Annual Report of Functional Analysis department for 2023

The staff of "Functional Analysis" department consists of 19 employees including 17 research associates. 9 of them doctor of sciences, professor.

1.Aslanov Hamidulla I. doct. ph.m.s.,prof.
2.Mammed Bayramoglu. 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 Elsad H. doct. ph.m.s.,ass.prof. sen.r.a.
9.Aslanova Nigar M. doct. ph.m.s.,prof. sen.r.a.
10.Mukhtarov Fekhreddin Sh. c.ph.m.s.,lead.r.a.
11.Jabrailova Afet N. c.ph.m.s.,lead.r.a.
12.Latifova Aygun R. phd in math.,chief.r.a.
13.Guliyev Namiq I. c.ph.m.s.,r.a.
14.Vahabov Nazim G. chief.r.a.
15.Alimardanova Kamilla A. c.ph.m.s.,chief. r.a.
16.Osmanli Jalala A. phd in math.,chief. r.a.
17.Safarova Aynur N. phd in math.,chief. r.a.
18.Iskenderli Guller Z.sen.lab.ass.
19.Bayramova Aygun F.sen.lab.ass.

I. Scientific part.

In 2023, in the department, according to the afformed plan 16 scientific works are carried out on "Spectral analysis of differential operators".

Theme "Spectral analysis of differential operators".

1).work: " Higher order trace formulas for second order operator- differential equations on a finite segment ." Ex. doct.ph.m.s., prof. H.I.Aslanov.

Let H- be a separable Hilbert space. In the space $H_1 = L_2([0,\pi], H)$

the consider the self- adjoint operators L and L_0 determined by the differential expressions

$$l_0(y) = -y''(x)$$
$$l(y) = -y'' + q(x)y$$

(1)

and boundary conditions

$$y(0) = y'(\pi) = 0$$

$$y(0) = y'(\pi) = 0 \qquad (2)$$

Assume that the operator-function Q(x) satisfies the following conditions:

1. For any $x \in (0, \pi)$ the operator $Q(x): H \to H$ is a kernel type self-adjoint operator. The operator - function Q(x) has continuous derivatives up to the fourth order for any $x \in (0, \pi)$ in the sense of the norm of the space $\sigma_1(H)$ and the operators $Q_{(x)}^{(i)}: H \to H$ $i = 1,2,3,4$ are also self-adjoint operators.

2. $\sup\limits_{0 \le x \le \pi} \|Q(x)\|_H < 1$

3. There is such an orthonormal basis $\{\varphi_n\}_{n=1}^{\infty}$ in the space that $\sum\limits_{n=1}^{\infty} \|Q(x)\varphi_n\|_{H_1} < \infty$

4. $\int\limits_0^{\pi} Q(x)dx = 0$

5. $Q^{(2i-1)}(0) = Q^{(2i-1)}(\pi) = 0, \quad i = 1,2$

Here $\sigma_1(H)$ is a space of kernel type operators acting in space H. The numbers

$$\left\{ \left(m - \frac{1}{2}\right)^2 \right\}_{m=1}^{\infty}$$ compose the

spectrum of the operator L_0. Each of these points is an infinite order eigenvalue of the operator L_0 and a system of orthonormal eigenfunctions corresponding to each of these eigen numbers is as $\psi_{mn}^{(0)} = \sqrt{\dfrac{2}{\pi}} \sin\left(m - \dfrac{1}{2}\right)x$

In the work the following main problem is proved:

Theorem: If the coefficient Q(x) of the operator (1) satisfies the conditions 1) - 5), the following equality the valid:

$$\sum_{m=1}^{\infty}\left[\sum_{n=1}^{\infty}\left(\lambda_{mn}^3 - \left(m - \frac{1}{2}\right)\right) - \frac{3\left(m - \frac{1}{2}\right)^2}{4\pi}\int_0^\pi trQ^2(x)dx - \right.$$

$$\left. - \frac{3}{16\pi}\int_0^\pi tr[Q'(x)]^2 dx - \frac{1}{\pi}\int_0^\pi g(x)dx + h\right] = \frac{3}{64}\left[trQ^{(IV)}(\pi) - trQ^{(IV)}(0)\right] -$$

$$- \frac{3}{8\pi}\left[trQ''(\pi)Q(\pi) - trQ''(0)\right] + \frac{1}{4\pi}\left[g(\pi) - g(0)\right] - \frac{h}{2}.$$

Here $\qquad h = \dfrac{15}{8}\sum_{i=1}^{\infty}\sum_{j=1}^{\infty}\left|\beta_{ij}\right|,$

$$\beta_{ij} = \frac{1}{\pi^2}\sum_{n=1}^{\infty}\sum_{q=1}^{\infty}\sum_{s=1}^{\infty}\int_0^\pi \left(Q(x)\varphi_n, \varphi_q\right)\cos ix\,dx \cdot \int_0^\pi \left(Q(x)\varphi_q, \varphi_s\right)_H \times$$

$$\times \cos(i - j)x\,dx \cdot \int_0^\pi \left(Q(x)\varphi_s, \varphi_n\right)\cos jx\,dx,$$

$$g(x) = \sum_{n=1}^{\infty}\sum_{q=1}^{\infty}\sum_{s=1}^{\infty}\int_0^\pi \left(Q(x)\varphi_n, \varphi_q\right)\cos ix\,dx \cdot \left(Q(x)\varphi_q, \varphi_s\right)_H \cdot \left(Q(x)\varphi_s, \varphi_n\right)_H dx$$

This formula is called a regularized trace formula of third order.

Note that the first order regularized trace formula for problem (1), (2) was found in [1], the second order trace formula in (2).

Paper (is in print)

1.Асланов Г.И., Сулейманов С.Е. Об асимптотике обобщенных решений краевых задач для эллиптических уравнений второго порядка в неограниченных областях типа слоя. Journal of Baku Engeneering University, Mathematics and computer science, volume 7, number 1, 2023.

Theses

1.H.İ.Aslanov, M.Bayramoğlu. On asimptotic properties of eigen-values of higer order operator-differential equations on the semi-axis. International conference "Modern problems of Mathematical and Mechanics" 26-28 april, 2023, Baku, Azerbaijan, p. 118-119

2.Асланов Г.И., Ейвазлы Г. Принадлеженост резолvenты операторного уравнения высокого порядке на конечном отрезке к классу $\mathfrak{G}_2$.
Материалы III международной конференций "Теоретические и прикладные проблемы математики". Сумгаитский Государственный Унтверситет 25-26 апреля 2023,стр.39-41

Literature

1.İnci Albayrak, Kevser Koklu, Azad Bayramov. A regularized trace formula for differential equations with trace class operator coefficients. Rocky Mountain Journals of Mathematics, volume 40, number 4, 2010, p. 1095 -1110.

2.Ehliman Adigüzelov, Yonca Sezer. The second regularized trace of self adjoin differential operator given in a finite interval with bounded operator coefficient. Mathematical and computer Modeling 53 (2011) 553-565.

 2). work: "Spectral analysis of discontinuous coefficient Shtrum Liouville operator on a finite segment ." Ex: doct.ph.m.s.,prof. sen.re.a. H.M.Huseynov.

In the paper, integral representation for the selections satisfying the initial conditions were obtained. The properties of its kernel, the asymptotics of eigen and normalizing numbers are studied. The

$$\frac{1}{\rho(x)}\left(\rho(x)y'\right)' + q(x)y = \lambda y, \ 0 < x < \pi \quad (1)$$

equation (1) considered. Here $q(x) \in L_2(0,\pi)$ is a real-valued function for $\rho(x) = 1$, $x \in (0,a)$ and $\rho(x) = \alpha$, $x \in (a,1)$, $0 < \alpha \neq 1$, $a \in (0,\pi)$.

In the paper, the spectrum and normalizing numbers for the problems created by the conditions

$$y(0) = y(\pi) = 0 \qquad (2)$$
$$y(0) = y'(\pi) = 0 \qquad (3)$$

and also direct and inverse problems with respect to the spectrum of this problem are considered and the following results are obtained.

1) The asymptotics of the spectrum of problems (1)-(2) and (1)-(3) were obtained and their priorities was shown.

2) The asymptotics of the problem (1)-(2) was obtained.

3) The representation of the equation (1) was obtained and the expression of its kernel by q(x) was found.

4) The inverse problem with respect to two spectra and normalising numbers was solved.

5) The algorithm of the solution of the inverse problem was given.

Thesis(is in print)

1. **H.M.Hüseynov** "Kəsilən əmsallı Dirak tənliklər sistemi üçün yarımoxda səpilmənin tərs məsələsi".Ümummilli lider H.Əliyevin 100 illiyinə həsir olunmuş elmi konfrans tezisləri. Bakı 2023 May Biznes universiteti .

Paper(is in print)

1.H.M.Hüseynov, A.F.Mamedova "Scattering problem of the perturbed Airy equation on a half-axis.".Proceedings of the İMM NASA

 3) . work: " Convergence of spectral expansion by eigenfunctions   of the Dirac operator ." Ex:doct.ph.m.s., prof. sen.re.a. V.M.Kurbanov.

Paper

1. В.М.Курбанов, Х.Р.Годжаева. О бесселевости систем корневых функций дифференциального оператора второго порядка. // Pedaqoji Universitetin Xəbərləri, 2023, №2, стр.8-15.

Paper (was submitted to print)

2. V.M. Kurbanov, E.J. Ibadov. On the properties of the systems of root vector functions of Dirac-type operator with summable potential. // Operators and Matrix

Theses

1. V.M.Kurbanov, A.I.Ismailova. Riesz property criterion for the system of root function of second order differential operator. // Ümummilli lider Heydər Əliyevin 100 illiyinə həsr olunmuş "Riyaziyyat və Mexanikanın Müasir Problemləri" adlı Beynəlxalq konfrans, Bakı, 26-28 aprel 2023, pp. 233-234.

2. V.M.Kurbanov, Y.Q.Abbasova. Bessel property for the system of root vector-functions of the second order differential operator with summable coefficients // Ümummilli lider Heydər Əliyevin 100 illiyinə həsr olunmuş "Riyaziyyat və Mexanikanın Müasir Problemləri" adlı Beynəlxalq konfrans, Bakı, 26-28 aprel 2023, pp. 231-232.

4) . work: " Studying solvability conditions of boundary value problems for second operator-differential equations "
Ex: doct.ph.m.s.,prof. sen.re.a. S.S.Mirzoyev.

In the separable Hilbert space H in the interval (0,1) the following boundary value problem is considered :

$$p\left(\frac{d}{dt}\right)u = -u''(t) + \left(A_1 + T_1\right)u''(t) + \left(A_2 + T_2\right)u'(t) + \rho(t)A^2 u(t) = f(t) \quad (1)$$

$$u(0) = 0, \quad u(1) = 0 \qquad\qquad (2)$$

It is assumed that the coefficients of the equation satisfy the following conditions:

1) The spectrum of the operator A is located in the sector

$$S_2 = \left\{\lambda : |\arg \lambda| < \varepsilon, \ 0 \le \varepsilon \le \frac{\pi}{2}\right\} \quad \text{and is an operator with}$$

completely continuous A^{-1} inverse.

2) The operators $B_1 = A_1 A^{-1}$ and $B_2 = A_2 A^{-2}$ are bounded operators in the space H

3) The operator $K_1 = T_1 A^{-1}$ and $K_2 = T_2 A^{-2}$ and are completely continuous operators in the space H.

4) $\rho(t)$ is a measurable bounded function so that $0 \le \alpha \le \beta < \infty$

By $\mathring{W}_2^2\big((0,1); H\big)$ we denote the following space:

$$\mathring{W}_2^2((0,1);H) = \left\{ u : u''(t) \in L_2((0,1);H), \ A^2 u \in L_2((0,1);H), \ u(0) = u(1) = 0 \right\}$$

In this space, the norm of the element is determined as follows:

$$\|u\|_{\mathring{W}_2^2((0,1);H)} = \left(\|u''(t)\|_{L_2((0,1);H)}^2 + \|A^2 u\|_{L_2((0,1);H)}^2 \right)^{1/2}$$

 It is proved that within the

conditions 1) – 4) the operator

$$Pu = p\left(\frac{d}{dt}\right)u, \quad u \in \mathring{W}_2^2((0,1);H) \quad \text{is a bounded operator acting from}$$

$\mathring{W}_2^2((0,1);H)$ to $L_2((0,1);H)$.

The following main theorem was proved.

Theorem. Assume that the coefficients of the given equation satisfy the conditions

1) – 4) and the following condition is satisfied**:**

$$\alpha_1(\varepsilon)\|\beta_1\| + \alpha_2(\varepsilon)\|\beta_2\| < 1$$

Here $\quad \alpha_1(\varepsilon) = \dfrac{1}{2\sqrt{2}\cos\varepsilon}, \quad 0 \le \varepsilon < \dfrac{\pi}{2}$

$$\alpha_2(\varepsilon) = \begin{cases} \dfrac{1}{2}, & 0 \le \varepsilon < \dfrac{\pi}{2} \\[2mm] \dfrac{1}{2\sqrt{2}\cos\varepsilon}, & \dfrac{\pi}{4} \le \varepsilon \le \dfrac{\pi}{2} \end{cases}$$

Then the operator P is a Fredholm type operator acting from the space

$\mathring{W}_2^2((0,1);H)$ to the space $L_2((0,1);H)$, i.e.

the domain of estimation of the operator P is closed, and $\ker p = \operatorname{codim} p$

5. Restoration problems for a bundle of quadratic

Sturm- Liouville type operators.

5) work: " Renewal problems for a bundle of quadratic Strum-Liouville operators."Ex: doct.ph.m.s., prof. sen.re.a. I.M.Nabiyev.

In 2023, inverse spectral problems were studied for a bundle of quadratic Sturm-Liouvill operators with a spectral parameter in one of boundary conditions in the nonlinear form. Spectral data uniquely determining the operator bundles and their main properties were studied. The sequence of eigenvalues of two spectral

problems was taken as main spectral data. A uniqueness theorem for solving the inverse problem was solved and an algorithm was composed.

Paper

1. I.M. Nabiev, L.I. Mammadova, G.S. Mammedzadeh. Algorithms for recovery of diffusion and Sturm-Liouville operators with semi-separated boundary conditions // Proceedings of the Institute of Mathematics and Mechanics, National Academy of Sciences of Azerbaijan, 2023, v. 49, issue 2. https://proc.imm.az/inpress/pimm0251.pdf

Theses

1. I.M. Nabiev, L.I. Mammadova, G.S. Mammedzadeh. On the uniqueness of the recovery of the non-selfadjoınt differential operator from spectral data / 2nd International Conference on Innovative Academic Studies ICIAS 2023 January 28 - 31, 2023 in Konya, Turkey. Abstract Book, p. 228.

https://drive.google.com/file/d/1QwAfEdWjFFaTrhVnnFRCHHvEuwwmcaZ1/view?usp=sharing

2. I.M. Nabiev, L.I. Mammadova, G.S. Mammedzadeh. Some properties of eigenvalues and eigenfunctions of the diffusion operator with a spectral parameter in the boundary condition / 1st International Conference on Scientific and Innovative Studies ICSIS 2023 April 18 - 20, 2023 Konya, Turkey. Abstract Book, p. 120.

https://drive.google.com/file/d/1r03TxhkBCAXPEjJQrU6xTEOFQEq0fwUk/view?usp=sharing

Theses (was submitted to print)

3. İ.M. Nəbiyev, L.İ. Məmmədova, A.V. Abbaslı. Sərhəd şərtində spektral parametr olan Dirak operatorunun bərpası haqqında / Ümummilli Lider H. Əliyevin anadan olmasının 100-cü ildönümünə həsr edilmiş Beyn. elmi-prak. konf. mater., Bakı, 13 aprel 2023, Biznes Univ. nəşr., s.

2. A. G. Ferzullazadeh, I.M. Nabiev. A sufficient condition on the solution of the

inverse problem for a Dirac operator with a spectral parameter in the boundary condition / Международная научно-практическая конференция «Спектральная теория операторов и смежные вопросы», посв. 75-летию проф. Я.Т. Султанаева. Сборник тезисов (г. Уфа, 26-27 октября 2023 г.), с. 61 https://matem.anrb.ru /sult2023

6) work: " The existence and uniqueness conditions for smooth solutions for two classes of third order operator differential equation ."
Ex: doct.ph.m.s., prof. sen.re.a. A.R.Aliyev.

In the paper two family of third order operator-differential equations with repetitive characteristics is studied. The notion of "Smooth" regular solution is introduced for these equations and sufficient conditions for "Smooth" regular solvability are found.

Paper

1.Aliev A.R., Muradova N.L. On conditions of regular solvability for two classes of third-order operator-differential equations in a fourth-order Sobolev-type space. *Turkish Journal of Mathematics*, 2023, vol. 47, no. 2, pp. 608-619. (WoS-SCIE; Scopus)

Paper (was submitted to print)

1.Алиев А.Р., Эйвазов Э.Х. О сумме отрицательных собственных значений трехмерного оператора Шредингера. *Математические заметки*, 2024, том 115, вып. 2 (**WoS-SCIE**; **Scopus**).

Theses

1.Aliev A.R., Rzayev E.S. On solvability of boundary-value problem for fourth-order elliptic equation with operator coefficients. Proceedings of the International Conference on Modern Problems of Mathematics and Mechanics dedicated to the

100-th anniversary of the National Leader Heydar Aliyev, 26-28 April 2023, Baku, Azerbaijan, p.p. 58-60.

2.Aliev A.R. On the conditions for the existence of smooth solutions from Sobolev-type space for two classes of fourth order operator-differential equations. International Conference on Nonlinear Phenomena in Biology, Ecology, Physics and Mechanics in honour of Professor Messoud Efendiev on the occasion of his 70th birthday, 22-26 October 2023, Baku, Azerbaijan, p.p. 6-7.

7) work: Some spectral problems for a fourth order operator coefficient differential equation."
Ex. : doct. ph.m.s.,prof.sen.r.a. M.Bayramoglu., doct. ph.m.s.,prof. sen.r.a. N.M.Aslanova

In the paper self-adjoint extensions are studied for a second order differential operator expression by leaving the space. In one particular case, asymptotic formula is obtained and regularized trace is calculated.

Papers

1. Fatma Aydın Akgun., Mamed Bayramoglu,"A regularized trace of an even order differential operator with bounded operator coefficient in a finite interval", FILOMAT journal of mathemati s, vol.37, no 11, 2023

2. Nigar M.Aslanova, Khalig M.Aslanov, "On self-adjoint extensions of symmetric operator with exit to larger space" Twis jurnal of pure and applied mathematics vol.14, no 1, 2023, pp. 91-105

8) work: " Relation between discontinuity points of a transfer function and eigenvalues of the perturbed operator."
Ex: doct.ph.m.s., ass.prof. sen.re.a. E.H.Eyvazov.

Construction of the projection operator to the boundary subspace is very important in solving boundary value problems stated for differential operators whose coefficient are distributions. In the report year, the projection of the Dirac function used widely in solving a boundary value problem for Schrodinger equation on the space of multi-point self centered distributions, was constructed.

Theses

1.**E.H.Eyvazov., L.V. Ibrahimova** "On the discreteness of the spectrum of a degenerate elliptic differential operator" , Modern Problems of Mathematics and

Mechanics PROCEEDINGS of the International Conference dedicated to the 100-th anniversary of the National Leader Heydar Aliyev Baku, 26-28 Aprel 2023, səh. 160-161.

Theses (was submitted to print)

1.**E.H.Eyvazov** "Dirak funksiyasinin ikinöqtəli çoxluğa mərkəzləşmiş ümumiləşmiş funksiyalar fəzasina proyeksiyasi", BAKI BIZNES UNIVERSITETI, Ümummilli Lider Heydər Əliyevin anadan olmasının 100-cu ildönümünə həsr edilmiş "Riyaziyyatın və İnformasiya Texnologiyalarının bəzi actual məsələləri" mövzusunda Beynəlxalq elmi- praktiki konfransın materialları, Bakı, 13 aprel, 2023-ci il.

1.**E.H.Eyvazov, A.R.Əliyev** "О сумме отрицательных собственных значений трехмерного оператора Шредингера", Математические заметки, 2024, том 115, выпуск 2.

9).work: " On spectral theory of operator bundles ". Ex: cand.ph.m.s., ass.prof. lead r.a. A.R.Jabrailova

Thesis

1.R.Dzabarzadeh, A.Jabrailova. Some results of multiparameter spectral theory. «Riyaziyyat və Mexanikanın Müasir Problemləri» Ümum. Lider H.Əliyevin 100-illik yubileyinə həsr olunmuş Beynəlxalq konfransın materialları.Bakı,26-28 aprel 2023,səh.156

10)work: " Studying multi-interval boundary value problems "
Ex: cand.ph.m.s., ass prof. lead r.a. F.Sh.Mukhtarov.
In the work, a Strum-Liouville type equation determined in two non-intersecting intervals, is considered. A periodic boundary value problem is considered in the intervals (a,c) and (c,b) with the mutual point. x=c. The differential transformation method for solving this boundary value problem is used.

Papers

1.F.Sh.Muhtarov, M.Yucel.O.Sh.Muhtarov. Generalized differential transformation method for solving two-interval weber equation subject to transmission conditions.Bulletin of the Karaganda University.pp.168-176. https://mathematics-vestnik.ksu.kz/

2.**Fahreddin S.Muhtarov,Merve Yücel.** " Parameterized Differential Transform Method and Its Application to Boundary Value Transmission Problems" Yuzuncu yil University,Journal of the İnstitute of Natural and Applied Sciences.Volume 28,İssue 2 (avqust),p412-423,2023

Thesis

1.F.Sh.Muhtarov. "Rayleigh quotient for two-interval periodic Shturm-Lioville problems." Ümumilli Lider Heydər Əliyevin 100-illik yubileyinə həsr olunmuş Beynəlxalq konfrans, səh 288-290

11) .work: " Mixed inverse problems for Strum-Liouvill operator containing a spectral parameter in boundary conditions ."
Ex: cand.ph.m.s., lead.r.a. N.J.Guliyev.

In the report period, the properties of the Weyl- Titchmarch function of Sturm-Liouville operator containing a spectral parameter in the boundary conditions, have been studied.

Paper

1. Guliyev N.J. Inverse square singularities and eigenparameter-dependent boundary conditions are two sides of the same coin, Q. J. Math., 74(2023) no 3, 889-910. https://doi.org/10.1093/qmath/haad004

12) .work: " Scattering problems for a system of ordinary differential equations on a semi-axis."Ex:c.ph.m.s.,chief. r.a. K. A. Alimardanova

In the report period, direct scattering problems were studied for a system of ordinary differential equations on a semi-axis three problems have been considered. The scattering operator was determine. A theorem on the existence and uniqueness of the scattering problem was proved.

Thesis

1. A.N.Safarova, K.A.Alimardanova. The scattering problem for the system of six ordinary differential equations on a semi-axis with three given incident waves / "Riyaziyyat və mexanikanın müasir problemləri" adlı Ümummilli Lider Heydər Əliyevin 100 illik yubileyinə həsr olunmuş Beynəlxalq Konfransının Materialları, 26-28 aprel 2023 il, Bakı, Azərbaycan, səh. 353-354.

13) .work: " Direct and inverse problems of spectral analyses for a class of Sturm-Liouvill operators."

Ex:phd in math.,chief.r.a. A.R. Latifova

Studies on the topic have been continued.

 14) .work: " Goldberg spectrum of the norm Hermite operators, its numerical range and the Lax milgram theorem "

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

The structure of the norm- Hermitian type operator were studied and the state diagram of Taylor. Goldberg was researched.

The operators that are the analogs of unitary operators in Banach space were introduced. The Laxmilgram type theorem in Hilbert space is proved. The obtained proof method is determined from simpler and easily verifiable conditions .

Theses

1.N.G.Vahabov The generalized Lenggel-Stone criterian and its applications. Modern problems of Mathematics and Mechanics Baku, 2023, p. 395-396.

2.N.G.Vahabov Normally-unitary operators. Modern problems of Mathematics and Mechanics Baku, 2022, p. 205-206.

3.N.G.Vahabov Isoabelian operators. Modern problems of Mathematics and Mechanics Baku, 2017, p. 220-221.

15) .work: " Inverse problem for Sturm - Lioville operator in the impedance form " Ex: phd in math.,chief. r.a. J. A. Osmanli

The main equation of the inverse problem has been obtained and its solvability has been studies

16) .work: " A scattering problem for a system of ordinary differential equations in the case of three incident and three scattered waves on a semi-axis were considered."
Ex: phd in math., chief. r.a. A. N. Safarova

Three problems were considered on a semi-axis, the asymptotic of the solution in the infinity is recorder when the coefficients satisfy some decreasing conditions. Studying the scattering problem was reduced to the system of integral equations. The scattering matrix was determined.

Theses

1. A.N.Safarova, K.A.Alimardanova. The scattering problem for the system of six ordinary differential equations on a semi-axis with three given incident waves /

"Riyaziyyat və mexanikanın müasir problemləri" adlı Ümummilli Lider Heydər Əliyevin 100 illik yubileyinə həsr olunmuş Beynəlxalq Konfransının Materialları, 26-28 aprel 2023 il, Bakı, Azərbaycan, səh. 353-354.

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. A.R. Aliyev is number and invited reporter of the International Scientific Conference "Nonlinear phenomena in Biology, Ecology, physics and Mechanics" devoted to the 70-th anniversary of the honored scienties of the Republic of Azerbaijan Mesud Efendiyev, and held at UNEC, an 22-26 October, 2023.

Aliyev A.R. On March 2019 April 2023 was the chairman of the Expert Councl at H.A.C. the was the reviewer of the following journals:

1. Proceedings of the Institute of Mathematics and Mechanics — 1 review
Mathematical Reviews (USA) — 2 reviews

He is a members of the journal of "proc. of IMM"

He is the editor in chief of the journal "Baku Mathematical Journal" and "Azerbaijan Journal of High Performance Computing"

Doct. ph.m.s.,prof.sen.r.a. I.M. Nabiyev in 2023 has participated in 4 International Conferences, has 3 abstracts, Proc. of Conferen and research paper (WOS, SCOPUS). He was the chairman of State Attestation Commission in Azerbaijan State University of Oil and Industry.

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.

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

PARTICIPATION IN SCIENTFIC SEMINARS

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

THE PUBLISHED SCIENTIFIC PAPERS

8 papers, 15 abstract of the department employees were published, 6 papers and 4 abstracts were submitted for publication. 7 of these papers were included into the Science of Scopus base.

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