan university, №2,(9),2018,pp-255-261.

**d) Work: “Studying linear and nonlinear boundary value problems for random walks described by first order autoregression process”.**

**Ex: ph.d. in math. ass. prof.sen.res.ass. V.S. Khalilov.**

In the report year, linear and nonlinear boundary value problems were studied for random walks described by first order autoregression process. The following results were published.

1.Aliev S.A., Ragioy F.H., Farhadova A.D., Khalilov V.S. Limit theorems for the family of first passage time of the level by random walk described by a nonlinear function of the antoregressive process one / Uzbek Mathematical Jurnal, 2019, № 1, pp.4-14. DOI:10.29229 /uzmj. 2019-1-1

2.Khalilov V.S., Bagirova G.A., Hasimova T.E. Central limit theorem for Markov random walk described by the antoregressive process of order one (AR(1)). An International Workshop dedicated to the 80th anniversary of an academician Mirabbas Geogla Gasimov, pp. 100-101. Spectral theory and it`s applications., Baku/June 7-8, 2019.

3.S.A.Aliev, V.S.Khalilov. Branching process with mean one and infinite variance XXXIV International Conference problems of decision making under Uncertainties (PDMV-2019). Pp-10, September 23-27, 2019 Lviv, Ukraine.

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

**e) Work: “Solving elliptic and quasielliptic type operator coefficient equations and some spectral properties”.**

**Ex: doct.ph.m.s. prof. sen.res.ass. S.S. Mirzoyev.**

In the report period, spectral properties of quasielliptic operator pencils were studied. The following papers were published.

1.С.С.Мирзоев., А.Т.Газилова. О полноте часть корневых векторов одного класса квазиэллиптических операторных пучков третьего порядка. Математические заметки, 2019, т.105, вып5. с. 801-804.

2.S.S.Mirzoev., S.F.Babaeva . On completeness of a Part of Eigen and Associated vectors of a Quadratic oper pencil for a Pouble Point Boundary Value Problem // TWMS Journal of Pure and Applied Mathematics, vol.10.№1, 2019,pp.83-93.

**f) Work: “Studying discreteness of the spectrum of differential operators with higher order normal operator coefficient in Hilbert space”.**

**Ex: doct.ph.m.s. prof. sen.res.ass. H.I. Aslanov.**

In the separable Hilbert space , the Green function of normal operator coefficient higher order operator-differential equation was constructed on a semi-axis, its derivatives were studied and regular estimation at rather large values of spectral parameter were obtained.

The following papers were published.

1.H.I.Aslanov. Riyazi modellərin parametrlərinin qiymətləndirilməsi üçün ən kiçik kvadratlar və maksimal doğruya oxşarlıq üsulları haqqında , Bakı Biznes Universiteti , “Azərbaycanda təhsilin və rəqabətin yüksəldilməsi istiqamətləri” Beynəlxalq elmi-praktik konfransın materialları, Bakı 2-3 may, 2019, s. 384-387.

2.G.I.Aslanov. On existence of the solution partial operator-differential equations in Hilbert spaces. International conference “Modern problems of Mathematics and Mechanics” devoted to the 60 th anniversary of the IMM. 23-25 oktober, 2019, Baku. Azerbaijan. p.136-138.

3.G.I.Aslanov. Completeness of the system of eigen and associated vectors of operators generated by partial operator-differential equations in Hilbert space. International Workshop dedicated to the 80 th anniversary of an academician Mirabbas Geogdja oglu Qasimov. Baku / June 7-8, 2019, p.48-51.

**g) Work: “Direct and inverse scattering problems for increasing potential one-dimensional Schrödinger equation”.**

**Ex: doct.ph.m.s. prof. sen.res.ass. H.M. Huseynov.**

In the work, the direct and inverse problems are considered when the potential increases with different velocity in positive and negative infinity, their characteristics are studied, the main equations of inverse problem is derived for the kernel of transformation operator.

1. И.М.Гусейнов., Ф. Достуев. Обратные задачи для оператора Штурма-Лиувилля с условиями разрыва. Матем.заметки 2019. т 105 вып.6. с.932-936. (Web of Science Core Collection: CP-SCI; Scopus)

2. H.M.Hüseynov.İ.M.Nəbiyev. “Riyaziyyatın tədrisinin səmərəliliyinin artırılması haqqında” Azərbaycanda ali təhsilin beynəlmilləşdirilməsi və rəqabətliyin yüksəldilməsi istiqamətləri mövzusunda H.Əliyevin anadan olmasının 96-cı ildönümünə həsr olunmuş beynəlxalq konfransın tezisləri Bakı 2019-cu il 2-3 may səh. 404-406.

3.H.M.Huseynov “Inverse scattering problem for operator Sturm-Liouville with discontinuity condition” “Spectral theory and its applications” M.G.Qasimovun 80 illiyinə həsr edilmiş konfrans tezisi. Bakı 7-8 iyun, 2019, səh. 84-85

4. H.M.Hüseynov. “Şturm-Liuvill operatoru üçün bir tərs məsələ” RMİ-nin 60 illiyi konfrans tezisi. Bakı 2019, səh.246-248.

**h) Work: “Studying convergence of spectral expansions in ordinary differential operators on a segment”.**

**Ex: doct.ph.m.s. prof. sen.res.ass. V.M. Gurbanov.**

In the report year, spectral convergence of an even order ordinary differential equations in eigen function is studied. The order ordinary differential operator summable on the interval was considered. One paper and one abstract were published.

1.V.M.Kurbanov, A.I.Ismailova, Kh.R.Gojayeva “On Uniform equiconvergence rate of spectral expansion in eigenfunctions of even order differential operator with trigonometric series” // Azerbaijan Journal of Mathematics, v9, № 2, p. 183-199. (WoS: SCIE; Scopus).

2.В.М.Курбанов, Гю.Р.Гаджиева. Оценки для корневых вектор функций оператора типа Дирака. Riyaziyyat və Mexanika İnstitutunun 60-illiyinə həsr olunmuş Beynəlxalq konfrans.Bakı 2019.

3.V. M. Kurbanov., L. Z. Buksaeva. On the Riesz Inequality and the Basis Property of Systems of Root Vector Functions of a Discontinuous Dirac Operator. Differential Equations August 2019, Volume 55, Issue 8, pp 1045-1055. (WoS: SCIE; Scopus).İF-0.659; Q3;

<https://link.springer.com/article/10.1134/S0012266119080056>

4. V. M. Kurbanov., Kh. R. Godzhaeva. Convergence of the Spectral Expansion in the Eigenfunctions of a Fourth-Order Differential Operator. Differential Equations January 2019, Volume 55, Issue 1, pp 8–23. (WoS: SCIE; Scopus).İF-0.659; Q3;

<https://link.springer.com/article/10.1134/S0012266119010026>

5.V.M.Kurbanov, Kh.R.Gojayeva “On equiconvergence rate of spectral expansion in eigen-function of even order differential operator with trigonometric series” // Spectral Theory and its Applications. An International Workshop dedicated to the 80th anniversary of an academician Mirabbas Geogja oglu Gasymov, Baku 2019, c.101-102.

6.V.M.Kurbanov, A.M.Abdullayeva “On local Uniform equiconvergence rate for the Dirac operator. Proceedings of Institute of Math. and Mechanics 2019.(çapa təqdim olunub)

**k) Work: “Representation of some exponential type entire functions”.**

**Ex: doct.ph.m.s. prof. sen.res.ass. I.M. Nabiev.**

The properties of some entire functions of exponential type were studied. Using De Hadamard theorem, the representation of these functions in the form of infinite product was obtained.

Six papers were published.

1.Ch.G. Ibadzadeh, L.I. Mammadova, İ.M. Nabiev. Inverse problem of spectral analysis for diffusion operator with non-separated boundary conditions and spectral parameter in boundary condition // Azerbaijan Journal of Mathematics, 2019, v. 9, № 1, p. 171-189 (Web of Science, Scopus). <http://azjm.org/volumes/0901/pdf/11.pdf>

2. İ.M. Nabiev. Inverse problem of the spectral analysis for the Sturm-Liouville operator with non-separated boundary conditions and spectral parameter in the boundary condition // arXiv:1903.05338v1 [math.SP] 13 Marth 2019, 15 p. <https://arxiv.org/abs/1903.05338v1>

3. H.M. Hüseyinov, İ.M. Nəbiyev. Riyaziyyatın tədrisi prosesinin səmərəliliyinin artırılması haqqında / Ümummilli Lider H. Əliyevin anadan olmasının 96-cı ildönümünə həsr olunmuş «Azərbaycanda ali təhsilin beynəlmilləşdirilməsi və rəqabətliliyinin yüksəldilməsi istiqamətləri» mövzusunda Beynəlxalq elmi-praktiki konfransın materialları, Bakı, 2-3 may 2019, Biznes Universiteti nəşriyyatı, s. 404-405.

4. И.М. Набиев, Дж.М. Исмаилзаде. Единственность восстановления дифференциального оператора на отрезке / Матер. IV Международной открытой конф. «Современные проблемы анализа динамических систем. Приложения в технике и технологиях». Воронеж, 21- 23 мая 2019 г. с. 149-152. <http://585386.wixsite.com/math>

5. I.M. Nabiev. On sufficient conditions for the solvability of the inverse problem for a differential operator / An International Workshop dedicated to the 80th anniversary of an acad. M.G. Gasymov «Spectral theory and its applications», Book of Abstracts, Baku, June 7-8, 2019, p. 129-131.



<http://www.azjhpc.com/Mirabbas-Gasymov-80/indexaz.html>

6. L.I. Mammadova, I.M. Nabiev. On the spectral properties of the Sturm – Liouville operator with a boundary condition quadratically dependent on the spectral parameter / International Conference «Modern Problems of Mathematics and Mechanics» devoted to the 60th anniversary of the Institute of Mathematics and Mechanics 23-25 October, 2019, Baku, Azerbaijan, səh 358-359.

<https://imm60.imm.az/>

**1) Work: “Studying many-dimensional magnetic Helmholtz equation in unbounded domain under radiation conditions”.**

**Ex: doct. ph.m.s. prof. sen.res.ass. A.R. Aliyev.**

1. Aliev A.R., Soylemezo M.A. Solvability conditions in weighted Sobolev type spaces for one class of inverse parabolic operator-differential equations // Azerbaijan Journal of Mathematics, 2019, vol. 9, № 1, p.p. 59-75. (WoS: ESCI; Scopus)

<https://www.azjm.org/volumes/9-1.html>

2. Aliev A.R., Mamedov V.M., Gasimov G.G. Analysis and Processing of Information in Economic Problems. Crisp and Fuzzy Technologies // In: 13th International Conference on Theory and Application of Fuzzy Systems and Soft Computing — ICAFS-2018. ICAFS 2018. Advances in Intelligent Systems and Computing, vol 896. Springer Nature Switzerland AG, 2019, p.p. 65-72. (WoS: CPCI-S; Scopus)

[https://link.springer.com/chapter/10.1007/978-3-030-04164-9\\_12#citeas](https://link.springer.com/chapter/10.1007/978-3-030-04164-9_12#citeas)

3. Aliev A.R. On the solvability in a weight space of a boundary-value problem for a class fourth-order operator-differential equations / Contemporary problems of mathematics and mechanics. Proceedings of the conference dedicated to the 80th anniversary of academician V. A. Sadovnichy. – Moscow: MAKS Press, 2019, p.p. 172-173.

4. Aliev A.R., Rzayev E.S. On the theory of a class of fourth-order polynomial operator / Abstracts of the International Workshop "Spectral Theory and Its

Applications" dedicated to the 80th anniversary of the academician M.G. Gasymov, 7-8 June 2019, Baku, Azerbaijan, p.p. 33-35.

<http://www.azjhpc.com/Mirabbas-Gasymov-80/indexen.html>

5. Aliev A.R., Hamzaev Kh., Ismayilova N., Jahangirbayov E., Jafarov F., Mammadov R. Parallel numerical method of an inverse problem of double-phased filtration // Azerbaijan Journal of High Performance Computing, 2019, vol. 2, no. 1, p.p. 75-81. (Index Copernicus; Crossref)

<https://azjhpc.org/index.php/archives/15-paper/46-parallel-numerical-method-of-an-inverse-problem-of-double-phased-filtration>

6. Aliev A.R., Heydarov R.J. Approximate solution of the boundary value problem for the Helmholtz equation with impedance condition // Doklady Mathematics, 2019, vol. 100, no. 2, pp. 436-439 (published in Doklady Akademii Nauk, 2019, vol. 488, no. 3, pp. 233-236). (WoS: SCIE; Scopus)

<https://journals.eco-vector.com/0869-5652/article/view/16243>

7. Aliev A.R., Rajabov Sh.Sh. Essential self-adjointness of the magnetic Helmholtz operator / Abstracts of the International Conference "Actual Problems of Analysis, Differential Equations and Algebra" (EMJ-2019) dedicated to the 10th anniversary of the Eurasian Mathematical Journal, 16-19 October, 2019, L.N.Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, p.p. 18-19.

8. Aliev A.R., Manafov M.Dzh. First-order regularized trace of the Sturm–Liouville operator with point of  $\delta'$ -interaction / Abstracts of the International Conference on Modern Problems of Mathematics and Mechanics dedicated to the 60th anniversary of the Institute of Mathematics and Mechanics of the Azerbaijan National Academy of Sciences, 23-25 October, 2019, Baku, Azerbaijan, p.p.90-91.

**m) Work: "Spectral properties of loaded string vibration equation problem in Morrey type space".**

**Ex: cand. ph.m.s. ass. prof. lead. res.ass. A.N. Jabrailova.**

In the work, the spectral problem for spectral parameter, discontinuous second order differential operator under the transformation conditions arising in solving the loaded string vibration equation is studied. Abstract theorem about constancy

of the main properties of multilayer systems in Banach space is proved with respect to the known transformations.

1.A.N.Jabrailova., A.Sh.Shukurov. On frames that are interaters of a multiplication operator. AMEA RMI-nin 60 illiyinə həsr olunmuş konfransın materialları . 23-25 oktyabr, 2019, Bakı.səh .285-287.

2.A.N.Jabrailova., A.Sh.Shukurov. On frames that are interaters of a multiplication operator(məqalə çapa hazırlanıb)

**n) Work: “Some spectral properties of non-classic Sturm Liouville problem”.**

**Ex: cand.ph.m.s. ass.prof.lead.res.ass. F.Sh. Mukhtarov.**

Some spectral properties of non-classical Sturm-Liouville problem are studied and especially the Strum-Liouville problems arising in mathematics and physics are researched. New spaces for differential operator be self-adjoint, was constructed and some spectral properties were studied. The work was adopted to be published in an authoritative journal.

1.F.Muxtarov Hayati Olgar and Kadriye Aydemir “Sampling theorem for new type Sturm-Lioville problems” 2nd International Turkish world Enqineering and Science Conqress, November 7-10 2019 Turkiye.

2.Oktay Muxtarli, Merve Yucel and Fehreddin Muhtarov “Solution of initial value tranmission problems by differential transform method”. 2-ci Beynəlxalq Türk dünyası İnjinerlərinin Elmi konfransı.Ankara şəhərində 7-10 noyabr 2019.

3.Fehreddin Muhtarov, X.H.Demirov. Discteteness of the spectrum of new type boundary value problems “International conference ” Modern problem of mathematics and mechanics” 23-25 oktober. Baku Azerbaijan. səh.387-390.

**o) Work: “Direct scattering problem for discontinuous condition Sturm-Liouville operator with different asymptotics”.**

**Ex: ph.d.in math. res.ass. J.A. Osmanly.**

In the whole axis the Schrodinger problem is found at any point within the discontinuity condition. It is assumed that at positive and negative infinity the potential has different asymptotics ( $A > 0$ ):

$$\int_0^{+\infty} (1+x)|q(x) - A|dx + \int_{-\infty}^0 (1+|x|)|q(x)|dx < +\infty$$

Integral representations for the lost solutions were obtained, the relations of the kernel of these representations with the potential and other properties were studied, and scattering data were introduced.

A paper for publication was prepared.

**p) Work: “Direct and inverse scattering problems on a semi-axis for the system of six one-dimensional hyperbolic equations”.**

**Ex: cand.p.m.s. sen.res.ass. K.I. Alimardanova.**

A theorem on the existence and uniqueness of the solution of the direct scattering problem on a semi-axis for the system of six one-dimensional equations was proved. The inverse scattering problem for this system of equations in a special case, was studied.

1.N.Sh.Iskenderov, K.A.Alimardanova. the scattering problem for hyperbolic system of equations on semi-axis with three incident waves/ IECMSA-2019, 8th international eurasian conference on mathematical sciences and applications, 27-30 August 2019, Baku, Azerbaijan, pp.152-153.

2. K.A.Alimardanova, A.N.Safarova. The scattering problem for the system of six ordinary differential equations on semi-axis/ AMEA Riyaziyyat və Mexanika İnstitutunun 60 illik yubileyinə həsr olunmuş “Riyaziyyat və Mexanikanın müasir problemləri” Beynəlxalq konfrans, 23-25 oktyabr 2019, Bakı şəhəri.səh 96-97.

**r) Work: “Inverse problems for a class of hyperbolic and parabolic equations”.Ex: jur.res.ass. A.N. Safarova.**

The inverse problem was studied under the nonlocal integral conditions for dissipative term hyperbolic equations. The obtained results were published in the form of abstracts.

1.Искендерова Г.Н., Сафарова А.Н. «Линейная обратная краевая задача для гиперболического уравнения второго порядка с диссипативным членом». Azərbaycan Xalqının Ümummilli Lderi Heydər Əliyevin anadan olmasının 96-cı

ildönümünə həsr olunmuş “Riyaziyyat və mexanikanın aktual problemləri” adlı Respublika elmi konfransının materialları, Bakı, BDU, 2019, səh. 100-101.

2. Tamova L.N., Safarova A.N. “Inverse scattering problem for a hyperbolic system of first order equations on a semi-axis on a first approximation.” Operators, Functions, and system of Mathematical Physics Conference, p. 25-26, June 10-14, 2019, Khazar University, Baku, Azerbaijan

3. Alimardanova K.A., Safarova A.N. “The scattering problem for the system of six ordinary differential equations on semi-axis” AMEA-nın RMI-nin 60 illiyinə həsr olunmuş, “Riyaziyyatın və Mexanikanın müasir problemləri” adlı Beynəlxalq konfransın materialları, Bakı, 2019. səh 96-97.

**s) Work: “Representation of initial solution for the system of Dirac equations with discontinuity condition at two points inside the interval”.**

**Ex: ph.d. in math. sen.res.ass. A.R. Latifova.**

Obtaining representation of the integral solution for the system of Dirac equations within the two discontinuity conditions inside the interval is studied. The kernel estimations are also studied. One paper is being prepared.

**t) Work: “Inverse problems with respect to two spectra”.**

**Ex: cand.ph.m.s. res.ass. N.J. Guliyev.**

A criterion for the eigen-functions of Sturm-Liouville problem that contains in spectral parameter rational Nevanlinna function in both boundary conditions is proved and one paper was submitted for publications.

The last paper was considered as one of the best papers of the journal by the editorial staff of “Journal of Mathematical Physics” and was chosen as “Featured Article”.

1. Guliyev N.J., Ismailov V.E. Approximation capability of two hidden layer feedforward neural networks with fixed weights. Neurocomputing, 316 (2018), 262-269. (2018 impakt-faktoru: 4.072).

2. Guliyev N.J. Schrödinger operators with distributional potentials and boundary conditions dependent on the eigenvalue parameter, J. Math. Phys. 60 (2019), no. 6, 063501, 23 pp.

## **II. Scientific-social activity.**

The head of the department, **doct. ph.m.s.,prof.sen.r.a. H.M. Aslanov** is a participant of the Science foundation, of the grant project of state oil Company.

He was an official opponent of one doctor of sciences degree and one phil. doct. dissertations.

He supervises three doctoral students. One cand. for a degree has defended phil. doct. dissertation.

**Doct. ph.m.s.,prof.sen.r.a. S.A. Aliyev** was a member of three organization committees of the International Conferences, was a member the editorial board of six scientific journals, has written reviews to doctoral and phil. doctor dissertations as a member of the expert board of the Higher Certificate Committee under the president of the Republic of Azerbaijan.

He was a supervisor of one phil. doct. dissertation, a participant of a grand project of Science Foundation at the President of the Republic.

**Doct. ph.m.s.,prof.sen.r.a. A.R. Aliyev** is an editor-in-chief of the international scientific journal “Azerbaijan Journal of High performance computing” (Azerbaijan), manager editor of the international scientific journal “Azerbaijan journal of Mathematics” and a member of the journals: «Proceedings of the Institute Mathematics and Mechanics, National Academy of Sciences of Azerbaijan» (Azərbaycan), «Transactions of Azerbaijan Institutes of Technology» (Azərbaycan), “Electronic scientific journal, SCIENCE and TECHNOLOGIES: MATHEMATICAL MODELLING. COMPUTER SCIENCE“ (Rusiya) və «Mathematics and Statistics»

**Doct. ph.m.s.,prof.sen.r.a. I.M. Nabiyev** has participated in the international conference. His 6 papers were published. They were published in Web of Science and Scopus base journal.

He was a chairman of the State Certificate Commission (in mathematics) in Azerb. State Oil and Industry University.

**Doct. ph.m.s.,prof.sen.r.a. H.M. Huseynov** is a member of editorial board of a lot of international and republican scientific journals. He is an adviser of magisters and doctoral students.

**Doct. ph.m.s.,prof.sen.r.a. S.S. Mirzoyev's** two cand. for degrees have submitted their dissertation works to the Scientific Council of IMM.

**Doct. ph.m.s.,prof.sen.r.a. V.M. Gurbanov** is a member of editorial board of a lot of international and republican scientific journals. He is an adviser of magisters and doctoral students.

Many of the department collaborators are engaged in pedagogical activity in different higher education institutions of the Republic.

### **Professional trips**

In the report period doct. ph.m.s.,prof.sen.r.a. S.A. Aliyev has participated at an international Conference (Egyptian Arabic Republic) .

### **PARTICIPATION IN SCIENTIFIC SEMINARS**

All the collaborators have participated in the institute and department seminars.

## **PUBLISHED SCIENTIFIC PAPAERS**

In the report period, 23 papers and 30 abstracts of the employees of the department were published, 3 papers were submitted for publication. 18 of them were published in foreign journals, 12 in web of science and Scopus base journals.

**Heard of department:**

**d.ph.m.s.prof.s.r.a.H.İ.Aslanov**