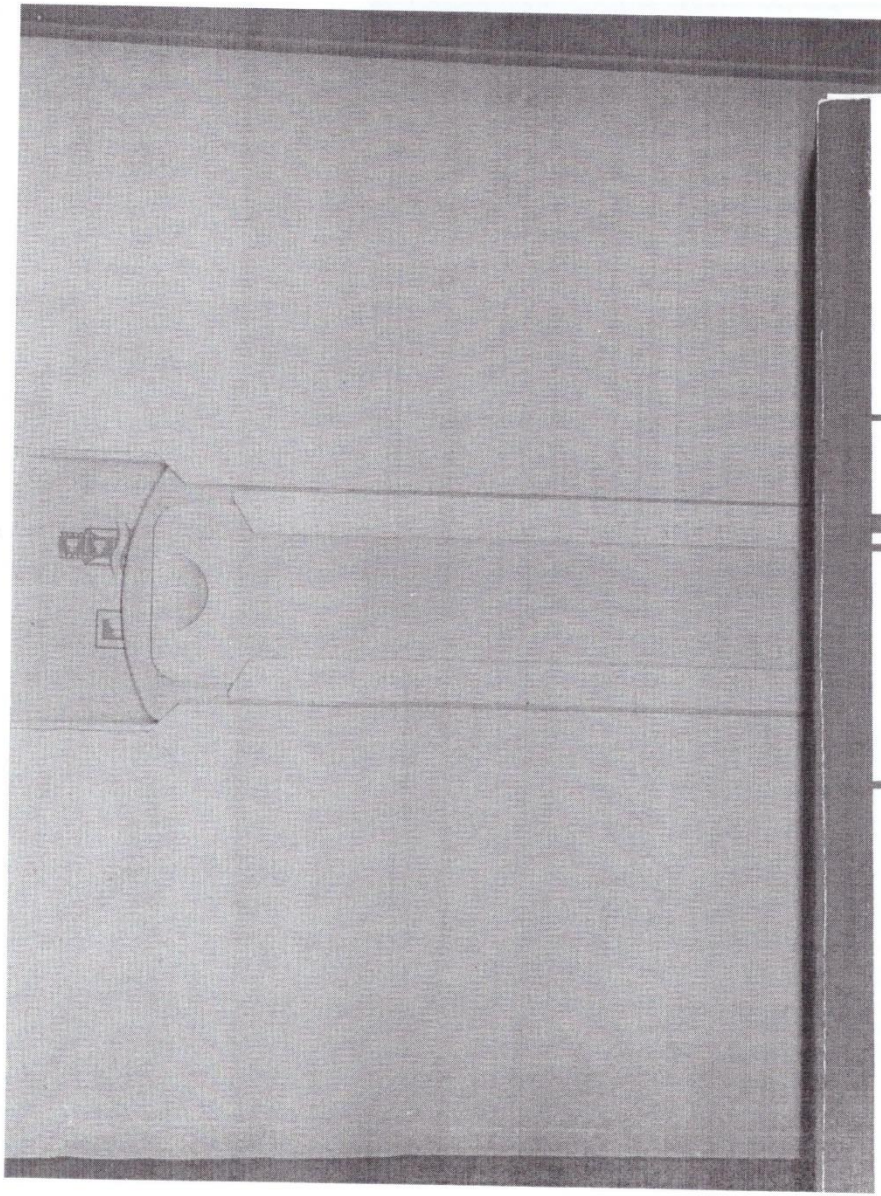

Third International Conference on
Analysis and Applied Mathematics

ICAAM 2016

THE ABSTRACT BOOK

07-10 September 2016

Institute of Mathematics
and Mathematical Modelling
Almaty, Kazakhstan

FOREWORD

The Organizing Committee of ICAAM and Institute of Mathematics and Mathematical Modelling are pleased to invite you to the Third International Conference on Analysis and Applied Mathematics, ICAAM 2016. The meeting will be held on September 7-10, 2016 in Almaty, Kazakhstan. This conference is dedicated to 70th birthday of Prof. Tynysbek Kalmenov.

The conference is organized biannually. Previous conferences were held in Gumushane, Turkey in 2012 and in Shymkent, Kazakhstan in 2014. The proceedings of ICAAM 2012 and ICAAM 2014 were published in AIP (American Institute of Physics) Conference Proceedings. Institute of Mathematics and Mathematical Modelling is pleased to host the third conference which is focused on various topics of analysis and its applications, applied mathematics and modeling.

The conference will consist of plenary lectures, mini symposiums and contributed oral presentations. The proceedings of ICAAM 2016 will be published in AIP (American Institute of Physics) Conference Proceedings. Selected full papers of this conference will be published in peer-reviewed international journals:

- FILOMAT (Science Citation Index),
- BOUNDARY VALUE PROBLEMS (Science Citation Index),
- CONTEMPORARY ANALYSIS AND APPLIED MATHEMATICS.

The aim of the International Conference on Analysis and Applied Mathematics (ICAAM) is to bring mathematicians working in the area of analysis and applied mathematics together to share new trends of applications of mathematics. In mathematics, the developments in the field of applied mathematics open new research areas in analysis and vice versa. That is why, we plan to found the conference series to provide a forum for researches and scientists to communicate their recent developments and to present their original results in various fields of analysis and applied mathematics. The Conference Organizing Committee would like to thank our sponsors. The main organizer of the conference is Institute of Mathematics and Mathematical Modelling, Almaty, Kazakhstan. The conference is also supported by Al-Farabi Kazakh National University, Almaty and L. N. Gumilyov Eurasian National University, Astana, Kasakhstan. We would like to thank Institute of Mathematics and Mathematical Modeling, Al-Farabi Kazakh National University and L. N. Gumilyov Eurasian National University for their support. We alsa would like to thank to all invited speakers, International Organizing Committee, International Organizing Committe, and Technical Program Committee Members. With our best wishes and warm regards,

Chairs:

Prof. Allaberen Ashyralyev

Prof. Mukhtarbay Otelbaev

CONTENTS

We show that Problem (4).(5) has a weak solution in a suitable Sobolev space $W_\mu^{1,p}(\Omega_0)$ determined by the norm $\|u\|_{W_\mu^{1,p}(\Omega_0)} = \left(\int\limits_{\Omega_0} |\nabla u|^p \, d\mu \right)^{\frac{1}{p}}$.

The key point in the proof is played by an analog of the Sobolev inequality,

$$\int\limits_{\Omega} |f|^q \, d\mu \le C \int\limits_{\Omega_0} |\nabla f|^p \, d\mu,$$

where the parameter q depends on p and on the structure of Ω. The latter dependence is rather complicated and, rouphly speaking, shows how tightly the strata are bound to one another.

Keywords: stratified set, p-Laplacian, Sobolev inequality

2010 Mathematics Subject Classification: 35J25, 35B45

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Asymptotic estimates of the solution of the Cauchy problem for singularly perturbed integro-differential equations

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Abstract: This report is devoted to the Cauchy problem for the integro-differential equation with a small parameter in the highest derivatives:

$$(6) \quad \sum_{r=1}^{m} \varepsilon^r A_{n+r}(t) y^{(n+r)} + \sum_{k=0}^{n} A_k(t) y^{(k)} = F(t) + \int\limits_0^1 \sum_{i=0}^{l+1} H_i(t,x) y^{(i)}(x,\varepsilon) dx$$

with the initial conditions

$$(7) \quad y^{(i)}(0,\varepsilon) = \alpha_{i+1}, \quad i = \overline{0, n+m-1}.$$

Here $\varepsilon > 0$ is small parameter and $l = \text{fix}\{0, 1, \ldots, n-1\}$,

A similar problem for differential equations considered in [1].

In this paper we consider the case when the roots $\mu_i(t)$, $i = \overline{1,m}$ of the additional characteristic equation

$$\mu^m + A_{n+m-1}(t)\mu^{m-1} + \ldots + A_{n+1}(t)\mu + A_n(t) = 0$$

have negative real parts.

Asymptotic estimates for the solution of the problem (1) and (2) and of the difference between the solutions of the original singularly perturbed problem (1) and (2) and a corresponding unperturbed problem are obtained.

Keywords: Singularly perturbations, small parameter, integro-differential equations, asymptotic estimates

2010 Mathematics Subject Classification: 34E15, 34K26, 45J05

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On the unique solvability of a nonlocal problem with integral conditions for the system of partial differential equations of second order

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Abstract: The nonlocal boundary value problem with integral conditions for the system of hyperbolic equations second order is considered. Algorithm of finding approximate solution to researching problem is constructed and the its convergence is proved. The sufficient conditions of the unique solvability to nonlocal problem are established in the terms of initial data.

In this work, on $\Omega = [0,T] \times [0,\omega]$ the nonlocal boundary value problem with integral conditions for the system of hyperbolic equations is considered

$$\frac{\partial^2 u}{\partial x \partial t} = A(t,x)\frac{\partial u}{\partial x} + B(t,x)\frac{\partial u}{\partial t} + C(t,x)u + f(t,x), \tag{1}$$

$$P(t)u(t,\theta) + \int_0^\theta K(t,x)u(t,x)dx = \psi(t), \qquad t \in [0,T], \tag{2}$$

$$S(x)u(\eta,x) + \int_0^\eta M(t,x)u(t,x)dt = \varphi(x), \qquad x \in [0,\omega], \tag{3}$$

where $u(t,x) = col(u_1(t,x), \dots u_n(t,x))$ is unknown function, the $(n \times n)$ matrices $A(t,x)$, $B(t,x)$, $C(t,x)$, n-vector function $f(t,x)$ are continuous on Ω, the $(n \times n)$ matrices $K(t,x)$, $M(t,x)$ are continuously differentiable on Ω by t, x, respectively, the $(n \times n)$ matrices $P(t)$ and $S(x)$, the n-vector functions $\psi(t)$ and $\varphi(x)$ are continuously differentiable on $[0,T]$, $[0,\omega]$, respectively, and $0 \le \eta \le T$, $0 \le \theta \le \omega$.

The conditions of classical solvability to problem (1)–(3) are established by method of introduction additional functional parameters [1-2].

Keywords: hyperbolic equation, nonlocal problem, integral condition

2010 Mathematics Subject Classification: 35L51, 35L53

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Asymptotical estimation of boundary value problems for singularly perturbed integro-differential equations

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Abstract: We consider the two-point boundary value problem for the singularly perturbed higher order linear integro-differential equation. The constructive formulae and asymptotic estimations for solutions and their derivatives are obtained.

Keywords: singularly perturbation, integro-differential equations, small parameter, asymptotic method, asymptotic expansion, initial jump

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