

# OPINION

**for the competition for the academic position Associate Professor  
in professional field 4.5 Mathematics (Mathematical Logic), for the needs of Sofia  
University "St. Kliment Ohridski "(Sofia University),  
Faculty of Mathematics and Informatics (FMI),  
announced in SG no. 87 of 19.10.2021 and on the websites of FMI and Sofia  
University**

The opinion was prepared by: **Assoc. Prof. Dr. Hristo Alexandrov Ganchev, FMI of Sofia University, 4.5 Mathematics** , in his capacity of a member of the scientific jury for the competition according to Order № RD 38-591 / 10.12.2021 of the Rector of Sofia University .

The only candidate, who has submitted documents for participation in the announced competition, is **Dr. Ivan Dimitrov Georgiev**.

## **I. General description of the submitted materials**

### **1. Candidate data**

The documents submitted by the candidate comply with the requirements of the Bulgarian legislation. The candidate has submitted a list of a total of 8 publications in Bulgarian and foreign scientific journals and scientific forums . All other required documents (in the form of official notes and certificates from the employer, funding organization or contracting authority, references and feedback, awards and other relevant evidence) supporting the applicant's achievements are also presented.

*I have no comments on the submitted documents.*

### **2. Candidate details**

Dr. Ivan Georgiev was born in 1983. After graduating from high school in Burgas, he entered the FMI at Sofia University, where he successively obtained the degrees Bachelor of Informatics (2007), Master of Mathematics (2009, MP Logic and Algorithms), PhD in 4.5 Mathematics (Mathematical Logic, 2016). In 2009 he started as an Assistant Professor at the University of Burgas "Prof. Dr. Asen Zlatarov). He is a laureate of the Annual Award for Research and Scientific Achievements in the Field of Computer Science, Mathematical Logic and Computability in the name of Prof. Ivan Soskov for 2014. He has participated in the preparation of problems for the national competitions in computer science. He is a member of the scientific organizations Computability in Europe ( CiE ), Computability and Complexity in Analysis ( CCA) and the Association of Symbolic Logic ( ASL). He speaks two foreign languages.

### **3. General characteristics of the scientific works and achievements of the candidate**

The 8 publications presented for the competition are in two areas – Computable Analysis and Fuzzy Sets, as the main part (6 of the publications) are in the first area. Computable Analysis is a relatively new and modern subfield of Computability Theory. It studies the computability and complexity of rational approximations of real numbers, as well as the main operators in Analysis. Special attention is paid to the approximations from the subrecursive classes, thus obtaining far finer results than in the general considerations. Working with these classes is technically difficult and

requires great ingenuity. A number of non-trivial and interesting results have been obtained. A clear evidence of this are two of the publications (one independent and the other co-authored), published in the Annals of Pure and Applied Logic - one of the best specialized journals in Mathematical Logic.

In general, the presented scientific papers meet the minimum national requirements and respectively the additional requirements of Sofia University "St. Kliment Ohridski" for holding the academic position Associate Professor in the scientific field and professional field of the competition. They were published after 2016 (the year the candidate obtained his PhD degree) and do not repeat works from previous procedures for acquiring a scientific title and academic position.

There is no legally proven plagiarism (or even suspicion of such) in the scientific papers submitted to the competition.

#### **4. Characteristics and evaluation of the teaching activity of the candidate**

Dr. Ivan Georgiev has extensive teaching experience. As an Assistant Professor (since 2009) at the University of Burgas "Prof. Dr. Asen Zlatarov" he has given courses in Higher Mathematics (including chapters in Linear Algebra, Analytical Geometry, Differential and Integral Calculus, Differential Equations, Probability Theory) for students in technical, economic and chemical specialties. He has also taught Computer Security and Computer Architectures. In the period 2018-2019 he gave an elective course Computable Analysis at the FMI of Sofia University. I was pleasantly impressed by his online lectures uploaded on his personal Youtube page .

I think that Dr. Georgiev is an excellent teacher who will be a great addition to the FMI team at Sofia University.

#### **5. Content analysis of the scientific and scientific-applied achievements of the candidate contained in the materials for participation in the competition**

Of the results contained in the publications submitted for the competition, those who study the computational complexity of different representations (different bases of representation, Dedekind sections, chain fractions, etc.) of irrational numbers make a strong impression. A method for constructing irrational numbers, having low computational complexity when presented with a Cauchy sequence, but whose  $p$ -based expansions can be of arbitrarily high complexity for all bases  $p$ , is shown. It has been proved that for every irrational number with representation in  $\mathcal{E}^2$ , there exists a number with representation in  $\mathcal{E}^2$ , such that their sum is of arbitrarily high computational complexity for each  $p$ -based expansion.

Other results that made a strong impression on me are those related to the complexity of real numbers, real functions and the operator integration with respect to the subrecursive class  $\mathcal{M}^2$  (polynomially bounded  $\Delta_0$ -definable total functions in natural numbers). It has been proved that the gamma function (limited to positive real numbers) and the zeta function (limited to real numbers greater than 1) are conditionally  $\mathcal{M}^2$ -computable. Furthermore, it is shown that the definite integral of a uniformly  $\mathcal{M}^2$ -computable analytic function with  $\mathcal{M}^2$ -computable limits is a  $\mathcal{M}^2$ -computable number. As a consequence of this result, it is derived that the Euler-Mascheroni constant is  $\mathcal{M}^2$ -computable.

#### **6. Critical remarks and recommendations**

*I don't have any.*

#### **7. Personal impressions of the candidate**

I have known Dr. Ivan Georgiev since the time he was a student at FMI, and since then I have a very good opinion about him. He has always impressed me as an extremely conscientious and thorough person. These impressions of mine are confirmed by the materials presented by him in this competition.

## **8. Conclusion on the application**

After getting acquainted with the materials and scientific papers presented in the competition and based on the analysis of their significance and the scientific and applied contributions contained in them, I **confirm** that the scientific achievements meet the requirements of ZRASRB, its Implementing Regulations and Sofia University "St. Kliment Ohridski" for holding the candidate for the academic position Associate Professor in the scientific field and professional direction of the competition. In particular, the candidate satisfies the minimum national requirements in the professional field and no plagiarism has been established in the scientific papers submitted at the competition.

I give my **positive** assessment of the candidacy.

## **II. OVERALL CONCLUSION**

Based on the above, I **recommend** the scientific jury to propose to the competent body for the selection of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" to choose Dr. Ivan Dimitrov Georgiev to take the academic position Associate Professor in the professional field 4.5 Mathematics (Mathematical Logic)

February 7, 2022

Prepared the opinion:

(Assoc. Prof. Dr. Hristo Ganchev)