Report

on a competition for the occupation of an academic position "Professor" in the scientific specialty of Mathematics (mathematical logic), for the needs of Sofia University "St. Kliment Ohridski "(Sofia University), Faculty of Mathematics and Informatics (FMI), announced in the State Gazette no. 59 of 26 July 2019 and on the websites of FMI and SU

The report was prepared by: Assoc. Prof. Dr. Dimitar Panayotov Guelev, Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences, as a member of the competition jury in Mathematics under the competition according to Order No. РД 38-555 / 25.09.2019. of the Rector of Sofia University.

Only one candidate has applied for participation in the announced competition: Assoc. Prof. Dr. Aleksandra Andreeva Soskova, SU, FMI.

I. General description of the materials presented

1. Details of the application

The submitted documents from the applicant comply with the requirements of ЗРАСРБ, ППЗРАСРБ and the Regulations on the conditions and procedure for acquiring scientific degrees and occupying academic positions at Sofia University "St. Kliment Ohridski" (ПУРПНСЗАДСУ). The candidate Aleksandra Andreeva Soskova has presented a list of 11 works, including 8 articles in Bulgarian and international scientific journals and conference proceedings volumes and 3 articles presented at the Panhellenic Logic Colloquium, which does not have official proceedings. Of these works, 4 are her own, and 7 are co-authored. A. Soskova is the 1st author of 6 of them.

Comments on the presented documents

Some of the presented works were at first submitted in their preliminary variants. That was noticed by other members of the jury and, upon request, the jury duly received the published versions of the articles.

2. Details on the applicant

Aleksandra Soskova received her M.Sc. in mathematics from the Faculty of Mathematics and Informatics of Sofia University "St. Kliment Ohridski" in 1979. She obtained her Ph.D. in 1990 with the thesis entitled "Effective Algebraic Systems" under the supervision of Prof. D.Sc. Dimiter Skordev. Aleksandra Soskova started her research careear as a research associate at Systemizot, Sofia, in 1981. Starting from 1990, she was research associate at Sofia University. She joined the Faculty of Mathematics and Informatics of Sofia University as assistant professor in 1993 and successively took the positions of assistant professor, senior

assistant professor and chief assistant professor in the period 1993-2005. She was elected associate professor in mathematical logic at the Department of Mathematical Logic and Its Applications in 2005, and currently holds this position. She has been Head of the the Department of Mathematical Logic and Its Applications and Vicedean Faculty of Mathematics and Informatics of Sofia University. She has supervised two M.Sc. studentships and one Ph.D. studentship which was completed with the awarding of a Ph.D. degree. One more ph.d. student of hers has been discharged, with the right to defend a thesis.

3. General characteristics of the applicant's scientific work and achievements

The research work of Aleksandra Soskova is in computability theory. In particular, she has studied so called unsolvability degrtees, which commence as classes of mutually reducible algorithmic problems. This is an interesting topic in computability theory of theoretical significance. A. Soskova has non-trivial contributions to the study of this topic.

The scientific works comply with the minimum national requirements (under Art. 2b, para 2 and 3 of the ЗРАСРБ) and respectively with the additional requirements of the Sofia University "St. Kliment Ohridski" for the occupation of the academic position of "Professor" in the scientific field and professional direction of the competition. The scientific papers submitted by the applicant do not repeat those of previous procedures for the acquisition of a scientific title and academic position. There is no proven plagiarism in the scientific works presented at the competition.

4. Characterization and evaluation of the applicant's teaching activity

A. Soskova is an experienced university teacher. Together with Stela Nikolova, she authored two texts, namely „Теория на програмите в задачи", 1997., and „Семантика на езиците за програмиране", 2008., both published by „Софтех". A. Soskova is an established univesity teacher with proven paedagogical ability.

5. Comprehensive analysis of the scientific and applied scientific achievements of the candidate contained in the materials for participation in the competition

The presented scientific works [1-11] describe results obtained by the candidate and her co-authors on the topic of degree spectra of structures wrt enumeration reducibility. In [1] the properties of quasi-minimal degrees are investigated. It is proven that there exist uncountably many quasi-minimal degrees for every degree spectrum. It is shown that the first jump spectrum of every structure consists exactly of the enumeration jumps of the quasi-minimal degrees for the degree spectrum and every element of the first jump spectrum could be represented as the join of two quasi-minimal degrees for the degree spectrum. The article [2] is a survey on results in enumeration reducibility and effective model theory. The article [3] investigates a generalisation of the notion of a degree spectrum of a structure with respect to countably many sets, based on the notion of omega-enumeration reducibility. It is shown that the omega-degree spectrum is a upward closed set with respect to total enumeration degrees. A normal form of the elements of the omega-co-spectrum of a structure is given. It is shown that the minimal pair theorem and the existence of quasi-minimal degree are true for the omega-degree spectrum carry over to omega-spectra of sequences of sets. The article [4] presents a otion of Degree spectrum of a structure relative to finitely many abstract

structures on the basis of the notion of relative $\sum_n^0$ sets. The connection with the notion of Joint spectrum is studied. Properties such as Minimal Pair type theorem and the existence of Quasi-Minimal degree are studied for the relativised spectra. The article [5] presents a jump inversion theorem for degree spectra. The article [6] proves the existence of a structure whose degree spectrum is the jump degree spectrum of an arbitrary given structure. Given a structure whose degree spectrum is a subset of the jump degree spectrum of some other given structure, it is proven that there exists a structure whose spectrum is a subset of the spectrum of the second one and whose jump spectrum is the spectrum of the first given structure. The article [7] investigates so-called relative degree spectra which were introduced in [4]. It is shown that relative degree spectra have the established general and specific properties of degree spectra. In particular, the minimal pair theorem and the existence of quasi-minimal degrees is proven. A syntactical characterisation of the element of co-spectra is given in terms of computable infinitary formulas. A comparison with the notion of joint spectrum wrt a finite number of structures is drawn. In [8] the properties of the degree spectra and, in particular, the connection between spectra and jump spectra are investigated. It is shown that the jump of the degree spectrum of a structure is the spectrum of some (other) structure and a jump inversion theorem is obtained. The article [9] is about some specific applications of the jump inversion theorem about degree spectra. The article [10] investigates the notion of intrinsically relatively recursively enumerable set wrt a given sequence of structures and proposes a generalisation of the notion of jump sequence from sets to structures. Some specific results are presented. In [11], a general result featuring sufficient condition on the possibility for the so-called strict jump inversion of degree spectra is obtained.

6. Personal impressions of the applicant

Aleksandra Soskova is a valued and respected teacher at the Faculty of Mathematics and Informatics of Sofia University.

7. Conclusion on the application

Having become acquainted with the materials and scientific works presented in the competition and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, I **confirm** that the scientific achievements comply with the requirements of the ЗРАСРБ, the Regulations for its implementation and the corresponding Regulations of Sofia University "St. Kliment Ohridski "for the position of the candidate in the academic position "Professor" in the scientific field and professional direction of the competition. In particular, the applicant satisfies the minimum national requirements in the professional field and no plagiarism has been found in the scientific papers presented at the competition.

I give my **positive evaluation** to the application.

II. GENERAL CONCLUSION

On the basis of the above, I recommend that the scientific jury propose to the competent body for the selection of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" to elect Aleksandra Andreeva Soskova to take the academic position of "professor" in the professional field of Mathematics (Mathematical Logic).

November 26, 2019   Signature of the author of this report: ....

(Assoc. Prof. Dr. Dimitar Panayotov Guelev)