

Report of “Differential Equations” Department on scientific and social activities for 2020

The department consists of 15 collaborators. There are 13 scientific workers, including 8 doctors of sciences and 4 philosophy doctors. The department conducts 10 research studies on one subject according to the plan in 2020.

Executed scientific works

Theme: “Some problems of Theory of Partial Differential Operators”.

Work 1. Hyperbolic mixed problems with dynamic boundary condition.

Executer: d.ph.m.s., prof. A.B.Aliev.

- a) The following mixed problem with a nonlinear dynamic boundary condition for a nonlinear wave equation has been investigated:

$$t > 0, t > 0, \quad (3.1.1)$$

$$\begin{aligned} \varepsilon u_{tt}(t, 0) - u_x(t, 0) + \gamma_0 u(x, 0) + b_{10}(u_t(t, 0)) + \\ + b_{20}(u(t, 0)) = f_0(t), \quad t > 0, \end{aligned} \quad (3.1.2)$$

$$\begin{aligned} \delta u_{tt}(t, 1) + u_x(t, 1) + \gamma_1 u(x, 1) + b_{11}(u_t(t, 1)) + \\ + b_{21}(u(t, 1)) = f_1(t), \quad t > 0, \end{aligned} \quad (3.1.3)$$

$$u(0, x) = \phi(x), u_t(0, x) = \psi(x), \quad (3.1.4)$$

Here $\varepsilon > 0, \delta > 0$;

$\gamma_0 \geq 0, \gamma_1 \geq 0, \gamma_0 + \gamma_1 > 0, f(\cdot), f_0(\cdot) \vee f_1(\cdot)$ are real-valued functions;

$$B_1(s) = \mu |s|^{q-1} s, \quad b_{10}(s) = \mu_0 |s|^{q_{10}-1} s \vee b_{11}(s) = \mu_1 |s|^{q_1-1} s,$$

So, $\mu, \mu_0, \mu_1, q, q_1, q_2$ are real numbers that satisfy the following conditions :

$$\mu \geq 0, \mu_0 \geq 0, \mu_1 \geq 0 \vee q > 1, q_0 > 1, q_1 > 1. \quad (3.1.5)$$

If the functions $B_2(\cdot), b_{20}(\cdot)$ and $b_{21}(\cdot)$ satisfies the local Lipschitz condition, i.e.

$$|B_2(x, s_2) - B_2(x, s_1)| \leq c(|s_1|, |s_2|) |s_2 - s_1|, \quad (3.1.6)$$

$$|b_{20}(s_2) - b_{20}(s_1)| \leq c_0(|s_1|, |s_2|) |s_2 - s_1|, \quad (3.1.7)$$

$$|b_{21}(s_2) - b_{21}(s_1)| \leq c_1(|s_1|, |s_2|) |s_2 - s_1|, \quad (3.1.8)$$

$$0 \leq x \leq 1, s_1, s_2 \in R, c(\cdot), c_0(\cdot), c_1(\cdot) \in (R_+^2; R_+), R_+ = (0, \infty)$$

the existence of local solution of the problem (3.1.1)-(3.1.4) has been investigated.

In some cases, the existence and uniqueness of a global solution to the problem has been proved.

- b) The following mixed problem with the nonlinear dynamic coupling condition for a strongly dissipated nonlinear wave equation has been investigated:

$$u_{tt} - (\mu_1(x)u_x)_{xt} - \eta_1(x)u_{xx} = f_1(u) + \zeta_1(t, x), \quad 0 \leq t \leq T, \quad 0 \leq x \leq 1, \quad (1)$$

$$v_{tt} - (\mu_2(x)v_x)_{xt} - \eta_2(x)v_{xx} = f_2(v) + \zeta_2(t, x), \quad 0 \leq t \leq T, \quad 1 \leq x \leq 2 \quad (2)$$

$$u(t, 0) = 0, \quad v(t, 2) = 0, \quad (3)$$

$$u(t, 1) = v(t, 0) = \phi(t)$$

$$\begin{aligned} \phi_{tt}(t) + \gamma_1 u_{xt}(t, 1) - \gamma_2 v_{xt}(t, 1) + \beta_1 u_x(t, 1) + \\ + \beta_2 v_x(t, 1) = h(\phi) + g(t), \end{aligned} \quad (4)$$

$$u(0, x) = u_0(x), \quad u_t(0, x) = u_1(x). \quad (5)$$

$$\phi'(0) = \phi_1, \quad (6)$$

Problems (1) - (6) are considered under the following conditions:

- (i) $\mu_1(\cdot) \in C^1[0,1], \quad \mu_2(\cdot) \in C^1[1,2];$
- (ii) $\mu_1(x) > 0, \quad 0 \leq x \leq 1, \quad \mu_2(x) > 0, \quad 1 \leq x \leq 2;$
- (iii) $\eta_1(\cdot) \in L_\infty(0,1), \quad \eta_2(\cdot) \in L_\infty(1,2);$
- (iv) $\gamma_1 > 0, \quad \gamma_2 > 0;$
- (v) $\beta_1, \beta_2 \in \mathbb{R};$
- (vi) $\zeta_1(t, x) \in C^1([0, T] \times L_p(0,1));$
- (vii) $\zeta_2(t, x) \in C^1([0, T] \times L_p(1,2)),$
- (viii) $g(t) \in C^1([0, T])$
- (ix) $|f_k(t) - f_k(s)| \leq c_1(t, s) \cdot |t - s|, \quad k = 1, 2, \quad c_1(t, s) \in C(\mathbb{R} \times \mathbb{R}),$
- (x) $|h_k(t) - h_k(s)| \leq c_2(t, s)|t - s|, \quad c_2(t, s) \in \mathbb{R} \times \mathbb{R}$

Let's denote the norm of $L_p(0,1)$ and $L_p(1,2)$ respectively with $\|\cdot\|_{p,1}$ and $\|\cdot\|_{p,2}$ and introduce the following spaces:

$$\begin{aligned} X_p = \{w: w = (u, v, \alpha), u \in L_p(0,1), v \in L_p(1,2), \alpha \in \mathbb{C}\}, \quad \text{with the norm} \\ \|w\|_{X_p} = \left[\int_0^1 \|u(x)\|_p^p dx \right]^{\frac{1}{p}} + \left[\int_1^2 \|v(x)\|_p^p dx \right]^{\frac{1}{p}} + |\alpha|, \quad \text{where} \end{aligned}$$

$$w = (u, v, \alpha), u \in L_p(0,1), v \in L_p(1,2), \alpha \in C.$$

$$Y_p = \{w: w = (u, v, \phi), u \in W_p^2(0,1) \cap W_p^1((0,1);0), \\ v \in W_p^2(1,2) \cap W_p^1((1,2);2), u(1) = v(1) = \phi\} \text{ with the norm}$$

$$\|w\|_{Y_p} = \|u_{xx}\|_{p,1} + \|u_x\|_{p,1} + \|v_{xx}\|_{p,2} + \|v_x\|_{p,2}$$

Theorem. Suppose that conditions (i) - (x) are satisfied. Then for any $u_0(\cdot) \in W_p^2(0,1) \cap W_p^1((0,1);0)$,

$$u_1(\cdot) \in L_p(0,1), v_0(\cdot) \in W_p^2(1,2) \cap W_p^1((1,2);2), v_1(\cdot) \in L_p(1,2), \phi_1 \in R$$

there exists such a number T_0 that the problem (1)-(6) has a unique solution:

$$u \in C([0, T_0] \times W_p^2((0,1);0)) \cap C^1((0, T_0) \times L_p[0,1]) \cap$$

$$\cap C^1((0, T_0] \times W_p^2(0,1) \cap W_p^1((0,1);0)) \cap C^2((0, T_0) \times L_p[0,1]),$$

$$u \in C([0, T_0] \times W_p^2((1,2);2)) \cap C^1((0, T_0) \times L_p[1,2]) \cap$$

$$\cap C^1((0, T_0) \times W_p^2(1,2) \cap W_p^1((1,2);2)) \cap C^2((0, T_0) \times L_p[1,2]),$$

$$\text{So, } \phi(t) \in C[0, T_0] \cap C^1(0, T_0] \cap C^2(0, T_0),$$

$$u_x(t, 1), v_x(t, 1) \in C(0, T_0), u_{tt}(t, 1), v_{tt}(t, 1), u_{tx}(t, 1), v_{tx}(t, 1) \in C(0, T_0).$$

Published works:

1) **A. B. Aliev and G. Kh. Shafieva, Mixed Problem with Dynamical Boundary Condition for a One-Dimensional Wave Equation with Strong Dissipation**

Mathematical Notes, 2020, Vol. 107, No. 3, pp. 152–155. © Pleiades Publishing, Ltd., 2020.
Russian Text © The Author(s), 2020, published in Matematicheskie Zametki, 2020, Vol. 107, No. 3, pp. 466–469 .

2) **A. B. Aliev and S. E. Isayeva, Attractors for Semilinear Wave Equations**

with Acoustic Transmission Conditions , Differential Equations, 2020, Vol. 56, No. 4, pp. 447–461. © Pleiades Publishing, Ltd., 2020.

Russian Text © The Author(s), 2020, published in Differentsial'nye Uravneniya, 2020, Vol. 56, No. 4, pp. 459–474 .

3) Akbar B. Aliev, · Samira O. Rustamova , Mixed problem for one-dimensional wave equation with dynamic boundary condition, Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics, 40 (1), (2020), p. 1-13.

Submitted for publication:

1) Алиев А.Б., Фархадова Е.М., The global existence and asymptotic behavior of the solution, the mathematical model of the oscillations of the suspension bridge, in the case when the tensioning cable has one common point with the roadbed.

2) A. B. Aliev and G. Kh. Shafieva A mixed problem with a dynamic transmission condition for a one-dimensional hyperbolic equation with strong dissipation

Thesis and conference materials:

1. Алиев А.Б., Фархадова Е.М., Исследования математической модели колебаний подвешенного моста имеющий общую точку контакта с кабелем. ВВМШ Понtryгинские чтения (Beynəlxalq konfransın Materialları, Voronej - Rusiya) /Воронежский государственный университет 2020 г.3–9 мая.-стр.23.
2. Рустамова С.О. Смешанная задача для одномерного волнового уравнения с динамическим граничным условием /Воронежский государственный университет 2020 г.3–9 мая.-стр. 168 (postgraduate student of department, supervisor – prof. A.Aliev)

Work 2: On selfadjoint extensions of symmetric operator with exit from space.
İcraçılar: prof. M.Bayramoğlu, r.e.d., prof. N.M.Aslanova.

Published works:

- 1) “On selfadjoint extensions of symmetric operator with exit from space” adlı məqalə <https://arxiv.org/abs/2004.07602>

Submitted for publication:

An article is also being prepared for publication.

Work 3: Wiman-Valiron-type estimates for partial differential equations. **Executor:** d.ph.m.s., prof. N.M.Suleymanov.

Wiman-Valiron-type estimates for such differential equations in Hilbert space are correct:

$$U'(t) + A(t)U(t) = 0$$

Here $A(t)$ is a self-adjoint positive and discrete spectral elliptical operator. The following estimate is proved for certain class increasing functions $\phi(y) > 0, y > 0$ by putting some conditions on $N(\lambda)$.

$$\|U(t)\| \leq \mu(t)t^{-\gamma} \sqrt{\phi(\log \mu(t))}, \gamma > 0, t \rightarrow 0.$$

Thus, this relationship can be violated in the set with a finite logarithmic dimension.

Published works:

2 articles about the work are being prepared for publication

Work 4: Regularity of solutions of nonlinear elliptic equations with VMO coefficients.
Executor: d.ph.m.s., prof. T.S.Gadjiev.

Published works:

1. "The Dirichlet problem for the uniformly elliptic equation in generalized weighted Muckenhoupt spaces." *Studia Scientiarum Mathematicarum Hungaria*, 57 (1), 2020, p. 68-90. (IF.0.309).
2. ICMSEM- 2020. Preceeding The Fourteenth International conference on Management Science and Engineering Management. – The Behaviour of Solutions to Degenerate Double Nonlinear Parabolic Equations. p. 1-15. Springer (EI retrieval)
3. ICMSEM- 2020. Preceeding The Fourteenth International conference on Management Science and Engineering Management. – A mathematical model of soil fertility. p.21-39 Springer(EI retrieval)
4. Solvability boundary value problem for degenerated equations – *Ukr. Mat. Journal*, 2020, 72, № 4 (IF.0.432)
5. *Trans. Natl. Acad. Sci. Azerb. Ser. Phys.-Tech. Math. Sci. Mathematics*, 40 (2), 1-13 (2020). The behavior of solution higher order nonlinear parabolic equations. (Scopus)

These works were published in the book of series

1. "Advances in Intelligent Systems and Computing". Publisher intends – Springer. 2020, volume

Theses:

1. **Gadjiev T.**, Suleymanova K., Galandarova Sh. The regularity of solutions of elliptic and parabolic equations with discontinuous coefficients. XXXV International Conference PROBLEMS OF DECISION MAKING UNDER UNCERTAINTIES (PDMU-2020, May 11-15), p. 42

2. **Gadjiev T.**, Rasulov R. Nonlinear elliptic equations with VMO coefficients. XXXV International Conference PROBLEMS OF DECISION MAKING UNDER UNCERTAINTIES (PDMU-2020, May 11-15), p. 42
3. **Gadjiev T.**, Kerimova M., Gasanova G. The solvability of boundary value problem for degenerate equations. XXXV International Conference PROBLEMS OF DECISION MAKING UNDER UNCERTAINTIES (PDMU-2020, May 11-15), p. 42
4. **Gadjiev T.**, Rustamov Y., Maharramova T. Forcing the system by a drift. XXXV International Conference PROBLEMS OF DECISION MAKING UNDER UNCERTAINTIES (PDMU-2020, May 11-15), p. 43
5. **Gadjiev T.**, Yangaliyeva A., Aliev X. The behavior of solutions to degenerate nonlinear parabolic equations. XXXV International Conference PROBLEMS OF DECISION MAKING UNDER UNCERTAINTIES (PDMU-2020, May 11-15), p. 43

Accepted for publication:

1. The regularity of solutions of nonlinear elliptic equations with VMO coefficients in generalized Morrey spaces. JMI, 2020 IF.1.390

Submitted for publication:

1. "Forcing the system by a drift". Mathem. Studii Ukrayna.(Scopus)

Work 5: Local and global bifurcation of solutions of nonlinear Dirac problems, structural properties of solutions of linear and nonlinear boundary problems for definite and indefinite weighted second and fourth order differential operators and second order elliptic type partial differential operators. **Executers: prof. Z.S.Aliyev, j.s.w. H.Rzayeva**

The results are reflected in the following published articles:

1. **С. Алиев**, Н.Б. Керимов, В.А. Мехрабов, О сходимости разложений по собственным функциям одной краевой задачи со спектральным параметром в граничных условиях, I, **Дифференциальные уравнения** (Journal Citation Reports®, Clarivate Analytics; IF 0.677) **56(2)** 2020, 147-161.

2. **С. Алиев**, Н.Б. Керимов, В.А. Мехрабов, О сходимости разложений по собственным функциям одной краевой задачи со спектральным параметром в граничных условиях, II, **Дифференциальные уравнения**, (Journal Citation Reports®, Clarivate Analytics; IF 0.677) **56(3)**, 2020, 291-302.

3. **Z.S. Aliyev**, P.R. Manafova, Oscillation properties for the Dirac equation with spectral parameter in the boundary condition, **Bulletin of the Malaysian Mathematical**

Sciences Society (Journal Citation Reports®, Clarivate Analytics; IF 0.856) **43**(2) (2020), 1449–1463.

4. **Z.S. Aliyev**, F. M. Namazov, Spectral properties of the equation of a vibrating rod at both ends of which the masses are concentrated, **Banach Journal of Mathematical Analysis** (Journal Citation Reports®, Clarivate Analytics; IF 0.969) **14**(2), (2020), 585–606.

5. **Z.S. Aliyev**, G.M. Mamedova, Some properties of eigenfunctions for the equation of vibrating beam with a spectral parameter in the boundary conditions, **Journal of Differential Equations** (Journal Citation Reports®, Clarivate Analytics; IF 2.192) **269**(2) (2020), 1383-1400.

6. **Z.S. Aliyev**, Sh.M. Hasanova, Global bifurcation of positive solutions from zero in nonlinearizable elliptic problems with indefinite weight, **Journal of Mathematical Analysis and Applications** (Journal Citation Reports®, Clarivate Analytics; IF 1.220) **491**(1) (2020).

7. **Z.S. Aliyev**, L.V. Nasirova (Ashurova), Bifurcation of positive and negative solutions of nonlinearizable Sturm-Liouville problems with indefinite weight, **Miskolc Mathematical Notes** (Journal Citation Reports®, Clarivate Analytics; IF 0.677) **21**(1) (2020), 19-29.

8. **З.С. Алиев**, Ф.М. Намазов, Базисные свойства корневых функций одной вибрационной краевой задачи с граничными условиями, зависящими от спектрального параметра, **Дифференциальные уравнения** (Journal Citation Reports®, Clarivate Analytics; IF 0.677) **56**(8) (2020), 995-1000.

9. **Z.S. Aliyev** and X.A. Asadov, Global bifurcation from zero in some fourth order nonlinear eigenvalue problems, **Bulletin of the Malaysian Mathematical Sciences Society** (Journal Citation Reports®, Clarivate Analytics; IF 0.856) (2020), pp. 1-12, <https://doi.org/10.1007/s40840-020-00989-6>

10. **Z.S. Aliyev**, Ya.T. Mehraliyev, E.H. Yusifova, Inverse boundary value problem for a third-order partial differential equation with integral conditions, Bulletin of the Iranian Mathematical Society (Journal Citation Reports®, Clarivate Analytics; IF 0.357) (2020), pp. 1-22, <https://doi.org/10.1007/s41980-020-00464-9>

11. K.F. Abdullayeva, **Z.S. Aliyev**, N.B. Kerimov, On the uniform convergence of Fourier series expansions in the system of eigenfunctions of the equation of a vibrating rod at one end of which the mass is concentrated, Proceedings of the Institute of Mathematics and Mechanics, National Academy of Sciences of Azerbaijan (Journal Citation Reports®, Clarivate Analytics) **46**(2) (2020), 1-17

1. **Z.S. Aliyev**, N.A. Neymatov, H.Sh. Rzayeva, Unilateral global bifurcation from infinity in nonlinearizable one dimensional Dirac problems, **International Journal of Bifurcation and Chaos** (Journal Citation Reports®, Clarivate Analytics; IF 2.469) (2020), 11 p.
2. **Z.S. Aliyev**, K.F. Abdullayeva, Uniform convergence of spectral expansions in the terms of root functions of a spectral problem for the equation of a vibrating beam, **Journal of Mathematical Study** (Journal Citation Reports®, Clarivate Analytics) (2020), 15 p.

Work 6. About the non-classical asymptotics of the eigenvalues of a boundary value problem for a second order elliptic differential-operator equation. **Executor: d.m.s., prof. B.A.Aliyev.**

In the published article, for the second order elliptic type differential-operator equation, the eigenvalues of the boundary value problem when the spectral parameter in the H Hilbert space is quadratically included to the equation and to one of the boundary conditions as a quadratic trinomial are studied and asymptotic formulas are obtained.

In the second article, the solvability of a boundary value problem for the second-order elliptic differential-operator is investigated when the same complex parameter included quadratically to the equation and linearly to one of the boundary conditions.

Published works:

1. **Б.А.Алиев**, В.З.Керимов. Асимптотическое поведение собственных значений одной краевой задачи для эллиптического дифференциально-операторного уравнения второго порядка со спектральным параметром в уравнении и в граничном условии. **Дифференциальные уравнения**, 2020, том 56, №2, с.195-203. (IF 0.677) WOS
2. **Б.А.Алиев**, В.З.Керимов, Я.С.Якубов. Вопросы разрешимости одной краевой задачи для эллиптических дифференциально-операторных уравнений второго порядка с квадратичным комплексным параметром. **Дифференциальные уравнения**, 2020, том 56, №10, с.1339-1350. (IF 0.677) WOS
3. **Б.А.Алиев**, В.З.Керимов. О разрешимости одной краевой задачи для эллиптических дифференциально-операторных уравнений второго порядка с комплексным параметром в уравнении и в граничном условии. **Ümummilli Lider Heydər Əliyevin anadan olmasının 97-ci ildönümünə həsr olunmuş “Riyaziyyat, mexanika və onların tətbiqləri” mövzusunda Respublika virtual Elmi konfransı, 20-21 May, 2020.**

Work 7: Direct and inverse problems of spectral analysis for Stark operator. **Executor:** d.ph.m.s., prof. Agil Kh. Khanmamedov.

7 articles reflecting the obtained results were published:

- 1) А.Ханмамедов. Об обратной задаче рассеяния для уравнения Шредингера с дополнительным линейным потенциалом // Теоретическая и Математическая Физика, 202(1): 66–80 (2020). (Индексируется в Web of Science Core Collection, Impact Factor 0.901)
- 2) А.Ханмамедов. Об операторе преобразования для уравнения Шредингера с дополнительным линейным потенциалом // Функциональный анализ и его приложения, 2020, т.54,№1, с.93–96. (Индексируется в Web of Science Core Collection, Impact Factor 0.712)
- 3) А.Ханмамедов. Обратная спектральная задача для одномерного оператора Штарка на полуоси// Украинский математический журнал, 2020, т. 72, № 4, с.494-508. (Индексируется в Web of Science Core Collection, Impact Factor 0.326)
- 4) А.Ханмамедов. О нулях модифицированной функции Бесселя второго рода// Журнал Вычислительной Математики и Математической Физики, 2020, том 60, № 5, с. 104–107. (Индексируется в Web of Science Core Collection, Impact Factor 0.774)
- 5) А.Khanmamedov. Transformation operators for the Schrodinger equation with a linearly increasing potential// Transactions Issue Mathematics of Azerbaijan National Academy of Science, Series of physical-technical & mathematics science, Volume 40 (2020), Issue 1, pp. 21-27. (Индексируется в SCOPUS)
- 6) А.Khanmamedov. On the Completeness of the System of Airy Functions//Azerbaijan Journal of Mathematics V. 10, No 2, 2020, July, pp.105-109 (Индексируется в Web of Science Core Collection)
- 7) А.Khanmamedov. Inverse spectral problem of an anharmonic oscillator on a half-axis with the Neumann boundary condition // J. Inverse Ill-Posed Problems, 2020; DOI: <https://doi.org/10.1515/jiip-2019-0102>, Published online: 16 Jul 2020, pp. 1–14 (Индексируется в Web of Science Core Collection, Impact Factor 0.938).

Work 8: Gradient estimations for the elliptic-parabolic equations in the weighted Morrey spaces. **Executor:** ass.prof. Sh.A.Muradova.

1. Sh.A. Muradova. “Some conditions for boundedness parabolic maximal operator in anisotropic generalized Morrey spaces”. Ümummilli Lider Heydər Əliyevin anadan olmasının 97-ci ildönümünə həsr olunmuş “Riyaziyyat, mexanika və onların tətbiqləri” mövzusunda Respublika virtual Elmi konfransı, 20-21 May, 2020, s.178.

2. Sh.A. Muradova. «On Boundedness Of Anisotropic Singular Operator in Anisotropic Generalized Morrey Spaces». “İnformasiya, Elm, Texnologiya və Universitet perspektivləri”, Lənkəran Dövlət Universiteti, Respublika virtual Elmi konfransı, 18 dekabr, 2020

Work 9: Investigation of multidimensional mixed problem for the one class third order non-linear partial differential equation. **Executor: d.ph.m. ass.prof. A.G.Aliyeva.**

Published works:

1. S.Aliyev, A.Aliyeva. The investigation of one-dimensional mixed problem for one class of nonlinear fourth order equations. The European Journal of Technical and Natural Sciences, Vienna, 2, 2020, p.16 -18.

Work 10: On the solvability of Dirichlet problem for the Laplace equation in the grand - Lebesgue space. **Executer: d.ph.m. N.R.Ahmedzade.**

Published works:

1. T. B. Gasymov, A.M. Akhtyamov, N.R. Ahmedzade, On the basicity in weighted Lebesgue spaces of eigenfunctions of a second-order differential operator with a discontinuity point. Proceedings of the Institute of Mathematics and Mechanics, National Academy of Sciences of Azerbaijan Volume 46, Number 1, 2020, Pages 32–44 (<https://doi.org/10.29228/proc.15> (WOS (Emerging Sources Citation Index), Scopus (SJR-0.28, Q3)))

Thesis:

1. N.R. Ahmedzade, Z.A. Kasumov, On the Solvability Dirichlet Problem for the Laplace Equation with the Boundary Value in Grand-Lebesgue Space. **3rd International Conference on Mathematical Advances and Applications (ICOMAA-2020), 24-27 iyun, 2020, İstanbul, Türkiyə.**

Accepted for publication:

1. N.R. Ahmedzade, Z.A. Kasumov, On the solvability Dirichlet problem for the Laplace equation with the boundary value in grand-Lebesgue space. “Elmi əsərlər” (Nakhchivan State University).

Articles of Mukhtarov Oktay, doctoral student of the department

1. M. Kandemir and **O. Sh. Mukhtarov**, Manypoint boundary-value problems for elliptic differential-operator equations with interior singularities, *Mediterr. J. Math.* (2020) 17:35. DOI <https://doi.org/10.1007/s00009-019-1470-3>(WOS)
2. **Oktay Sh. Mukhtarov** and Merve Yücel, A Study of the Eigenfunctions of the Singular Sturm Liouville Problem Using the Analytical Method and the Decomposition Technique, *Mathematics* 2020, 8(3), 415; doi:10.3390/math8030415. (WOS)
3. **O. Sh. Mukhtarov**, M. Yücel and K. Aydemir, Treatment a New Approximation Method and Its Justification for Sturm Liouville Problems, *Complexity*, vol. 2020, pp. 1–8, May 2020, <https://doi.org/10.1155/2020/8019460>(WOS)

SOCIAL ACTIVITY OF COLLABORATORS OF THE “DIFFERENTIAL EQUATIONS” DEPARTMENT

The head of the department prof. Akper Aliev is the member of the Expert Commission under the HAC.

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

- 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; prof Bahram Aliyev**
- Azerbaijan Journal of Mathematics - **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 Khanmamedov, ass.prof. Nigar Aslanova.**
- Balkan Journal of Mathematics - **ass.prof. Nigar Aslanova.**
- **Journal of Contemporary Applied Mathematics(A.B.Aliev, M.Bayramogly, A.Kh.Khanmamedov)**
- **Journal of Baku Engineering University Mathematics And Computer Science (A.B.Aliev).**

Professor Akper Aliev, professor Mammad Bayramogly, professor Ziyatkhan Aliyev, professor Agil Khanmamedov, professor Nigar Aslanova and professor Bahram Aliyev are a reviewer of several international journals.

Participation in the Institute Seminar

All collaborators have been actively participated (before the pandemic) in the Institute's general works, including the Institute Seminar .

Before the pandemic, every Wednesday, at 12.00, the scientific seminar named “Modern problems of the theory of differential equations” guided by A.B.Aliev, had being conducted. All collaborators of department, including doctoral and post-graduate students participated in the seminar.

Akper Aliev is the member of the Expert Commission under the HAC. He is also a member of the "Scientific Council on Mathematical Problems" under the "Coordinating Council of Republican Scientific Research."

The collaboratos of the department, prof. Akper Aliev, prof. Mammad Bayramogly, prof. Ziyatkhan Aliyev, prof. Tahir Gadjiev, prof. Agil Khanmamedov, prof. Bakhram Aliev, ass.prof. Nigar Aslanova, ass.prof. Shamsiya Muradova teaches at the universities of the Republic (Azerbaijan Technical University, BSU, ASPU, AACU) for bachelors and masters.

There are scientific relations with some scientific centers and educational institutions of the country.

At the international level, there are contacts with the following scientific educational institutions

- **Moscow State University (prof. A.V.Furskov, prof. L.Krichkov);**
- **Dagestan State University**
- **Tbilisi State University and Razmadze Institute of Mathematics;**
- **Some Universities in Turkey (Hacattepe University, Sivas University, Tokat University, Koç University, Kütahya University);**
- **Frans. Prof. Mokhtar Kirane**(Mathematician, Professor at University of La Rochelle, Fransa, **Khalifa University, United Arab Emirates);**
- **İsrael, Tel- Aviv , Tel- Aviv University, prof. Yakov Yakubov;**
- **-Almaniya , prof. Efendiyev M.** Institute of Computational Biology Helmholtz Zentrum Muchen, 85764 Neuherberg, Germany

The project “Investigation of global solutions of systems of semi-linear pseudohyperbolic equations with structural dissipation and their application to quantum mechanical systems” presented by the Department for the Grant Project “Integration of Science and Education”, announced by the Science Development Foundation, won the competition. Supervisor: prof. Akbar B. Aliev (50,000 man). Executors: Muradova Sh.A. and collaborator of the department "Mathematical Physics" , Bagirov Sh.H.

Total – 53 work

Article - 35 (published)və 8 (prepared and submitted for publication) (In WOS – 30, all published in high IF journals abroad; Scopus - 2 articles (Transaction); Abroad - 2).

Thesis – 10.

Head of Department

prof. Akbar B. Aliev