STATEMENT REPORT

by professor PhD Nikolai Manev,

The Institute of Mathematics and Informatics – BAS

on the dissertation thesis of **Deyan Zhivkov Dzhundrekov** entitled

"Graded Algebras and Noncommutative Invariant Theory"

Submitted for acquiring "**Ph. D. degree**"

Area of Higher Education: **4. Natural Sciences, Mathematics and Informatics**,

Professional Field: **4.5 Mathematics**

Ph.D. program: **"Algebra, number theory and applications"- topology**

Scientific Adviser: **Associate Professor Silvia Boumova**

1. General description of the procedure and the applicant

Deyan Dzhundrekov was born in 1994. He received Bachelor degree in 2017 and MS degree with subject "Algebra, Geometry, Topology" in 2019, both at the Faculty of Mathematics and Informatics of the Sofia University "St. Kliment Ohridski". Dzhundrekov started his PhD study in 2020. In the period 2015-2023 Deyan Dzhundrekov was at a part time position as an assistant professor. Since 2023 till now he is at full time position as assistant professor in department "Complex Analysis and Topology".

By order № РД 38-64 / 01.02.2024 of the Rector of the Sofia University "St. Kliment Ohridski" I was appointed as a member of the Scientific Jury. In such a capacity I received all required documents (in digital form) that concern the procedure. The documents shows that the applicant fully meets the minimal national requirements according to the Act on Development of the Academic Staff in the Republic of Bulgaria as well as the Regulations for the conditions and rules for acquiring PhD degree of the Sofia University "St. Kliment Ohridski".

2. Approbation of the results in the dissertation

The results presented in the dissertation have been published in 2 papers, all with coauthors. Both papers have impact factor: one in the first 10%, and the other in

Q2. The papers have not been used for acquiring other degree or for occupying positions. The results are presented at 7 conferences.

3. Assessment of the personal contribution of the applicant in joint works

According declaration of coauthors and my personal observations I can conclude that the personal contribution of Deyan Dzhundrekov to the joint papers is equipollent.

4. Impact of the results on the work of other scientists

Deyan Dzhundrekov has not presented any information about citations of his papers but the Act on Development of the Academic Staff in the Republic of Bulgaria does not require the existence of citations.

5. Quality of the dissertation Abstract

The Abstract contains 49 pages and presents correctly the content of the chapters and the spirit of the dissertation as a whole. It underlines also the main results obtained in the thesis.

6. Description and analysis of results in the thesis

The dissertation thesis contains 87 pages and consists of Introduction, three chapters, Conclusion, and Bibliography with 56 items. Dzhundrekov's publications concerning the thesis as well as his conference presentations are listed in Conclusion.

Chapter 2 introduces the numerous notions and facts necessary for reading and understanding the rest of the thesis. The author's original results are given in Chapters 3 and 4.

The thesis studies the polynomial algebras of noncommutative variables that are invariant under the action of symmetric group or its subgroups with the additional action of Koryukin (called S-action in the thesis). The goal is to find minimal generating set or at least to determine if the studied algebra is finitely generated or not.

Section 3.1 addresses the case when the field characteristic is zero or greater than number of variables. In partial a noncommutative analog of the fundamental theorem for symmetric polynomial as well as the Newton's identities are proven.

In Section 3.2 it is proven that in the case of nonzero characteristic less or equal to the number of variables the S-algebra of symmetric noncommutative polynomials is not finitely generated.

In the research descried in Chapter 4 the symmetric group is replaced by alternative group but the tasks are the same. The investigations are not complete - they are only for 3 variables. It is proven that the considered algebra is not finitely generated in the case of characteristic 2 and 3. Nevertheless, in my opinion, the obtained results are valuable.

Deyan Dzhundrekov claims 9 scientific contributions. They are listed on the pages 37 and 38 of the Abstract and pages 72 and 73 of the thesis. The first six contributions in this list are the result obtained in Section 3.1. The next three contributions are part of the results obtained in Section 3.2.
The contributions of Deyan Dzhundrekov are solutions of difficult and interesting problems.

7. Critical remarks

I have no essential critical remarks.

CONCLUSION

The dissertation thesis of Deyan Dzhundrekov contains theoretical results that are original contribution to the studied mathematical area. The thesis fully meets the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its application, and the Regulations for the conditions and rules for acquiring PhD degree of the Sofia University "St. Kliment Ohridski". **Dzhundrekov demonstrates qualities and abilities for carrying out scientific investigations.**

Based on the aforesaid in this report **I give a positive estimation of the considered dissertation and strongly recommend the Scientific Jury to confer on Deyan Zhivkov Dzhundrekov the educational and scientific degree "Doctor" in area 4. Natural Sciences, Mathematics and Informatics**, professional field: **4.5 Mathematics, Ph.D. program: "Algebra, number theory and applications"- topology.**

18.03.2024 г.   Signature:

Sofia   Prof.   N. L. Manev