OPINION

By: *Teodora Zapryanova, Associate Professor Doctor*

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Regarding: The application of Diana Kirilova Nedelcheva

for a competition for the academic position of **Associate Professor**

in Area of Higher Education 4. Natural Science, Mathematics and Informatics

in Professional Field 4.5.Mathematics,

scientific subject "Mathematical Analysis" and "Operation Research"

at Technical University of Varna

The procedure has been announced in the State Gazette issue 61 dated 23 July 2021.

Candidate: Diana Kirilova Nedelcheva

I present the following evaluation in my capacity as a member of the Academic Jury for the procedure indicated above by Order No. 639 of 21.10.2021 of the of the Rector of Technical University of Varna. At the first meeting of the Academic Jury, held on 5 November 2021, I was appointed as an author of the opinion. The only candidate in the competition is PhD Diana Nedelcheva, lecturer at the Department of Mathematics and Physics at TU- Varna. This evaluation is based on the Development of Academic Staff in the Republic of Bulgaria Act, the Rules for its implementation, the internal rules of Technical University of Varna, regulations and policies.

Basis for Evaluation: documents submitted by the candidate:

- Curriculum Vitae;
- PhD Diploma No. 000596 of June 24, 2015;
- List of publications of the candidate;
- Scientific papers on the competition;
- Abstracts of the enclosed publications;
- Author reference to the theoretical and applied results and contributions of the publications;
- Reference for Scopus and Web of Science publications;

- List of citations;
- Self-assessment of the candidate for the fulfillment of the minimum national requirements for occupation of the academic position of "Associate Professor" in Area of Higher Education 4. Natural Science, Mathematics and Informatics, in Professional Field 4.5. Mathematics ;

1. Biographical data

Diana Kirilova Nedelcheva graduated with honors master's degree in Applied Mathematics at Plovdiv University "Paisii Hilendarski" in 2010. She enrolled in a doctoral program at the Institute of Mathematics and Informatics at BAS in 2011 with supervisor Prof. D. Sc. Julian Revalski. In 2015 she successfully defended dissertation "Implicit function theorems for generalized equations". Since 2007 she has been working consecutively as an assistant and chief assistant at Technical University - Varna.

2. General characterization of the Candidate's major theoretical and applied research and contributions.

Ch. Assistant Dr. Diana Nedelcheva participates in the competition for "Associate Professor" with 8 publications - 1 monograph, 6 articles, and 1 book. According to the information provided, all six articles are published in journals indexed in Scopus or Web of Science. Two of the articles are in quartile Q2 of the Web of Science database.

The presented quotation of Ch. Assistant Dr. Diana Nedelcheva contains 10 citations, 9 of which in Scopus or Web of Science. According to the Web of Science information system, Diana Nedelcheva has an H-index of 2.

From the presented information it is clear that Dr. Diana Nedelcheva has participated in 7 national research or educational projects.

The main focus of the research work of Dr. Diana Nedelcheva is the theory of fixed points in abstract spaces. In this is direction is the monograph on the competition "Theory of Fixed Points", in which, according to the separation protocol, Diana Nedelcheva has 90% authorial participation. The monograph consists of 139 pages and includes an introduction, three chapters, a conclusion, and list of used literature from 103 sources.

Chapter one discusses some generalizations of the fixed point theorem. Author contributions are the theorem for pairs of fixed points (Theorem 1.2.3) and the theorem for common fixed points (Theorem 1.2.5). As an application of the fixed point theorems, the results for convergence of some basic iterative processes such as the chord method have been proved, as

well as applications for solving generalized equations and generalized equations with a parameter in Banach spaces. The stability of the considered iterative processes is also studied.

Chapter 2 is devoted to the fixed point theory in conical metric spaces. The existence and uniqueness of fixed points for the composition of two set-valued operators in these spaces are discussed. The author generalizes the theorem proved in [49] from the literature cited in the monograph, introducing the notion of α-ψ-e - contraction set map and proving the fixed point theorem. The uniqueness of the fixed point in the single-valued case with an additional assumption is also proved (Theorem 2.2.9). In the last paragraph 2.4 of this chapter, D. Nedelcheva introduces the notion of α - admissible pair of set maps and with their help proves the theorem for the common fixed points for this type of maps - Theorem 2.4.3. As a consequence of this theorem Theorem 2.4.6 and Corollary 2.4.5 are proved.

In Chapter 3, "Fixed Points in Partial Metric Spaces," the author proves several theorems for contraction set-valued operators that generalize and supplement already known results. Using Bianchini-Grandolphi calibration functions, D. Nedelcheva proves the existence of a pair of fixed points for a composition of two pseudo-contracting multivalued maps - Theorem 3.3.3. The theorem for the common fixed points of two multivalued maps in partial metric spaces is proved - Theorem 3.2.1, as well as the existence of a solution of the generalized problem for fixed point pairs of two multivalued maps - Theorem 3.4.1.

Diana Nedelcheva's research work is in two main directions - the optimization of sets and fixed points in abstract spaces.

The following publications can be mentioned in the first direction.

[M.H. Geoffroy, Y. Marcelin, D.K. Nedelcheva: Convergence of relaxed minimizers in set optimization, Optimization Letters 2017, 11(8):1677-1690. DOI:10.1007/; s11590-016-1079-4 (IF 1.013) Q2];

[M. Gaydu, M.H. Geoffroy, C. Jean-Alexis, D.K. Nedelcheva: Stability of minimizers of set optimization problems, Positivity 2017, 21(1):127-141. DOI:10.1007/; s11117-016-0412-6 (IF 0.92) Q2];

[D. Kamburova and D. K. Nedelcheva: Variational Principles for supinf Problems with Constraints Geometry, Integrability and Quantization, 2020, pp 163-169. DOI:10.7546/giq-21-2020-163-169].

The first paper investigates the stability of several relaxed minimizers of set optimization problems. A topology on vector ordered spaces has been introduced, from which a concept of convergence has been derived. This convergence allows studying the upper and the lower stability of the sets of relaxed minimizers.

The second paper studies the asymptotic behavior of sequences of minimization problems in set optimization.

The third article presents variational principles of supinf problems. Conditions that ensure the validity of the results in the case of Stackelberg problem are provided.

The following publications are presented in the second direction:

[M. Hristov, A. Ilchev, D. Nedelcheva, B. Zlatanov: Existence of Coupled Best Proximity Points of *p*-Cyclic Contractions Axioms 2021, 10(1), 39; doi.org/10.3390/axioms10010039];

[G. Gecheva, D. Nedelcheva, M. Ruseva and B. Zlatanov: Applications of Coupled Fixed Points for Multivalued Maps in the Equilibrium in Duopoly Markets and in Aquatic Ecosystems Axioms 2021, 10(2), 44; doi.org/10.3390/axioms10020044];

[D. K. Nedelcheva: Altering Points in Partial Metric Space Geometry, Integrability and Quantization, 2020, pp 221-231. DOI:10.7546/giq-21-2020-221-231].

The first paper generalizes the notion of coupled fixed (or best proximity) points for cyclic ordered pairs of maps to p-cyclic ordered pairs of maps. Sufficient conditions for the existence and uniqueness of the coupled fixed (or best proximity) points have been found. An appropriate example to illustrate the results is given.

In the second article, a new class of ordered pairs of multivalued maps is obtained that have pairs of coupled fixed points. The main result is illustrated by two relevant examples, which cover a wide range of models.

The third paper discusses the composition of two set-valued mappings in partial metric spaces. The existence of an "altering point" for two set-valued mappings in complete partial metric space is proved.

3. Evaluation of the Candidate's teaching

In the period 2005-2007, Diana Nedelcheva worked as a teacher in mathematics. In 2007 she started working at the Technical University - Varna, where she held positions of Assistant and Ch. Assistant so far. From the presented report on auditorium employment in the last three years, it can be seen that Ch. Assistant Professor Dr. Diana Nedelcheva has taken classes in subjects: Mathematics 1, Mathematics 2, Mathematics 3, Applied Mathematics, Selected Chapters in Mathematics, Numerical Methods and Mathematical Statistics, Statistics, Mathematical Statistics.

Finally, let us note again that the main results of Dr. Diana Nedelcheva have been published in famous international journals with impact factor or SJR, she is a scholar with authority among the academic community in Bulgaria and as well the many citations that the articles have.

CONCLUSION

From the analysis of the submitted scientific papers, their importance, the scientific and applied contributions contained therein

I RECOMMEND THAT DIANA NEDELCHEVA BE GRANTED THE ACADEMIC RANK ASSOCIATE PROFESSOR

in the Area of Higher Education 4. Natural Science, Mathematics and Informatics, in Professional Field 4.5. Mathematics, Scientific subject "Mathematical Analysis" and "Operation Research" at the Technical University of Varna.

Varna

Signature: Заличена информация по Регламент (ЕС) 2016/679

December, 2021

/Assoc. Prof. Teodora Zapryanova/