V Congress of the

TURKIC WORLD MATHEMATICIANS

Kyrgyzstan, «Issyk-Kul Aurora», 5-7 June, 2014

ABSTRACTS

Bishkek - 2014

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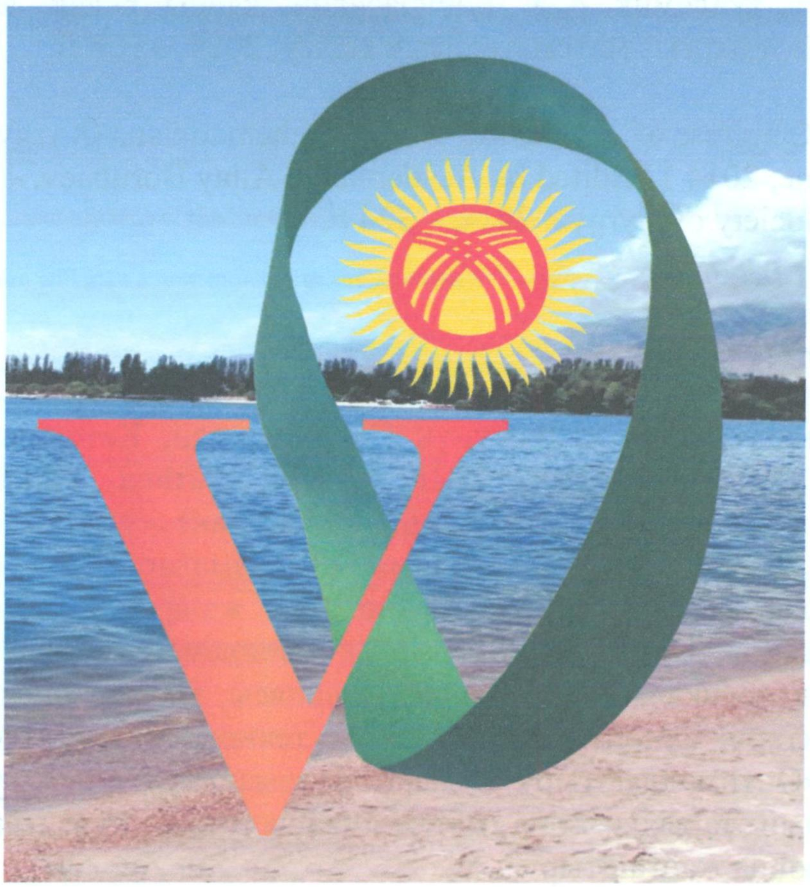

ABSTRACTS

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SECTION 3. DIFFERENTIAL AND INTEGRAL EQUATIONS

SUBSECTION 3A. ORDINARY DIFFERENTIAL AND INTEGRAL EQUATIONS

ON SOLUTION OF BOUNDARY VALUE PROBLEM

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Problem statement. We consider the following value problem [1]

$$\dot{x} = A(t)x + B(t)f(x,t) + \mu(t), \quad t \in I = [t_0, t_1] \tag{1}$$

with boundary conditions

$$(x(t_0)) = x_0, x(t_1) = x_1) \in S \subset R^{2n} \tag{2}$$

at phase restrictions

$$x(t) \in G(t) : G(t) = \{x \in R^n | \gamma(t) \le F(x,t) \le \delta(t), \ \ t \in I\}, \tag{3}$$

and also integral restrictions

$$g_j(x) \le c_j, \ \ j = \overline{1, m_1}; g_j(x) = c_j, \ \ j = \overline{m_1 + 1, m_2}; g_j(x) = \int_{t_0}^{t_1} f_{0j}(x(t), t)dt, \ l; j = \overline{1, m_2}; \tag{4}$$

Here $A(t)$, $B(t)$ are prescribed matrixes with piecewise continuous elements of $n \times n$, $n \times m$ orders correspondingly, $\mu(t)$, $t \in I$ is the given n - dimensional vector-function with piecewise continuous elements, m - dimensional vector-function $f(x,t)$ is determined and continuous by set of values $(x,t) = R^n \times I$ and satisfies to the condition:

$$|f(x,t) - f(y,t)| \le l|x - y|, \quad \forall (x,t), \ \ (y,t) \in R^n \times I, \ \ l = const > 0,$$

$$|f(x,t)| \le c_0|x| + c_1(t), \quad c_0 = const \ge 0, \quad c_1(t) \in L_1(I, R^1),$$

S is prescribed convex closed ensemble. Function $F(x,t) = (F_1(x,t), \dots, F_r(x,t))$, $t \in I$ is r - dimensional vector-function which is continuous by set of values, $\gamma(t) = (\gamma_1(t), \dots, \gamma_r(t))$, $\delta(t) = (\delta_1(t), \dots, \delta_r(t))$, $t \in I$ are prescribed continuous functions. And c_j, $j = \overline{1, m_2}$ are given constants, $f_{0j}(x,t)$, $j = \overline{1, m_2}$ are prescribed continuous functions by set of values which satisfy to the conditions

$$|f_{0j}(x,t) - f_{0j}(y,t)| \le l_j|x - y|, \quad \forall (x,t), \ \ (y,t) \in R^n \times I, \ \ j = \overline{1, m_2};$$

$$|f_{0j}(x,t)| \le c_{0j}|x| + c_{1j}(t), \quad c_{0j} = const, \quad c_{1j} \in L_1(I, R^1), \ \ j = \overline{1, m_2}.$$

To find necessary and sufficient conditions for existing of solution of the value problem (1)-(4).

In this work a method for solving the value problem of ordinary differential equations with boundary conditions at phase and integral restrictions is supposed. The base of the method is an immersion principle [2].

References

[1] *Aisagaliev S.A.* Obshee reshenie odnogo classa inegralnih uravneni // Matematicheski jurnal. Institut matematiki MON RK. - 2005. - T. 5, N4. - S. 7-13.

[2] *Aisagaliev S.A., Zhunussova Zh.Kh., Kalimoldaev M.N.* Princip pogruzhenia dla krevoi zadachi obiknovenih differenzialnih uravnenii // Matematicheski jurnal. Institut matematiki MON RK. - 2012. - T. 12, N2(44). - S. 5-22.