Abstract

The aims of this paper is to prove existence and uniqueness of following integral boundary conditions mixed problem for parabolic equation

\[
\begin{aligned}
\frac{\partial \theta}{\partial t} - \frac{a(t)}{\lambda^2} \left( \frac{\partial}{\partial x} \left( \frac{\partial \theta}{\partial x} \right) \right) + b(t) \theta &= \theta(x, t) \\
\theta(x, 0) &= \lambda(x), \quad 0 \leq x \leq \ell \\
\int_0^\ell x \theta(x, t) dx &= E(t), \quad 0 \leq t \leq T \\
\int_0^\ell x^2 \theta(x, t) dx &= G(t), \quad 0 \leq t \leq T.
\end{aligned}
\]

The proofs are based on a priori estimates established in Sobolev function spaces and Fourier’s method.

Keywords and phrases: Fourier’s method for nonlocal boundary conditions, singular parabolic equations, Sobolev function spaces.