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**SUBALGEBRAS AND AUTOMORPHISMS OF FREE LEIBNIZ  
ALGEBRAS**

The abstract of dissertation is presented for the scientific degree of the PhD of mathematical sciences, 6D060100-« Mathematics»

**Actuality of the problem.** The Leibniz algebras was introduced for the first time in 1965 in A. Blokh's work under the name of D-algebras. Later these algebras have arisen in work J.-L. Loday and D. Quillen at studying of properties of cyclic and Hochschild homologies of matrixes algebras. Presently Leibniz algebras is actively investigated by many mathematicians of France, Germany, Russia, Italy, Canada, Kazakhstan, and the USA etc.

Leibniz algebra class is a close generalization of Lie. So first of all it is interesting to study the analogues of known results for the Lie. The particular interest is the study of the structure of subalgebras of free algebras, the description of groups of automorphisms of free algebras of finite rank, the membership problem for finite generated subalgebras, and free production, etc.

The theorem's of A.I. Shirshov and E.Witt about the free of subalgebras of free Lie algebras is classic. The analogy of this result is incorrect for Leibniz's algebras. Nevertheless, A.A.Mikhalev and U.U.Umirbaev proved finite separability of subalgebras of Leibniz free algebras. The linear basis of free production of two Lie algebras is also described by A.I.Shirshov.

The English mathematician P.Kohn proved that all automorphisms of Lee free algebra of final rank are tame. A.T.Abdykhalykov, A.A.Mikhalev, U.U.Umirbayev constructed an example of wild automorphism of Leibniz's free algebra from two generating. Now a number of the first-class results of research

of group of automorphisms of free algebras is received by van der Kalk, P.Kohn, L.Makar –Limanov, A.Mikhalev, A.Chernyakevich, H.Jung, I.P. Shestakov, U.U.Umirbaev, etc..

So the question about structure of subalgebras of Leibniz's free algebras and about generating groups of automorphisms of Leibniz's free algebras is current.

**The object of research.** The Leibniz algebras.

**Subjects of research.** Subalgebras and automorphisms of free Leibniz algebras.

**The aim of the research.** This dissertation work is devoted to the investigation of automorphisms of free Leibniz algebras and investigation of the structure of subalgebras of free Leibniz algebras.

**Methods of the research.** We use the methods and results of group theory and structural and combinatorial theory of Lie algebras.

**The main results of the work are:**

- it is proved that the right ideals of a free Leibniz algebras generated by a subset of a set of free generators are free subalgebras;
- a linear basis of the free product of two Leibniz algebras is constructed;
- it is proved that the subalgebra membership problem for free products of some nonzero Leibniz algebras and free metabelian Lie algebra of a sufficiently large rank is undecidable;
- a representation of the group of tame automorphisms of two-generated free Leibniz algebras in the form of free product is obtained;

- the structure of almost elementary automorphisms of free Leibniz algebras is described;
- it is proved that almost tame automorphisms of free Leibniz algebras are 2-stably tame;
- a representation of the group of almost tame automorphisms of two-generated free Leibniz algebras in the form of free product is obtained;
- an example of an automorphism of two generated free Leibniz algebras which is not almost tame is constructed.

**Theoretical and practical importance.** Work has the oretical value. The results and methods of the work can be used for further research of Leibniz's algebras and free algebras, and also to research the automorphisms of free algebras. Therefore, the results can be used when reading special courses according to the theory of rings.

**Publications on a research subject.** Results of the dissertation are published in 9 works. including 1 article in a foreign magazine, which has a impact factor according to the database of scientific journals of Thomson Reuters; 3 articles – from the list recommended to Committees on control in education and science of Ministry of Education and Science of Republic of Kazakhstan, the 5-th work in materials of the international conferences.

**Structure and volume of the dissertation.** The work consists of an introduction, three chapters, conclusions and a list of sources used. The total volume of the dissertation is 59 pages.