

## REVIEW

Of Materials Submitted for Participation in Contest  
For Occupying Academic Position Associate Professor  
in Professional Field 4.5. Mathematics  
(Mathematical Analysis),  
At Sofia University “St. Kliment Ohridski”,  
Faculty of Mathematics and Informatics  
Candidate: chief assistant Nikolay Antonov Ivanov, PhD  
Reviewer: Prof. Nadezhda Kostadinova Ribarska, DSci  
August 11th, 2022

Chief Assistant Nikolay Antonov Ivanov, PhD is the only one candidate in the contest for occupying the academic position “associate professor” in: scientific area 4. Natural Sciences, Mathematics and Informatics, professional field 4.5. Mathematics (Mathematical Analysis) for the needs of Sofia University “St. Kliment Ohridski”, Faculty of Mathematics and Informatics, announced in State Gazette no. 30 of 15 April 2022 and on the Internet sites of FMI and Sofia University “St. Kliment Ohridski”. He is born on October 15, 1977. He obtained his MSci degree in FMI of Sofia University “St. Kliment Ohridski” in 2001. After that Nikolay Ivanov began his graduate study in Texas A&M University, U.S.A. Part of it (September 2004 – July 2005) he spent in Westfälische Wilhelms-Universität Münster where he collaborated with Prof. J. Cuntz, Prof. S. Echterhoff and Dr. Y.Ueda. He defended his thesis “On the structure of some free products of  $C^*$ -algebras” in 2007 under the guidance of Prof. Kenneth Dykema at Texas A&M University.

Dr. N. Ivanov held post-doctoral positions in Fields Institute from July 2007 to December 2007 and in Queen’s University from January 2008 to June 2009. He is teaching in the University of Veliko Tarnovo in the years 2009-2016. Since August 2016 Nikolay Ivanov is Chief Assistant at Sofia University “St. Kliment Ohridski”, Faculty of Mathematics and Informatics, chair of Mathematical Analysis.

Dr. Nikolay Ivanov has submitted for participation in the contest a full set of documents and materials, which complies with the Regulations on the Academic Staff Development in the Republic of Bulgaria, the Regulations for their application and with the respective regulations for acquiring scientific degrees and holding academic positions of Sofia University “St. Kliment Ohridski”.

The research interests of Dr. Nikolay Ivanov are in the field of oper-

ator theory, more precisely structure and classification of  $C^*$ -algebras. The candidate has serious achievements in this field.

Dr. Nikolay Ivanov has teaching experience as well. The candidate has taught various mathematical disciplines at the University of Veliko Tarnovo and at FMI of Sofia University. In the last years the candidate has lectured on Mathematical Analysis 1 and 2 for students majoring in mathematics at Sofia University. It is worth noting that this is the most advanced of the obligatory Mathematical Analysis courses at FMI. He is a serious, responsible and helpful teacher. His colleagues can rely on him.

Dr. Nikolay Ivanov submitted for the participation in the present contest for Associate Professorship 7 publications. The articles in peer-reviewed scientific journals are 6, of which 4 are published in journals with impact factor – 3 in Q1 (Journal of Functional Analysis, Transactions of the American Mathematical Society) and 1 in Q2 (Annales de L’institut Fourier). Two papers are in mathematical journals (Serdica Math. J. and Ann. Sofia Univ., Fac. Math. and Inf.) and one is in conference proceedings (Current Developments in Differential Geometry and its Related Fields). The results of three scientific papers presented by the applicant have been used in his PhD thesis. All submitted papers have not been used in previous contests. The individual publications are 5. I have no doubt that Dr. Nikolay Ivanov has contributed at least an equal share to all joint publications.

The scientific papers submitted for the competition satisfy the minimal requirements of the law (under Art. 2b, para. 2 and 3 of ZRASRB) and the additional requirements of Sofia University “St. Kliment Ohridski” for occupying the academic position “Associate Professor” in the scientific area and the professional field of the competition.

Study of  $C^*$ -algebras is an important part of modern mathematics. The interest in  $C^*$ -algebras stems from their use in quantum mechanics. Please note that the techniques used in the field are complex and belong to various mathematical disciplines (algebra, functional analysis, combinatorics, probability theory etc) and the applicant had mastered them.

Dr. Nikolay Ivanov addresses the issues of simplicity and uniqueness of the trace for various classes of  $C^*$ -algebras. In the first paper of the list, necessary and sufficient conditions for simplicity and uniqueness of the trace for reduced free products of finite families of finite-dimensional  $C^*$ -algebras with specified traces are found (previously the result was known only for abelian  $C^*$ -algebras). Research (on the same questions) on reduced free products of  $C^*$ -algebras with amalgamation, started by the candidate in the third paper of the general list (not submitted for the competition), has been successfully continued and extended in [4] and [6]. The notion of quasi-kernel is introduced, by means of which a characterization of the  $C^*$ -simplicity property is obtained. Concrete examples of groups whose  $C^*$ -algebras are not simple but have a unique trace are presented. The papers [5] and [7] present wider classes of

examples given by generators and relations (making their study considerably easier) that satisfy the trace uniqueness property. In the second article of the list, a class of  $C^*$ -algebras generated by Toeplitz operators satisfying certain conditions is considered. Their  $K$ -theory is found and some of their structural properties are proved.

In total, Dr. Nikolay Ivanov has published 8 articles in peer-reviewed scientific journals. In the documents provided by the applicant, 8 citations (of only one article) are indicated. A basic search in Web of Science shows that the citations of his works (without self-citations) in journals with an impact factor are at least 16. In Google Scholar, the number of citations of his works (without self-citations, but including publications in arxiv) rises to 38. This proves that the works of the candidate are appreciated by the mathematical community.

I have no doubt that Dr. Nikolay Ivanov has an equal contribution to all joint articles.

No plagiarism was found in the publications submitted for assessment.

#### **CONCLUSION:**

The scientific achievements of Dr. Nikolay Ivanov, both in terms of quality and quantity, do not leave any doubt in the positive assessment of his research and pedagogical activity.

**I strongly recommend the scientific jury to prepare a report-proposal to the esteemed Faculty Council of the Faculty of Mathematics and Informatics of Sofia University to elect Chief assistant Nikolay Antonov Ivanov, PhD for the academic position “Associate Professor” of Sofia University “St. Kliment Ohridski” in Scientific Area 4. Natural sciences, Mathematics and Informatics, Professional field 4.5. Mathematics (Mathematical Analysis).**

11.08.2022

(Prof. N. Ribarska, DSci)