(English translation)

REVIEWER'S OPINION

on Competition procedure for the position of full Professor in the field

4.5 Mathematics (Mathematical Logic)

Announced by Sofia University St. Kliment Ohridski, Faculty of Mathematics and Informatics in

the State Gazette, issue 59/26.7.2019 and on the Sofia University St. Kliment Ohridski web page

By Prof. Dr. Tinko Velichkov Tinchev,

Sofia University St. Kliment Ohridski, Faculty of Mathematics and Informatics, professional field

4.5 Mathematics (Mathematical Logic) in his capacity of Scientific Jury Member following

Order# RD 38-555 / 25.09.2019 of the Rector of Sofia University St. Kliment Ohridski

The only candidate in this competition procedure for full Professor is Alexandra Andreeva Soskova, Ph.D., currently Associate Professor from Faculty of Mathematics and Informatics, at Sofia University St. Kliment Ohridski.

I. GENERAL DESCRIPTION OF THE DOCUMENTS PRESENTED FOR THE COPMPETION

1. Description of the application

Documents presented at the competition by Assoc. Prof. Alexandra Soskova, meet the requirements of the Law for Development of the Academics in the Republic of Bulgaria, Bylaws (Pravilnik) for implementation of the Law for Development of the Academics in the Republic of Bulgaria and at Sofia University St. Kliment Ohridski.

For participation in the competition, Associate Professor Alexandra Soskova has presented 11 publications in international scientific journals and scientific conferences.

Four of them (issues 1, 7, 8 and 11 from the list of submitted publications for the competition) are in the renowned specialized journal "Journal of Logic and Computation", referenced and indexed in a number of world bases, among which are Scopus and WoS .

Another 4 of item (Nos. 2, 3, 4 and 5 from the list of entries for the competition) are in the well-known series Lecture Notes in Computer Science, referenced and indexed on a number of world bases, among which is Scopus.

Articles 6, 9 and 10 are in the proceedings of the Panhellenic Logic Simposium international regularly organized conference and I will not review them, since the maximum text volume allowed

by the organizers is too limited and does not allow for indisputable evaluation - they contain, in general, definitions only, statements and ideally just a sketched construction or a proof idea.

Four of the articles presented for the competition (Nos. 3, 4, 5 and 7) are solely authored by Alexandra Soskova, four (Nos. 1, 6, 8 and 9) with Ivan Soskov, one (No. 2) with Maria Soskova, one (No. 10) with her two PhD students Vatev and Terziivanov, and one (No. 11) in co-authorship with Vatev and five other foreign scientists.

Concerning Article 122 (2) of The Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University "St. Kliment Ohridski ":

Two references to the works of Assoc. Prof. Alexandra Soskova by prominent scientists in computational theory - Antonio Montalbán (University of California Berkeley) and Valentina Harizanov (George Washington University) - are presented. They undoubtedly demonstrate the recognition and good name of Assoc. Prof. Alexandra Soskova in the international community of scientists in the field.

Known and easily verifiable data are available on her participation in a number of international specialized scientific conferences and seminars (63!) and scientific visits at 19 universities across 5 continents (Europe, Asia, North America, South America, and Australia).

Information is presented about her participation in a number of organizational and program committees at international conferences and workshops; I will only note that Assoc. Prof. Alexandra Soskova was the chairwoman of the organizing committees of two important scientific conferences in Sofia - Logic Colloquium 2009 and Computability in Europe 2011.

Associate Professor Alexandra Soskova is a member of the Association for Symbolic Logic, Computability in Europe Association and the American Mathematical Society. She has been on the governing bodies of the Association for Symbolic Logic for years.

Assoc. Prof. Alexandra Soskova is involved in or leading more than 10 international scientific-research and structural projects.

2. Information about the Candidate

Alexandra Soskova graduated in 1979 with a Master's Degree in Mathematical Logic from the Faculty of Mathematics and Mechanics of Sofia University "St. Kliment Ohridski ". In 1990 she defended her PhD thesis in mathematical logic under the scientific guidance of Prof. D.Sc. Dimitar Skordev in the field of computational theory, in which she has worked ever since.

From 1979 to 1981 she was a mathematician at the Science and Technology Institute, from 1981 to 1986 she was a researcher at SYSTEMISOT, from 1990 to 1991 she was a researcher at the Scientific Research Center of Sofia University "St. Kliment Ohridski". From 1993 to 2005 she was consecutively an assistant, senior assistant and chief assistant at the Department of Mathematical Logic and its Applications at Faculty of Mathematics and Informatics (FMI). From 2005 until now, she has been an Associate Professor in the same department. In two consecutive terms, 2008-2016,

she was the head of the department. I would like to particularly acknowledge her care and successful efforts in the development of the staff and in attracting young assistants to the department as well as the academic spirit in the department under her leadership.

In the period 2015-2016, Assoc. Prof. Alexandra Soskova is the Deputy Dean of FMI. She actively participated in the life of the academic community - for two terms (1999-2017) she was a member of the Academic Council of the University from the quota of non-habilitated professors, from 1999 until now (except 2006-2008) is a member of the Faculty Board of the FMI. She has been a member of various committees (academic, elective, Erasmus coordinator, etc.) at the FMI and the General Assembly of Sofia University.

In addition to regular university administrative activities, Assoc. Prof. Alexandra Soskova actively serves the international professional community as chairwoman and member of a number of organizational and program committees at international scientific conferences. Since 2010, she has been a member and chairwoman of various association bodies for the Association for Symbolic Logic.

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

The scientific works presented by the applicant do not repeat those of the previous procedures for acquiring a Ph.D. and the academic position of Associate Professor. The earliest publication date submitted for this competition is after the latest procedure for the acquisition of the academic position of Associate Professor and the scientific title of PhD.

There is no reason to suspect plagiarism in the scientific papers presented at the competition. All the results of the articles presented are in the proceedings of conferences published in Lecture Notes in Computer Science and in the Journal of Logic and Computation, which are well visible to the scientific community.

The scientific articles submitted for the competition fully comply with the minimum national requirements (Article 2b, (2) and (3) of the Law for Development of the Academics in the Republic of Bulgaria) and accordingly to the additional requirements of Sofia University "St. Kliment Ohridski" for the occupation of the academic position of "professor" in the professional field 4.5. Mathematics (Mathematical logic).

The only candidate in the competition procedure has completed a Form showing that she fully meets the minimal national requirements published in the Bylaws (Pravilnik) for implementation of the Law for Development of the Academics in the Republic of Bulgaria for the scientific field 4.5 Mathematics. In particular: she has accumulated the necessary 150 points for Index1, Index2, and Index 3 from the ABV group by possessing the title Doctor (50 points) and having presented 3 articles equivalent to 120 points.

Requirement for number and quality of publications for a professor according to group D (P5 to P10) of the Bylaws (Pravilnik) for implementation of the Law for Development of the Academics in the Republic of Bulgaria (amend. SG 15/02/2019, Table 2, District 4.5.) is that the applicant

should acquire no less than 200 points. According to the information provided, the applicant claims a total of 210 points for 5 of her scientific articles presented for the competition, the points for which are correctly calculated, both for each publication individually and for the total amount.

Applicants for professorship are also required to submit 100 points of citations to their publications. They are classified in Group E (P11) of the Bylaws. The enclosed table shows that the applicant is claiming 120 points. They are sufficient in terms of the minimum requirements, but the applicant has significantly more citations, as shown in the international databases of scientific articles. По отношение на група Е при 100 необходими кандидатът набира 310, от които ръководство на защитил докторант 50 точки, за ръководство на национални проекти – 40, за ръководство на българския екип и участие в международни проекти – 200, както и 20 точки от съавторство в две университетски учебни пособия.

With regard to Group E, while candidates are required to earn 100 points, Assoc. Prof. Soskova has 310, of which 50 points for one successfully defended PhD under her supervision, 40 for leadership in national scientific projects, 200 for Bulgarian team leadership in international projects, and 20 points for co-authorship in two university textbooks.

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

Over the years, Assoc. Alexandra Soskova has taught courses in mathematical logic, logic programming, mathematical foundations of computer science, theory of programs, semantics of programming languages, computability and complexity in the Bachelor's program at FMI. In recent years, Assoc. Alexandra Soskova has taught several courses in discrete mathematics: Discrete Structures 1 and 2, Discrete Mathematics and Algorithms; Languages, automata and Computability, to which she relates with responsibility and care for students. This includes working with assistants and demonstrators to prepare them for exercises, developing sample sets of problems with solutions, using the Moodle system to generate individual student tests, developing notes and using multimedia tools. I would like to point out that she is the co-author of two collections "Theory of Programs in Problems" and "Programming Languages Semantics", which are also used successfully in Master's programs in Logic and Algorithms in the fields both of Mathematics and Informatics.

In Master's programs Assoc. Prof. Alexandra Soskova teaches courses in Computational Theory and Model Theory (shared teaching).

She has been the scientific supervisor of two successfully defended Master's theses and has been on numerous committees for the defense of diploma papers.

Since 2015, Assoc. Prof. Alexandra Soskova has been the Head of the Master's Program in Logic and Algorithms, majoring in Computer Science, at the FMI of Sofia University.

There is one successfully defended PhD student under her supervision and one PhD student who has been deferred.

Overall, I give an excellent assessment of her teaching and teaching activities.

5. Scientific achievements of the candidate in the articles submitted for the competition

In the publications submitted for the competition the subject of study is the relations between enumeration reducibility and computable model theory, degree spectrum and jump of degree spectrum in different reducibilities as well as analogues of enumeration reducibility of classical properties of theory of degrees. Prof. Alexandra Soskova's competence and good knowledge of the history, current state of the problems in the aforementioned subjects and the place of the Sofia School in their development were demonstrated in her joint article with Maria Soskova [2]. In this article, one can actually see the self-assessment of her scientific achievements, in particular, her contributions to the articles presented for the competition with the numbers 1-10, which are clearly visible to the attention of specialists in this narrow field. (Maybe this one should have been the first of the competition articles.)

In the article [1] the properties of quasi-minimal degrees with respect to the enumeration spectrum are investigated, along with a number of interesting and important properties proven, the beautiful property is demonstrated: each element of the jump of degree spectrum is a join of two quasi-minimal degrees of enumeration spectrum. In the conference papers [3, 4], variants of the concept of degree spectrum are considered and the analogy with the enumeration degree is studied. Particularly noteworthy is the conference paper [5], in which Assoc. Alexandra Soskova proves, if not the most interesting, at least her most cited result - the theorem for jump inversion theorem for the degree spectra, which is also contained in the journal version [8], enriched with the results of Ivan Soskov. (A recent Scopus review showed 24 citations of these two articles with auto-citation excluded.) Article [7] is a journal version of [4]. In fact, it is worth noting that both references included I the documentation by Antonio Montalbán and Valentina Harizanov place Alexandra Soskova's jump inversion theorem as central achievement.A very recent article [11] proves sufficient condition a structure to admit strong jump inversion and gives examples for structures which do not admit strong jump inversion. This sufficient condition is applied to some interesting structures.

On the whole, I can state that the scientific results in the articles included for the competition are significant and significantly enrich the knowledge of the computable and its complexity. The proofs use deeply nontrivial, difficult modern techniques and methods. They are published in visible places for all specialists to see and are noticed and used by reputable scientists, as shown by a quick check in Scopus.

6. Critical notes and recommendations

My critical remarks relate mainly to the style of the scientific contributions in the Self-review of Assoc. Prof. Alexandra Soskova. (1) Poor focus: in an effort to show the place of her results in the scientific field, she delves into a far too extensive description of the field and the results of the Sofia School of Computability Theory. (2) Too much technical detail, both with regard to the

description of the field and the articles submitted for the competition. (3) Inappropriate modesty, for example, for the authorship of the jump inversion theorem for degree spectrum of a structure (perhaps the strongest result of Assoc. Prof. Alexandra Soskova). (4) Long and unnecessary comments on articles co-authored by Alexandra Soskova but not submitted for the competition. (5) Inattention to translation, for example Roland Fraïssé became Фреше (but in Bulgarian this denotes Fréchet – a completely different author), predicate „non-equal" is translated as „неравенство" (inequality) instead of „различие" (difference) etc. The wonderful style of [2] may have led Assoc. Alexandra Soskova to "get involved", but in the case of the contribution description, the purpose and readers are completely different from the readers of [2].

These notes do not in the least alter my assessment of the scientific value of the articles submitted for the competition.

7. Personal impressions of the applicant

I have personally known Assoc. Prof. Alexandra Soskova since the 1970s. I have witnessed her professional development and growth. She has been my assistant in the courses in mathematical logic and logic programming, so I have a profound knowledge of the responsibility and commitment she has to teaching and attention to students.

Together with her and Assoc. Prof. Angel Dichev, we have thaught for many years the course in Logical Foundations of Computer Science for the specialization of Mathematical Logic, which is the precursor of the Master's program in Logic and Algorithms. For over twenty years, we have been lecturing together at FMI's Master's programs. So I can confidently claim that she is very good at teaching.

8. Conclusion on the application

After careful study of the scientific works and the additional documentation presented in the competition and on the basis of the analysis of their importance and their scientific contributions, I confirm that the scientific achievements of the candidate meet the requirements of the Law for Development of the Academics in the Republic of Bulgaria, Bylaws (Pravilnik) for implementation of the Law for Development of the Academics in the Republic of Bulgaria and the additional requirements of Sofia University St. Kliment Ohridski for the occupation of the academic position of "Professor" in the scientific field and the professional subfield of the competition. Assoc. Alexandra Soskova meets the minimum national requirements in the professional field 4.5. Mathematics and no plagiarism was found in the scientific works presented for the competition.

I give a **positive assessment** of the application of Assoc. Prof. Alexandra Andreeva Soskova for the academic position of "Professor" in the professional field 4.5. Mathematics (Mathematical Logic) in the competiton announced for the needs of Sofia University "St. Kliment Ohridski ", Faculty of Mathematics and Informatics.

II. GENERAL CONCLUSION

On the basis of the above, I **recommend** that the Scientific Jury **propose** to the Faculty Council of the Faculty of Mathematics and Informatics at Sofia University "St. Clement Ohridski ", expanded in accordance with Art. 29c, para. 2 of the Law for the Development of Academic Staff in Republic of Bulgaria, **to elect Assoc. Prof. Alexandra Andreeva Soskova to take the academic position of "Professor"** in the professional field 4.5. Mathematics (Mathematical logic).

November 26, 2019   **Reviewer:**

(Prof. Tinko Tinchev, Ph.D.)