Programm of the Seminar of I. Vekua Institute of Applied Mathematics

2004

24.03, 19.05 **Tavkhelidze I.** *(I.Vekua Institute of Applied Mathematics)* Apriory energetic estimates of the solutions of one class of nigh order elliptic equations.
Summary -In this article we consider the apriory energetic estimates of Saint-Venant's type. We study problem of dependence of coefficients in this estimates with geometric structure of considered domain, with dimension of space and with order of poly-harmonic equation.

31.03 **Chankvetadze O.** *(I.Vekua Institute of Applied Mathematics)* Interrogation. Generalization of the equation concept.
Summary - Interrogation is the relation in which we can meet one or more unknown quantities. It's known that equation is the equality with one or unknown quantities; from which follows that interrogation concept is defined generalization of the equation of the equation notion.
With introduction of the concept, terms, general rules of the interrogation solution and others at the same time indicates their nature.
There were examined concept of linguistic and mathematical interrogations and their were compared in comparison with standpoint of relation.
There were defined general and quasi-general and particular solutions of interrogation and adduced corresponding theorems.
There are indicated also, that introduction of the general concept of interrogation gives us a great chance to define more precisely some fundamental concepts and terms.
At the end is considered concept of the logical systems of interrogation, which is generalization concept of classical and conjunctive system.
Hereinafter is considered one typical example about solution of the logical system.
This way concept of interrogation is one of the fundamental notions of modern mathematic. We have to indicate the circumstance that nearly till the and of first half of XX$-^{\text{th}}$ century we knew only about one interrogation - "Equation". In present time it is clear that number of interrogation is sufficiently big.

7.04 **Alkhazishvili L.** *(I.Javakhishvili Tbilisi State University)* The linearized maximum principle for optimal problems with variable delays and with non-fixed initial moment.
Summary - Formulas of variation for non-linear controlled delay differential equations with discontinuous and continuous initial moment are proved. For optimal problems with incommensurable delays in controls and with discontinuous and continuous initial condition necessary conditions of optimality are obtained in the form of linearized maximum principle for initial function and control and in the form of equalities and inequalities for initial and final moments.

7.04 **Vakhania N.** *(Morello State University, Mexico)* Exact and approximation algorithms for minimization of regular objective functions in scheduling theory.
Summary - We have considered single-machine scheduling, multiprocessor scheduling and shop scheduling problems. Our objective was to minimize regular (objective) func-

tions such as the maximal job completion time (makespan), the maximal lateness, the number of late jobs etc. We have suggested new approaches for solving these problems which resulted to the novel efficient algorithms. Sone of the algorithms improve the earlier known best ones, the others solve yet open problems. We have also reported a number of new complexity results for multiprocessor and shop scheduling .

7.04 **Pkhakadze K.** *(I.Vekua Institute of Applied Mathematics)* Georgian Language as Formal Language.

Summary - The possibility of understanding of the Natural Georgian Language as the General Formal Theory (GFT) described by Sh. Pkhkadze in 1977 is shown.

14.04 **Chichua G.** *(Sulkhan-Saba State Pedagogical University)*

A) Division of a Speech Phrase into Words.

Summary - I have created a computer program, idea of which has been worked by the supervisor of the "United Georgian Group of Logic and language" Dr. K. Pkhakadze. The programme insures split of a phrase into its constituent. We have to indicate in the programme frame MIN_ AMPLITUDE as lesser sound which is considered as silence and MIN_ MUTE_ WAIT as minimal interval of silence to split a speech phrase into words.

B) Identification of the Speech.

Summary - The aim of the programme is to transform unuttered words into written ones. There is two modes of operation in the programme teaching mode and identification mode. In order to view result of program activity we must pressed on button "statistic". Received date showed that after teaching 30 words, identification is 80%.

14.04 **Skhirtladze R.** *(I.Javakhishvili Tbilisi State University)* A Computer Model of the Core Part of Georgian and the Experimental Version of Georgian Syntax Level Spell-checking.

Summary - I have created the computer program according that formal algorithm which has been worked by the supervisor of the "United Georgian Group of Logic and language" Dr. K. Pkhakadze. The programme has built-in dictionary of Georgian words. User can add new words to it. To each word corresponds appropriate category (N with indexes for Nouns, A with indexes for Adjective, V with indexes for Verbs) according its morphologic. Syntactic rules are described as algebraic operations on N-α,A-α,V(N-α_1 N-α_2 N-α_3) where α is morpho markers of Georgian Language. For example: N-α_1+ V(N-α_1 N-α_2 N-α_3)=V(N-α_2 N-α_3).

The programme make the syntactics analysis of the simple sentences and simple noun phrases and if it finds mistake then it suggests proper cases by Changing word's morphological forms.

14.04 **Chankvetadze G.** *(I.Vekua Institute of Applied Mathematics)* A Computer Model of the Core Part of Georgian and the Experimental Version Syntax Synthethizer and Analyzer for Georgian.

Summary - I have created the computer program according that formal algorithm which has been worked in the "United Georgian Group of Logic and language". The system is designed on the basis of nouns, adjective, numerals, possessive pronouns, personal names, vocatives and verbs. With verbal forms and to synthesize and analyze of sentence program use methods worked by Dr. K. Pkhakadze. According this methods on the basis pre-verbal semantic unites as one of the main lexical category in the

program are generated the formally described verbal forms which gives us possibility to make syntax synthesizer and analyzer for Georgian.

14.04 **Pkhakadze K.** *(I.Vekua Institute of Applied Mathematics)* Natural Georgian Language as Inverse First Order Theory.

Summary - The term of a Inverse First Order Theory is defined. It is shown the possibility of understanding the Natural Georgian Language as the Inverse First Order Theory.

28.04 **Giorgadze G.** *(Institute of Cybernetics Georgian Academy of Sciences)* Invariants of holomorphic bundles and Riemman-Hilbert problem.

Summary - In the report it is considered the analytic theory of differential equations on complex analytic manifolds with nontrivial topology and the effective methods for computing of the invariants of Fuchisian systems in terms of associated holomorphic bundles is given. It is given also the solvability conditions for Riemann-Hilbert problem on Riemann surfaces for several monodromy groups. In particular, the following new results are proved:

Estimates of partial indices for rational matrix functions by a number of poles, index and order.

Criterion of stability of two-dimensional holomorphic vector bundle in terms of existence of meromorphic connection with three simple poles. An explicit formula for the splitting type of three- dimensional vector bundles in terms of its Cherm number, weight of corresponding Fuchsian system and reduced moduly number.

Effective reduction of certain Fuchsian systems of Okubo form to Schrödinger equations.

Explicit formula for the splitting type of canonical vector bundle associated with Fuchsian system of Okubo form.

Existence of local holomorphic equivalence between the module space of stable vector bundles on Riemann surface and the fiber of holomorphic map induced from monodromy functor.

Existence of one-to-one correspondence between the space of gauge equivalent Carleman-Bers-Vekua systems and the space of holomorphic structures of the associated vector bundle.

Explicit expression of monodromy matrices of Carleman-Bers-Vekua by Chen's iterated integrals.

Conditions of embeddibility of holomorphic principal bundles in terms of partial indices.

Solvability conditions for Riemann-Hilbert problems with values in a compact Lie group.

Algorithmic method of computing the Euler characteristics of fibers of quadratic mappings and explicit formula for the Euler characteristic of module space of Deligne-Mumford stable curves of genus zero.

A new model of quantum computing in terms of monodromy representations of Fuchsian systems.

5.05 **Absava R.** *(Sukhumi Branch of I.Javakhishvili Tbilisi State University)* On the non-parametric estimations of functional characteristics of distribution laws and its applications to the problems of classification and identification.

Summary - For the wide class of functional estimators of distribution limit distribution of integral quadratic deviation is studied and is prover that from these estimations well-known functional estimations could be received as a particular case.
For the distribution density and regression curve integral type statistical test criterion is constructed and the problem of using non-parametric kernel type estimation of distribution density and regression curve is studied in the problems of classification and identification.
Empirical class of solutions is constructed for which Bays risk consequences almost everywhere converge to optimal.
The method of construction of criteria of testing hypothesis for the equivalence of two regression functions and asymptotic qualities of this criterion are studied.
For the consequence of "closely standing" alternatives proposed criteria are more strong then Kolmogorov-Smirnov's type criteria.
The result of Weiss-Wolfowitz of estimation of distribution density in the point is generalized.!

19.05 **Ramishvili I.** *(Georgian Technical University)* The linearized maximum principle for quasi-linear neutral optimal problems with non-fixed initial moment.
Summary - For quasilinear neutral optimal problems with variable delays in phase coordinates and controls necessary conditions of optimality are obtained: in the form of the linearized integral maximum principle for initial function and control, in the form of equalities and inequalities for initial and final members.

9.06 **Gubelidze D.** *(I.Javakhishvili Tbilisi State University)* Second order degenerated elliptic equations and systems of equations defined on angular domains.
Summary - On plane angular domains are considered second order elliptic differential equations and systems of equations degenerating on the boundary of the domain. Existence and uniqueness of solutions for some boundary value problems in the class of regular solutions are proved.
Correctness of the boundary value problems formulated in generalized sense is proved in special weighted Sobolev spaces studied beforehand.

23.06 **Jorjiashvili N.** *(I.Javakhishvili Tbilisi State University)* Probability-possibility (combined) method of fuzzy image construction.
Summary - In dissertation it's presented a new consideration of fuzzy subsets which is based on the term of splitting of classical set(Kantorian set). It seemed that using of this procedure is effective for generalization of such classical terms as a random event probability, an entropy of random events'set.
It's shown that dual element plays an important role in describing split subset lattice Actually, it's been established the role of the dual element in understanding fuzziness. It's described different combine distributions, such as the binomial distribution with fuzzy elementary events, the binomial distribution with fuzzy number of successes, the fuzzy upper binomial distribution, the negative binomial distribution with fuzzy elementary events, the fuzzy Fuchs' distribution. All these distributions play an important role in probability-possibility modelling of linear structures.
It's shown that by using of splitting of the entropy we can generalize of Zipf-Mandelbrots' principle of least effort which plays as role for combined (probability-possibility) events as principle of maximum of information's entropy for classical cases it's elaborated so

called informational perturbation theory. It's defined a term of an image of linear structure. There are considered some examples: process of word formation with syllables by influence of consonant structures and construction of an image of possibility structures of planets' distribution at the moment of an earthquake.
Examples are chosen so that will be clear a wide area of using of the method that is considered in the dissertation.!

29.09 **Kiguradze Z.** *(I.Javakhishvili Tbilisi State University)* The asymptotic behavior of the solutions of one nonlinear integro-differential model.
Summary - The asymptotic behavior as $t \to \infty$ of solutions for a nonlinear system of integro-differential equations is studied. The system arises as a model describing the penetration of the electromagnetic field in a substance.

20.10 **Zurabiany Z.** *(I.Javakhishvili Tbilisi State University)* On a system of second order degenerate elliptic equations.
Summary - The bending of a prismatic cusped shell described by the zero approximation of I.Vekua's version of the theory of elastic prismatic shells is considered. Mathematically it leads to a Dirichlet type boundary value problem for a strongly elliptic system of differential equations with order degeneration on the boundary. The existence and uniqueness of generalized solutions of the corresponding boundary value problems in the weighted Sobolev spaces are proved.

3.11 **Svanadze N.** *(Batumi State University)* Some applications of closed queueing systems in reliability theory.
Summary - The multiunit repairable stand-by systems are considered. Closed queueing systems with two sources of requests are construed for their mathematical modelling. Particularly systems with one type of service are received when failed unit is momentarily substituted with a stand-by unit, and systems with two types of service, when switching time is a random value.
Analytical models of the systems and probability characteristics of queueing lines are obtained.

22.12 **Veliashvili N., Jibuti M.** *(I.Vekua Institute of Applied Mathematics)* About some problems of modern programming.
Summary - In this article are considered some problematic aspects of Client/Server technology, Object-oriented Programming, Visual Programming and Event-Driven programming.

29.12 **Vekua T. Meladze O.** *(Georgian Technical University)* On approximate calculation of some improper integrals Summary.
Summary - Approximate calculation of improper integrals with unbounded integrands is considered. Values of the integrals are found as solutions of a certain Cauchy problem for an differential equation of the first order. A formula of the numerical integration of improper integrals with the remainder term of the forth order with respect to the step of integration is constructed by means of the formulas of the numerical integration and Runge-Kutta.