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FIZIKA, MATEMATIKA VA MEXANIKANING DOLZARB MUAMMOLARI XALQARO ILMIY-AMALIY ANJUMANI

MATERIALLARI

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BUXORO DAVLAT UNIVERSITETI

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xalqaro ilmiy-amaliy anjumani

MATERIALLARI

(I qism)

Buxoro, O‘zbekiston, 24-25-may, 2023-yil

МИНИСТЕРСТВО ВЫСШЕГО ОБРАЗОВАНИЯ, НАУКИ И ИННОВАЦИЙ РЕСПУБЛИКИ УЗБЕКИСТАН
БУХАРСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ТЕЗИСЫ ДОКЛАДОВ

(Часть I)

международной научно-практической конференции

АКТУАЛЬНЫЕ ПРОБЛЕМЫ ФИЗИКИ, МАТЕМАТИКИ И МЕХАНИКИ

Бухара, Узбекистан, 24-25 мая, 2023 год

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN
BUKHARA STATE UNIVERSITY

ABSTRACTS

(Part I)

of the international scientific and practical conference

ACTUAL PROBLEMS OF PHYSICS, MATHEMATICS AND MECHANICS

Bukhara, Uzbekistan, May 24-25, 2023

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SOLVABILITY OF INVERSE PROBLEM FOR INTEGRO-DIFFERENTIAL HEAT EQUATION WITH PERIODIC AND INTEGRAL CONDITIONS

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We consider the initial-periodic boundary problem for the heat equation with a convolution-type integral term on the right-hand side

$$\partial_t^\alpha u - u_{xx} + a(t)u = f(x)g(t), \quad (x,t) \in D_T, \tag{1}$$

$$u(x,0) = \varphi(x), \tag{2}$$

$$u(0,t) = u(1,t), \ \ u_x(0,t) = u_x(1,t), \varphi(0) = \varphi(1), \ \ \varphi'^{(0)} = \varphi'^{(1)}, \tag{3}$$

T is arbitrary positive number and $D_T := \{(x,t): 0 < x < 1, 0 < t \leq T\}$).

The problem of determining a function $u(x,t), (x,t) \in D_T$, that satisfies (1)-(3) with known functions $k(t)$ and $\varphi(x)$ will be called the direct problem.

In the inverse problem, it is required to determine the kernel $k(t), t > 0$, of the integral in (1) using overdetermination condition about the solution of the direct problem (1)-(3):

$$\int_0^1 \omega_i(x)u(x,t)dx = h_i(t), \quad x \in (0,1), \tag{4}$$

where $\omega(x), h(t)$ are given functions.

Definition. *The pair* $\{u(x,t), k(t)\}$ *from the class* $C^{2,\alpha}(D_T) \cap C^{1,0}(\overline{D}_T) \times C[0,T]$ *is said to be a classical solution of problem* (1)-(4), *if the functions* $u(x,t)$ *and* $k(t)$ *satisfy the following conditions:*

(*1*) *The function* $u(x,t)$ *and its derivatives* $\partial_t^\alpha u(x,t), u_{xx}(x,t)$ *are continuous in the domain* D_T *;*

(2) the function $k(t)$ *is continuous on the interval* $[0,T]$*;*

(3) equation [1] and conditions [2]-[4] are satisfied in the classical (usual) sense.

In this work, we consider inverse problem of determining $u(x,t)$ and $k(t)$ functions in the one-dimensional integro-differential diffusion equation with the

initial- periodic boundary and overdetermination conditions. The unique solvability of the direct problem are proved. To investigate the solvability of the inverse problem, we first consider an auxiliary inverse boundary value problem, which is equivalent to the original one. Existence and uniqueness of the solution of the equivalent problem is proved using a contraction mapping. Finally, using the equivalency, the existence and uniqueness of classical solution is obtained.

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A GENERALIZED (G'/G) - EXPANSION METHOD FOR THE LOADED NONLINEAR DEGASPERIS-PROCESI EQUATION

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This paper is dedicated to find the solutions of the equation of the loaded nonlinear Degasperis-Procesi equation. It is shown that (G'/G) - expansion method is one of the most effective way of finding the solutions.