A SOURCE INVERSE PROBLEM FOR THE PSEUDO–PARABOLIC EQUATION FOR A FRACTIONAL STURM–LIOUVILLE OPERATOR

Daurenbek SERIKBAEV, Niyaz TOKMAGAMBETOV

Department of Mathematics: Analysis, Logic and Discrete Mathematics, Ghent University, Belgium
Al–Farabi Kazakh National University, Almaty, Kazakhstan

daurenbek.serikbaev@ugent.be, tokmagambetov@math.kz

A class of inverse problems for restoring the right-hand side of the pseudo-parabolic equation for one fractional Sturm–Liouville operator is considered. The inverse problem of determining the coefficient and the right hand side of a pseudo-parabolic equation from a local redefinition a state that has important applications in various fields of applied science and engineering. The study of inverse problems for pseudo-parabolic equations began in the 1980s (see [1]).

In this paper we consider pseudo–parabolic equation generated by fractional Sturm–Liouville operator with Caputo time-fractional derivative. We investigate the equation

$$\mathcal{D}_t^\alpha[u(t,x)+\partial_{+a,x}^\alpha D_{b-,x}^\alpha u(t,x)]+\partial_{+a,x}^\alpha D_{b-,x}^\alpha u(t,x)=f(x), \tag{1}$$

for $(t,x)\in\Omega=\{(t,x)|\ 0<t\leq T<\infty,\ a\leq x\leq b\}$, where $\mathcal{D}_t^\alpha$ is the Caputo derivative and $\partial_{+a,x}^\alpha D_{b-,x}^\alpha$ is the fractional Sturm–Liouville operator. In many physical problems, it is required to determine the coefficients or the right-hand side (the original term, in the case of the diffusion equation) in the differential equation from some available information; These problems are known as inverse problems.

Funding:The authors were supported by the Ministry of Education and Science of the Republic of Kazakhstan (MESRK) Grant AP05130994. No new data was collected or generated during the course of research.

References

[1] W. Rundell. *Determination of an unknown nonhomogeneous term in a linear partial differential equation from overspecified boundary data* // Appl. Anal. 10:231–242, 1980.

— ⁕ ⁕ ⁕ —

ON THE SOLUTIONS OF A FRACTIONAL q-DIFFERENTIAL EQUATION WITH THE COMPOSITE FRACTIONAL q-DERIVATIVE

S. SHAIMARDAN, N.S. TOKMAGAMBETOV

L. N. Gumilyev Eurasian National University, Nur-Sultan, Kazakhstan

shaimardan.serik@gmail.com, nariman.tokmagambetov@gmail.com

Let $0<q<1$. Then the q-analogue differential operator $D_qf(x)$ is [1]:

$$D_qf(x):=\frac{f(x)-f(qx)}{x(1-q)}.$$

This work was supported by Scientific Committee of Ministry of Education and Science of the Republic of Kazakhstan grant AP05130975.