International Conference “Inverse and Ill-Posed Problems of Mathematical Physics”,
dedicated to Professor M.M. Lavrent'ev on occasion of his 75-th birthday, August 20-25, 2007, Novosibirsk, Russia

Boundary value problems for higher order abstract differential-operator equations

K.S. Fayazov*, I.O. Xajiev**

* National University of Uzbekistan,
Vuzgorodok, 4,
7000147, Tashkent, Uzbekistan
E-mail: kfayazov@yahoo.com

** National University of Uzbekistan,
Vuzgorodok, 3,
7000147, Tashkent, Uzbekistan
E-mail: hajiev_79@rambler.ru

Let $\varphi_i(t) \in C^2$ $(t \geq 0)$ $(i = 1, 2)$, $t \in [0, T]$, and $|\varphi'(t)|\, t^{1/2} < \mu$, $(i = 1, 2)$, where μ is a constant. Let Ω_T be a bounded simply connected region in R^2 defined as follows:

$$\Omega_T = \{(x, t) : 0 < t < T,\ \varphi_1(t) < x < \varphi_2(t),\ \varphi_1(0) = \varphi_2(0)\},$$

and $\partial\Omega_T = \bar{\Gamma}_1 \cup \bar{\Gamma}_2$, $\Gamma_1 \cup \Gamma_2 = \emptyset$, where $\Gamma_1 = \{(x, t) : x = \varphi_i(t),\ (i = 1, 2),\ 0 \leq t < T\}$, $\Gamma_2 = \{(x, t) : t = T\ \varphi_1(t) < x < \varphi_2(t)\}$.

Let D (D does not depend of (x, t)) be an everywhere dense domain in Hilbert space H, and $A(x, t)$, $B(x, t)$, $C(x, t)$ and $E(x, t)$ are family of linear operators (possibly unbounded) with domain D, $u(x,\ t)$ $((x,\ t) \in \Omega_T)$ is a function with values in the space H. Let $u(x,\ t)$ satisfy the equation

$$\left(A\frac{\partial^3}{\partial t^3} - B\right)(CL - B)u = 0,\ \ (x, t) \in \Omega_T \tag{1}$$

where

$$Lu(x, t) \equiv u_{tt} + u_{xx} \tag{2}$$

and in the part Γ_1 of the bound $\partial\Omega_T$ the boundary values are given

$$\left.\frac{\partial^i u(x, t)}{\partial n^i}\right|_{\Gamma_1} = g_i\ \ i = 0,\ 1,\ 2, 3, 4. \tag{3}$$

The boundary problem (1)-(3) is not in general well posed in the sense of Hadamard. We will prove theorems of uniqueness and stability of problem (1)-(3) using integral energy method and modification of logarithmic convexity method.