Semi-Annual Report of Functional Analysis department for 2019

The staff of "Functional Analysis" department consists of 21 employees including 18 research associates. 7 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.Mukhtarov Fekhreddin Sh. c.ph.m.s.,lead.r.a.
9.Jabrailova Afet N. c.ph.m.s.,lead.r.a.
10.Ibadova Irade A. c.ph.m.s,.lead.r.a.
11.Latifova Aygun R. phd in math.,chief.r.a.
12.Vahabov Nazim G. chief.r.a.
13.Guliyev Namiq I. c.ph.m.s.,r.a.
14.Khalilov Vuqar S. phd in math.,chief.r.a.
15.Jafarov Ilqar J. 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.Guluyev Tural M.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.

In the report period, 3 papers published in Ukrain, India, Azerbaijan and 3 abstract were published.

b)Work: "Number domain and spectrum of -operators in Banach space".

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

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.A.D. Farhadova., İ.A.İbadova. On strong law of large numbers for the family of first passage times for the level in random walk described by a non-linear function of autoregression process of order one (AR (1)) (məqalə - Caspian Journal of applied mathematics, ecology and economics jurnalının redaksiyasına təqdim olunub.

2. F.H. Rahimov ., A.D. Farhadova., İ.A.İbadova. Central limit theorem for perturbed Markov random walk described by the autoregreressive process of order one (AR(1)) Akademik Mirabbas Qasımovun 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.

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., Ragimov F.H., Farhadova A.D., Khalilov V.S. Limit theorems for the family of firs 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, p.p. 4-14. DOI.10.29229/uzmj.2019-1-1.

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 pensil 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.

g) Work: "Direct and inverse scattering problems for increasing potential

one-dimensional Schrodinger equation".

Ex: doct.p.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 .Обратные задачи для оператора Штурма-Лиувилля с условиями разрыва.Матем.заметки 2019 т 105 вып.6. с.932-936

2. H.M.Hüseynov. "Riyaziyyatın tədrisinin səmərəliliyinin artırılması haqqında" Azərbaycanda ali təhsilin beynəlmiləlləşdirilməsi və rəqabətliliyin 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.

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.В.М.Курбанов Х.Р.Ходжаева. О сходимости спектрального разложения по собственным функциям дифференциального оператора четного порядка // Дифференциальное уравнения, 2019, Т.55. №1 с.10-24.

(Tomson impact factor-məqalə)

2. V.M.Kurbanov , Kr.R. Gojayeva. On equiconvergence rate of spectral expansion in eigenfunctions 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 Gasimov. Baku/ June 7-8, 2019, p.101-102. (Tezis)

k) Work: "Representation of some exponential type entire functions".

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

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.

Three 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 Mar 2019, 15 p. https://arxiv.org/abs/1903.05338v1

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

l) Work: "Studying many-dimensional magnetic Helmholts equation in unbounded domain under radiation conditions".

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

The work was continued and 2 papers were published.

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, no. 1, pp. 59-75. https://www.azjm.org/volumes/9-1.html

Web of Science Core Collection, Emerging Sources Citation Index (ESCI); Scopus

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 Confe-rence 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, pp. 65-72. https://link.springer.com/chapter/10.1007/978-3-030-04164-9_12

Web of Science Core Collection, Conference Proceedings Citation Index - Science (CPCI-S); Scopus

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(məqalə çapa hazırlanıb)

2.A.N.Jabrailova., A.Sh.Shukurov. On frames that are interaters of a multiplication operator. AMEA RMİ-nin 60 illiyinə həsr olunmuş konfransın materialları . 23-25 oktyabr, 2019, Bakı(tezis çapa qəbul olunub)

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.

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 Iost 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.

One paper was submitted for publication.

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

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.А.Н.Сафарова. "Линейная обратная краевая задача для гиперболического уравнения второго порядка с диссинативным членом". "Riyaziyyat və mexanikanın aktual problemləri"adlı Respublika konfransının materialı ,23-24 may, 2019-cu il.

2.A.N.Safarova. "İnverse scattering problem for a semi-axis on a first apprioximation". "Operators, funcsions and sustems of mathematical physics" adlı Beynəlxalq Konfransının materialları 10-14 iyun, 2019-cu il.

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. (2017 impakt-faktoru: 3.241)

2.Guliyev N.J. On extensions of symmetric operators. Oper. Matrices, to appear. (2017 impakt-faktoru: 0.551)

3.Guliyev N.J. Schrödinger operators with distributional potentials and boundary conditions dependent on the eigenvalue parameter. J. Math. Phys., 60 (2019), no. 6, to appear. (2017 impakt-faktoru: 1.165)

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. S.A. Aliyev has participated at an international Conference (Egyptian Arabic Republic) with a report.

His one monograph has been published in the USA.

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 has participated in the international conference. His 3 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 trops

In the report period doct. ph.m.s.,prof.sen.r.a. S.A. Aliyev was on a professional trip in Dnepr city of Ukraine in may. S.A. Aliyev has participated at an international Conference (Egyptian Arabic Republic) with a report.

PARTICIPATION IN SCIENTFIC SEMINARS

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

PUBLISHED SCIENTFIC PAPAERS

In the report period, 13 papers and 7 abstracts of the employees of the department were published, 6 papers and 3 abstracts were submitted for publication. 13 of them were published in foreign journals, 5 in web of science and Scopus base journals, 2 in impact factor journal.

Heard of department: **d.ph.m.s.prof.s.r.a.H.İ.Aslanov**