S T A N D P O I N T

on the contest for the Acquisition of the Academic Position "Professor"

in Professional Direction 4.5 Mathematics

at Sofia University "St. Kliment Ohridski" (SU)

Faculty of Mathematics and Informatics (FMI)

announced in St. Gaz. 63/30.07.2021 and on the Web Sites of SU and FMI

The standpoint is written by Prof. Ph.D. Azniv Kirkor Kasparian, Section of Algebra, Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski", Professional direction 4.5 Mathematics, as a member of the scientific juri for the contest, according to Order RD-38-475/28.09.2021 of the Rector of Sofia University.

The only applicant for the announced contest is Associate Professor, Ph.D. Maya Miteva Stoyanova, Section of Algebra, Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski".

1 General description of the presented materials

1.1 Data of the application

The documents, presented by the applicant for the contest, comply with the requirements of the Law on the Development of the Academic Staff of Republic Bulgaria, the Rules on its Implementation and the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University "St. Kliment Ohridski". Ass.Prof. Ph.D. Maya Stoyanova participates in the contest with 13 articles in prestigious scientific journals and proceedings of international conferences. She has provided evidences for the ranking of her articles and their citations, as well as for the equipollence of the contributions of the co-authors in the joint publications. Ass. Prof. Ph.D. Maya Stoyanova has delivered 47 talks at international and national conferences or during her visits at Universität Wien - Austria, Brown University - USA, Linköping University - Sweden and other foreign universities. The official transcripts include testimonies for the membership of the applicant in the organizing or the programme committees of 3 international and 5 national conferences, in Research Data Alliance, in the international research exchange agreement between Indiana University Purdue University Fort Wayne and Sofia University "St. Kliment Ohridski". There are evidences for her work as a scientific advisor of one Masters and two Graduate Students, as a coordinator of an International Project "Minimal Energy and Extremal Problems in Coding Theory", as a mentor within the project "Students Practices" from the European Operative Programme "Development of Human Resources", as well as for her overall classroom occupation during the past 8 academic years, including her teaching of "Business Mathematics I" in English. The aforementioned data illustrates the reach experience of Ass. Prof. Ph.D. Maya Stoyanova in doing and organizing research at an international level, as well as in teaching basic and highly sophisticated specialized courses.

1.2 Brief biography of the applicant

Ass. Prof. Ph.D. Maya Stoyanova works at the Section of Algebra, Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski" from 1999. She defended her Ph.D. Thesis in 2009 and habilitated as an Associated Professor in 2014. From 2016 to 2019 Ass. Prof. Ph.D. Maya Stoyanova was a Head of the Section of Algebra. From 2017 she is a Vice Dean on the Academic Development of the Faculty of Mathematics and Informatics. Ass. Prof. Ph.D. Maya Stoyanova has 24 publications in specialized scientific journals and 22 papers in Proceedings of International Conferences. Her research has 64 citations, from which 30 are refereed and indexed in Web of Science or Scopus. Ass. Prof. Ph.D. Maya Stoyanova has h-index 5. She has participated in 7 projects of the National Science Foundation and 10 projects of the Science Foundation of Sofia University, from which two times as a Head. Ass. Prof. Ph.D. Maya Stoyanova is a member of the Bulgarian Union of Mathematicians, the Research Data Alliance, the European Union of Women in Mathematics and the American Mathematical Society.

1.3 General characterization of the scientific works and the contributions of the applicant

Ass. Prof. Ph.D. Maya Stoyanova works on extremal problems for codes and orthogonal arrays in polynomial metric spaces. Her works combine elaborated combinatorial arguments with techniques for studying continuous functions as quadrature formulae, Hermite interpolation and asymptotic analysis. Ass. Prof. Ph.D. Maya Stoyanova publishes in prestigious specialized journals with extremely high Impact Factor as "Analysis and Mathematical Physics" with IF 2,056 from the publication year 2019, "IEEE Transactions on Information Theory" with IF 2,501 from 2020, "Designs, Codes and Cryptography" with IF 1,114 from 2017, "Discrete Applied Mathematics" with IF 0,932 from 2017 and others. The scientific contributions of Ass. Prof. Ph.D. Maya Stoyanova comply with, and even exceed considerably the minimal national requirements of Decree 26/13.02.2019 on the Amendments of the Rules for Implementation of the Law on Development of the Academic Staff of Republic Bulgaria, as well as the specific requirements of the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University "St. Kliment Ohridski". More precisely, she earns the total of 781 points versus the required 550 ones. From these, the scientometric properties of the presented publications earn her 462, instead of the obligatory 300 points. The scientific advising of graduate students and the work on projects rate 165, instead of the required 100 points and etc.

The scientific works, presented for the competition do not include ones, used in previous procedures for acquisition of academic degrees and occupation of academic positions. I am strongly convinced that there is no plagiarism in the aforementioned scientific works of Ass. Prof. Ph.D. Maya Stoyanova.

1.4 Characterization of the teaching activity of the applicant

Ass. Prof. Ph.D. Maya Stoyanova has taught all the basic undergraduate courses in algebra, namely, Linear Algebra, Higher Algebra, Linear Algebra and Analytic Geometry.

Besides, she has developed and taught graduate courses "Spherical Codes and Designs. Orthogonal Arrays", "Codes and Designs in Polynomial Metric Spaces - I and II". Ass. Prof. Ph.D. Maya Stoyanova is extremely dedicated to her teaching responsibilities. She has mastered creating a vivid communication with her students and explaining successfully even the most difficult subjects.

1.5 Contential analysis of the scientific contributions of the materials, presented for the contest

The scientific contributions of Ass. Prof. Ph.D. Maya Stoyanova concern the development of the theory of the polynomial metric spaces for studying codes and designs. The notion of a polynomial metric space is introduced by Levenshtein in the early 1990's. The examples comprise the compact Riemannian and Hermitian symmetric spaces of rank 1, the Hamming spaces $\mathbb{F}_q^n$ and the Johnson spaces $J(n, w) := \{x \in \mathbb{F}_2^n \mid \mathrm{wt}(x) = w\}$ of the binary words of fixed length n and Hamming weight w. The polynomial structure on a compact metric space (M, d) with a Borel measure μ and a standard substitution $\sigma : [0, \mathrm{diam}(M)] \to [-1, 1]$ is known to be useful for setting an upper bound $\mathcal{A}(M, \delta)$ on the maximal cardinality of a code $C \subset M$ of diameter $\mathrm{diam}(C) \leq \delta$, as well as for obtaining a universal lower bound $\mathcal{E}_h(M, m)$ on the energy of a code $C \subset M$ of cardinality $|C| = m$ with respect to an absolutely monotone potential h. This kind of a technique reduces the estimation of $\mathcal{A}(M, \delta)$ and $\mathcal{E}_h(M, m)$ to the choice of appropriate polynomials and construction of test functions, characterizing the optimization scope of these polynomials. The performance of the aforementioned strategy is very difficult and usually requires a masterful use of computer implementations towards specific results.

The articles of Ass. Prof. Ph.D. Maya Stoyanova develop also elaborate algorithms, relating the distance distributions of binary and ternary orthogonal arrays to the distance distributions of their derived ones. These are applied for attaining non-existence results for binary orthogonal arrays of strength $n \geq 8$, length $n + 4$ and index 6, as well as towards the non-existence of some binary orthogonal arrays of strength $4 \leq t \leq 5$, length $9 \leq n \leq 12$ and index $6 \leq \lambda \leq 7$. The structure of an orthogonal array of strength $t = 4$ and index $\lambda = 6$ in $\mathbb{F}_2^9$ is described. The index of a ternary orthogonal array of strength $t = 3$ and length $16 \leq n \leq 17$ is shown to be bounded below by 5. The numerical relations among the distance distribution of an orthogonal array and its derived ones are exploited towards explicit upper bounds on the covering radius of an orthogonal array.

Among the 13 articles of Ass. Prof. Ph.D. Maya Stoyanova, presented for the contest, 6 are published in highly prestigious scientific journals with Impact Factor, 2 are from journals with SJR and 5 are from refereed and indexed sources. Among the journals with IF, one is from the first qurtile, two - from the second quartile, one - from the third quartile and two from the fourth quartile. The presence of 3 publications of the applicant in journals with Impact Factor from the first two quartiles is a testimony for the importance and the high level of the difficulty, attained by her research. Ass. Prof. Ph.D. Maya Stoyanova has presented for the contest 13 citations, refereed in Web of Science or Scopus. The existence of 17 more citations of her works in Web of Science or Scopus, as well as of 34 other citations is an evidence for the extremely high appreciation of her work by the mathematical community. According to the enclosed declarations, the

contributions of all co-authors in joint publications are equipollent.

1.6   Critical remarks and suggestions

According to De Rham theory on a smooth compact manifold M, the harmonic forms compute the cohomology of M. It is interesting to express the topological preperties of M in terms of a polynomial structure on the harmonic differential L^2-forms of M.

1.7   Personal impressions

Ass. Prof. Ph.D. Maya Stoyanova is dedicated to the excellence in doing and teaching mathematics. Combining awareness of the contemporary results with masterful skills for solving difficult problems, she has attained remarkable scientific results. Ass. Prof. Ph.D. Maya Stoyanova is widely respected for her honesty, diligence, responsibility and precision in any job. Her students appreciate the competence, fairness and the care-giving to them. Ass. Prof. Ph.D. Maya Stoyanova is extremely well organized and gifted to be a team leader. Her interactions with the colleagues are professional, marked by integrity and mutual respect.

1.8   Conclusion on the application

After getting acquainted with the materials and the scientific works, presented for the competition, and based upon the aforementioned analysis of their scientific significance and applicability, I confirm that the scientific contributions comply with the Law on Development of the Academic Staff of Republic Bulgaria, the Rules on its Implementation and the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University "St. Kliment Ohridski", for occupation by the applicant of the academic position "Professor" in the scientific field and the professional direction of the contest. In particular, the applicant satisfies the minimal national requirements in the professional direction and no plagiarism was found in the presented scientific works. That is why, **I evaluate positively the application.**

2   General conclusion

Based upon the aforementioned, **I strongly recommend** the scientific Juri to propose the appropriate election authority of the Faculty of Mathematics and Informatics of Sofia University "St. Kliment Ohridski" to elect

**Ass. Prof. Ph.D. Maya Miteva Stoyanova
to take up the academic position "Professor"**

in Professional Direction 4.5 Mathematics.

November 14, 2021

Standpoint written by:

Prof. Ph.D. Azniv Kasparian