



ABSTRACTS

of the international conference

**MATHEMATICAL ANALYSIS AND ITS
APPLICATIONS IN MODERN
MATHEMATICAL PHYSICS**

PART I

**Samarkand
September 23-24, 2022**

MINISTRY OF HIGHER AND SECONDARY SPECIAL
EDUCATION OF THE REPUBLIC OF UZBEKISTAN

SAMARKAND STATE UNIVERSITY NAMED AFTER SH.RASHIDOV
MATHEMATICS INSTITUTE OF THE ACADEMY OF SCIENCE OF
UZBEKISTAN

INTERNATIONAL CONFERENCE

MATHEMATICAL ANALYSIS AND ITS
APPLICATIONS IN MODERN MATHEMATICAL
PHYSICS

September 23-24, 2022; Samarkand, Uzbekistan

PART I

SAMARKAND – 2022

UDK 51:517

Mathematical analysis and its applications in modern mathematical physics:
international scientific conference (September 23-24, 2022 y. Samarkand).

Chief Editor Lakaev S.N. – Samarkand, 2022 y.

The collection of abstracts of the reports of the international scientific conference "Mathematical analysis and its applications in modern mathematical physics" contains scientific reports on the following areas: Mathematical analysis, differential equations, mathematical physics, algebra, geometry, numerical mathematics, mathematical modeling, probability theory, mathematical statistics, mathematical engineering and information technologies .

It is intended for specialists in the field of physical and mathematical sciences and information technologies, teachers, doctoral students and undergraduates of universities.

EDITORIAL TEAM:

Chief Editor:

Academician Lakaev S.N.

Members of the editorial board:

**Prof. Ikromov I.A.
Prof. Khasanov A.B.
Prof. Khalkhuzhaev A.M.
Prof. Khushvaktov H.A.
Prof. Rasulov T.H
Prof. Muminov Z.E**

Responsible for the issue:

**Bozorov I.
Khamidov Sh.
Abdukhakimov S.
Almuratov F.**

ORGANIZING COMMITTEE OF THE CONFERENCE

Chairman:

Khalmuradov R.I. – professor, rector of SamSU (Uzbekistan)

Vice-chairman:

Soleev A.S. – professor, vice-rector of SamSU (Uzbekistan)

Khushvaktov Kh.A. – DSc, vice-rector of SamSU (Uzbekistan)

Members of the organizing committee:

Ayupov Sh.A. – academician of the AS RUz, director of the Institute of Mathematics named after V.I. Romanovsky (Uzbekistan)

Lakaev S.N. – academician of the AS RUz, head of the Department of SamSU (Uzbekistan)

Alimov Sh.A. – academician of the AS RUz (Uzbekistan)

Sadullaev A.S. – academician of the AS RUz (Uzbekistan)

Azamov A.A. – academician of the AS RUz (Uzbekistan)

Farmonov Sh.K. – academician of the AS RUz (Uzbekistan)

Motovilov A.K. – professor, head of the Sector of the Laboratory of Theoretical Physics named after N.N. Bogolyubov (Russia)

Makarov K.A. – professor at the University of Missouri (USA)

Kurasov P.B. – professor at the Stockholm University (Sweden)

Darus M. – professor at the Kebangsaan University (Malaysia)

Rakhimov I.S. – professor at the MARA University of Technology (Malaysia)

Turmetov B.X. – professor at the International Kazakh-Turkish University named after H.A. Yassavi (Kazakhstan)

Kholmatov Sh.Y. – professor at the University of Vienna (Austria)

Rozikov U.A. – professor, deputy director of the at the Institute of Mathematics named after V. I. Romanovsky (Uzbekistan)

Ashurov R.R. – professor at the Institute of Mathematics named after V. I. Romanovsky (Uzbekistan)

Khalkhuzhaev A.M. – professor, head of Samarkand branch of the Institute of Mathematics named after V.I. Romanovsky (Uzbekistan)

Akhatov A.R. – professor, vice-rector of SamSU (Uzbekistan)

Abdujabborov S.B. – PhD, vice-rector of SamSU (Uzbekistan)

Ruzimurodov Kh.Kh. – dean of the Faculty of Mathematics, SamSU (Uzbekistan)

Khasanov A.B. – professor, head of the Department of SamSU (Uzbekistan)

Khuzhayorov B.Kh. – professor, head of the Department of SamSU (Uzbekistan)

Ikromov I.A. – professor at the Samarkand branch of the Institute of Mathematics named after V.I. Romanovsky (Uzbekistan)

Bozorov I.N., Qalandarova G.U., Jalilova Z.Y. The number of eigenvalues of the model operator associated to a system of two particles on a lattice	174
Buriev T.E. Bifurcation Study of 3rd Predator Prey Model with Saturation Affect in the Predator Population	176
Durdiev D., Jumaev J. Investigation the direct problem for integro -differential fractional diffusion equation	178
Dustov S.T. Spectral properties of a family of the Generalized Friedrichs models with the perturbation of rank one	178
Hiroshima Fumio Asymmetry of non-local discrete Schrödinger operators on a lattice	180
Ibragimov G., Kuchkarova S. Differential game with geometric constraints on controls in the Hilbert space l_2	180
Ibragimov G.I., Egamberganova O.Y. Multiple pursuer one evader pursuit differential game with Grönwall-type constraints on controls	181
Karimov K.T., Murodova M.R. Besselning klassik va singulyar tenglamalari orasidagi bog'lanish	183
Kerimbekov A. K. Synthesis of boundary controls in the problem of optimization of thermal processes	184
Khasanov M.M., Omonov Sh.Sh., Yakubov H.E. A generalized (G'/G) - expansion method for the loaded Burgers equation	185
Konstantin A. Makarov Exponential Decay in Quantum Mechanics and Continuous Monitoring	186
Kuchkorov E.I., Dekhkonov F.N. On the boundary control problem for the fast heating process of a rod	186
Kurbanov Sh.Kh, Dustov S.T. Puiseux Series Expansion For Eigenvalue of the Generalized Friedrichs Model under Rank One Perturbation	188
Kurbanov Sh.Kh, Juraev.I.R Number of eigenvalue of the Generalized Friedrichs Model under Rank One Perturbation	189
Kurbonov O., Akhralov Kh. Eigenvalues of the discrete Schrödinger operator with non-local potential in $d=3$	191
Lakaev S.N., Bozorov I.N., Khamidov Sh.I. The Threshold Effects for the Two Particle Discrete Schrödinger Operator on a Lattice	192
Lakaev S.N., Akhmadova M.O., Alladustova I.U. On the number of eigenvalues of the discrete Schrödinger operator on lattices	195
Lakaev S.N., Boltaev A.T. The essential spectrum of a three particle Schrödinger operator on lattices	197
Lakaev S.N., Akhmadova M.O. On the number of eigenvalues of the discrete Schrödinger operator on the two-dimensional lattices	199
Lakaev S.N., Boltaev A.T., Almuratov F.M. On the discrete spectra of Schrödinger-type operators on one dimensional lattices	201
Lakaev S.N., Khamidov Sh., Temirova D. The number and location of eigenvalues of the two particle discrete Schrödinger operators	204
Matyakubov M. M., Xayitova S. O. Integration of the type loaded second-order Korteweg-de Vries equation with a free term independent of the spatial variable	206
Motovilov Alexander K. Optimal bounds on the speed of subspace evolution governed by time-independent Hamiltonians	208
Muminov M.I., Ochilov Z. Kh. On a solution of the integral geometry problem for a family of cones with a weight function	208
Muminov M.I., Radjabov T.A. Existence conditions for solutions of mixed differential equation with piecewise continuous arguments	210
Muminov Z., Lakaev Sh. Spectral and Threshold analysis for Discrete Schrödinger operator with some potential	211
Mutti-Ur Rehman A low-rank ODE's based tool to compute bounds of structured singular values	213

Investigation the direct problem for integro -differential fractional diffusion equation

¹Durdiev D., ²Jumaev J.

¹Bukhara branch of the institute of Mathematics named after V.I. Romanovskiy at the Academy of sciences of the Republic of Uzbekistan,

e-mail: durdiev65@mail.ru

² Bukhara branch of the institute of Mathematics named after V.I. Romanovskiy at the Academy of sciences of the Republic of Uzbekistan

e-mail: jonibekjj@mail.ru

Consider the problem of determining of function $u(x, t)$, from the following equations with fractional derivative in time t :

$$\partial_t^\alpha u - u_{xx} + a(x)u = \int_0^t k(t - \tau)u(x, \tau)d\tau, \quad (x, t) \in D_T, \alpha \in (0, 1), \quad (1)$$

$$u|_{t=0} = \varphi(x), \quad x \in [0, l], \quad (2)$$

$$u|_{x=0} = \mu_1(t), \quad u|_{x=l} = \mu_2(t), \quad \varphi(0) = \mu_1(0), \quad \varphi(l) = \mu_2(0), \quad t \in [0, T], \quad (3)$$

with the Caputo time fractional derivative ∂_t^α of order $0 < \alpha < 1$, defined by

$$\partial_t^\alpha u(t) = \frac{1}{\Gamma(2 - \alpha)} \int_0^t (t - \tau)^{1-\alpha} u'(\tau) d\tau,$$

where Γ is the Euler's Gamma function, $D_T = \{(x, t) | x \in (0, l), 0 < t \leq \tau, \tau \in (0, T]\}$, $T > 0$ are arbitrary fixed number, $a(x), k(t), \varphi(x), \mu_1(t), \mu_2(t)$ are given functions of $x \in [0, l]$ and $t \in [0, T]$.

Lemma. *If $(\varphi(x), a(x)) \in C[0, l], (\mu_1(t), \mu_2(t)) \in C^1([0, T]), k(t) \in C([0, T])$, then there is the unique classical solution $u(x, t)$ to the problem (1)-(3) of the class $C^{2,\alpha}([0, l] \times [0, T])$ ($C^{2,\alpha}(D_T) = \{u(x, t) \in C^2[0, l]; t \in (0, T]; u(x, t) \in AC[0, T]; x \in [0, l]\}$).*

In what follows we also use the usual class $C(D_T)$ of continuous in D_T functions.

References

1. *Caputo M.* Linear models of dissipation whose Q is almost frequency independent II, *Geophys. J. Royal Astronom. Soc.*, 13, (1967) 529-539.
2. *Kilbas A.A., Srivastava H.M., Trujillo J.J.* Theory and Applications of Fractional Differential Equations. Elsevier, Amsterdam, 2006.

Spectral properties of a family of the Generalized Friedrichs models with the perturbation of rank one

Dustov S.

Navoi State Pedagogical Institute, Navoi, Uzbekistan

e-mail: saiddustov@mail.ru

Let \mathbb{Z}^3 be the three-dimensional hypercubes lattice and $\mathbb{T}^3 = (-\pi, \pi]^3$ be the three-dimensional torus (Billion zone), the dual group of \mathbb{Z}^3 . The operators of addition and multiplication by number of the elements of torus $\mathbb{T}^3 \equiv (-\pi, \pi]^3 \subset \mathbb{R}^3$ was defined as operations in \mathbb{R}^3 modulo $(2\pi\mathbb{Z}^3)$.

Let $L^2(\mathbb{T}^3)$ be the Hilbert space of square-integrable functions defined on the torus \mathbb{T}^3 and \mathbb{C}^1 be the one-dimensional complex Hilbert space.

We consider a family of the Generalized Friedrichs models acting in $L^2(\mathbb{T}^3)$ as follows:

$$H_\mu(p) = H_0(p) + \mu\Phi^*\Phi, \quad \mu > 0.$$