REVIEW

By Prof. Boyan Georgiev Zlatanov, PhD

University of Plovdiv Paisii Hilendarski

Faculty of Mathematics and Informatics

Department of Mathematical Analysis

On the documents submitted for a participation in the competition for an occupation of the academic position "Associate Professor" Technical University of Varna on **Research area: 4.** Natural sciences, mathematics and informatics, **Professional field 4.5.** Mathematics (Mathematical analysis and Operations research).

For the participation in the announced in the State Gazette no. 61 of 23.07.2021 and on the web site of the Technical University of Varna, **just one candidate** (Assist. Prof. Diana Kirilova Nedelcheva, PhD) has submitted documents.

By Order №639/21.10.2021 of the Rector of the Technical University of Varna, I was appointed as a member of the Scientific Jury of the competition for the occupation of the academic position "Associate Professor" in on Research area: 4. Natural sciences, mathematics and informatics, Professional field 4.5. Mathematics (Mathematical analysis and Operations research).

As a member of the jury, I obliged to write a review, have received all the necessary documents attached to the application of Assist. Prof. Diana Kirilova Nedelcheva, PhD to the Rector of the Technical University of Varna for participation in the competition. The documents are well designed and arranged.

For the participation in the announced competition **just one candidate** (Assist. Prof. Diana Kirilova Nedelcheva, PhD) has submitted documents. She has enclosed required reports to satisfy the minimum national requirements and the additional requirements of the Technical University of Varna: She has presented a diploma for a PhD degree, already obtained in 2015. The documents include those required by the regulations of the Technical University of Varna:

1. Application to the Rector.
2. Curriculum vitae (CV - European model).
3. Employment contract for the academic position "assistant" or "chief assistant".
4. Diploma for PhD (or "Doctor of Science").
5. Detailed reference for compliance with the minimum national requirements and the requirements of Annex 1 of these Regulations on the applicable groups of indicators to which the necessary evidence is attached;
6. The scientific papers related to the competition.
7. Abstracts of papers up to one page for each paper.
8. Other related documents proving the scientific, teaching and/or implementation activity, according to art. 22, para. 2 and para. 3.

The candidate has received his PhD in 2015, thus she satisfies the minimum national requirements and has a score of 50 points for the group of indicators “A”.

The candidate has been an Assistant Professor at the Technical University of Varna scince 2007 and a chief assistant since 2016 till now.

The dissertation is registered in NACID with scientific-metric indicators and satisfies the requirements for the publications on it to have not less than 30 points.

For holding the academic position of “Associate Professor” at the Technical University of Varna in Art. 18 (3) states "… .. Candidates for the academic position “Associate Professor” in the field of mathematics, arts and other non-technical sciences should meet the **specific** requirements of the relevant specialized universities or research institutes of the Bulgarian Academy of Sciences …" . The term specific is from the previous version of the Law on the Development of the Academic Staff in the Republic of Bulgaria. This term is an additional requirement. I accept that this is a technical error.

The additional requirements of the Technical University - Varna for the academic position of associate professor include the ability to meet the additional requirements of the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences, which have slightly increased national minimum requirements. That is why I will comment on the satisfaction of the additional requirements of the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences.

The candidate presents for participation in the competition the monograph “Fixed Point Theory” (in Bulgarian), ISBN 978-954-20-0818-7, which is indexed in the database COBISS.BG-ID - 43329800, with a volume of 139 pages indexed as a as a monograph in COBISS.BG, with two authors, A protocol is presented, which shows that Assistant Professor Diana Nedelcheva, PhD, is the author of 90% of the text. If we subtract 8 pages of content, title pages, introduction and 11 pages of literature, 120 pages of scientific text remain, which in 90% makes over 108 pages. Therefore the presented monograph satisfies the Law on the Development of the Academic Staff in the Republic of Bulgaria and thus the candidate satisfies the requirement for a group of indicators "B" -100 points.

The candidate presents for participation in the competition 6 articles, 2 in WoS with Q2, 4 in SCOPUS with SJR>0 and one book based on the her PhD Thesis, which is indexed in the COBBIS database (ISBN - 978-954-20-0819-4, COBISS.BG-ID - 43434504). Thus she satisfies the Law on the Development of the Academic Staff in the Republic of Bulgaria and the additional requirements of Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences of 220 points on a group of indicators "Г" with 260 points.

Assistant Professor Diana Kirilova Nedelcheva, PhD participated with 9 citations in WoS and/or SCOPUS, and one citation from MathSciNet and/or zbMATH. Thus she satisfies the Law on the Development of the Academic Staff in the Republic of Bulgaria and the additional requirements of Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences of 70 points and therefore she satisfies the requirement for group of indicators “Д” with 76 points.

The Law on the Development of the Academic Staff in the Republic of Bulgaria does not require points on a group of indicators “E”. The additional requirements of Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences for group of indicators “E” are a minimum of 20 points. Assistant Professor Diana Kirilova Nedelcheva participates in the competition with three national projects as a member and therefore she satisfies the requirement for a group of indicators “E” with 30 points.

This brief review shows that all the minimum national requirements and the additional Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences have been met.

GENERAL CHARACTERISTICS OF THE APPLICANT'S ACTIVITY

EVALUATION OF THE EDUCATIONAL AND PEDAGOGICAL ACTIVITY

Assistant Professor Diana Kirilova Nedelcheva was born in 1982, graduated with a bachelor's degree in mathematics, master's degree in applied mathematics, professional qualification as a teacher of mathematics at the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski". She gets her PhD degree at the Bulgarian Academy of Sciences in 2015.

I know the candidate personally from her training at the Faculty of Mathematics and Informatics at Plovdiv University “Paisii Hilendarski” and from the reports she has presented at seminars and conferences. She has the ability to present her results in an interesting and understandable language, according to the audience. Informal conversations and discussions with her convinced me of his desire to share his knowledge and skills, as well as to accept new ideas. Shee has an interest in research.

EVALUATION OF SCIENTIFIC AND SCIENTIFIC-APPLIED ACTIVITIES

The candidate has divided her scientific contributions into two directions

1) Optimization of sets

2) Fixed point theorems and applications

I would also add a third area: application of fixed point theory and set valued maps in the study of equilibrium in noncompetitive markets, because in 4 of the publications are presented models of markets with two participants as applications. The contribution 2) includes applications in the economy, bf course,, but too generally stated.

In the publications [M.H. Geoffroy, Y. Marcelin, D.K. Nedelcheva (2017). Convergence of relaxed minimizers in set optimization, Optimization Letters, 11 (8): 1677-1690. DOI: 10.1007 / s11590-016-1079-4] and [M. Gaydu, M.H. Geoffroy, C. Jean-Alexis, D.K. Nedelcheva (2017). Stability of minimizers of set optimization problems, Positivity, 21 (1): 127-141. DOI: 10.1007 / s11117-016-0412-6] Diana Nedelcheva and her co-authors consider an optimization problem (P), in which the set of minimizers of a multivalued map is investigated. For this purpose, they use a number of optimization problems (Pn), whose minimizers converge in a certain sense to the minimizers of the specific task and study the convergence of the set of minimizers of (Pn) to the set of minimizers of (P). The authors work with a wide class of minima, called ρ-minima, and study their stability in Banach spaces. In the articles one of the considered problems is for Pareto

minimizer and (weak) minimum Pareto points, which is a classic problem from the theory of non-competitive markets. Two new concepts for convergence of PK and Γ convergence of a number of problems have been introduced, instead of convergence of sets. The authors work in infinite spaces and consider the case when the interior of the cone, that introduced the partially ordere of the underlying partially ordered conical Banach space can be an empty set, which often happens. The results summarize the results of Lemaire and Zeng, Zhang, Xue, where results were obtained only for weak minimizers and the results of Li, Wang, Lin, where compactness is replaced only by closeness and convexity.

Detelina Kamburova and Diana Nedelcheva in [D. Kamburova and D.K. Nedelcheva (2020): "Variational Principles for Supinf Problems with Constraints" Twenty First International Conference on Geometry, Integrability and Quantization, pp 163–169.DOI: 10.7546 / giq-21-2020-163-16] study some contemporary results related with variational principles for supinf problems for a two-variable function. The conditions derived by D. Gaumont, D. Kamburova and J. Revalski under which the objective function can be disturbed by a continuous function with arbitrarily small norm in such a way that the supinf problem for the disturbed function has a solution are considered. As a special case of the supinf task, they consider the Strtackelberg task with 2 "leader-follower" companies, which gives a new perspective on the equilibrium problem in non-competitive duopoly markets.

In the monograph [D. Nedelcheva, R. Marinov: "Theory of Fixed Points" - monograph, University Press at the Technical University - Varna, ISBN 978-954-20-0818-7] the authors present their results in the field of fixed point theory. In the first chapter some generalizations of the fixed point theorem are considered. Results were obtained for pairs of fixed point and fixed point for pairs of maps. The results obtained in paragraph 1.2 are applied to solve generalized equations and generalized equations with a parameter in Banach spaces, where the studied images are by Frechet differentiable or Hölder continuous. The applications are illustrated for solving nonlinear programming problems. The stability of the considered methods has been studied. Chapter 2 is devoted to the theory of fixed points in partially ordered conical spaces. Multi-valued maps, compositions of singled valued maps and compositions of multi-valued maps were studied. Sufficient conditions have been obtained for the existence and uniqueness of fixed points. Some of the results are illustrated with non-trivial examples. Chapter 3 deals with the problem of fixed points in partial metric spaces. The existence of common fixed points for pairs of multi-valued maps or single valued ones has been studied. Sufficient conditions for the uniqueness of the fixed point for classes of pairs of singled valued maps are obtained. The question of the presence of fixed point pairs and of pairs of multivalued maps in partial metric spaces has been studied. The conclusion summarizes the contributions of the authors in this monograph. Some of the results presented in the monograph are new and not yet published.

In [D. K. Nedelcheva (2020). "Altering Points in Partial Metric Space" Twenty First International Conference on Geometry, Integration and Quantization, pp 221-231] a composition of two multivalued maps with values in partial metric spaces is considered. Several theorems for the existence of fixed points have been proved, which summarize and supplement some known results. The main result of the paper is a generalization of the fixed point theorem of A. Dontchev and H. Frankowska in partial metric spaces, with the difference that more general assumptions,

containing Bianchini-Grandolfi calibration functions, are considered, instead of pseudo-contractive multi-valued maps. The main result includes Abdessalem Benterki's theorems even in partial metric space.

In the articles [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] and [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] the properties of ordered pairs of fixed for p-cyclic map or for multi-valued maps are investigated. Sufficient conditions for the existence of best proximity (or fixed) points are obtained. The theory of coupled fixed points was introduced in 1987, but only the last 10 years has undergone rapid development with many applications. Such an application is in the theory of non-competitive markets, where a new look at Cournot's theory is given. The second paper discusses the application of coupled fixed points of multivalued maps in the theory of duopoly markets. An interesting application of the results for multivalued maps in the study of equilibria in aquatic ecosystems is presented. The journal in which the two articles were published is expected to receive an IF in 2022, and it is likely that the candidate's points by group of criteria "Д" may increase.

In the book presented [D. Nedelcheva: "Methods for solving generalized equations" - book, University Press at the Technical University - Varna, ISBN 978-954-20-0819-4], COBISS.BG-ID - 43434504, based on the PhD Thesis of Diana Nedelcheva, the author discusses problems for solving generalized equations with and without a parameter. Newton's method, chord method, chopping method, implicit function theorem in chord and chopping methods are considered. The book gives an overview of some of the trends in fixed point theory for multivalued maps. The book is based on the author's PhD Thesis, but includes other results, which makes it useful in training masters and PhD students in the professional field 4.5. Mathematics

The total number of publications of Diana Kirilova Nedelcheva is 24, she has six conference papers, a total of 17 citations, 16 of which in WoS and/or SCOPUS and one in MathSciNet. It makes a good impression that all citations are from colleagues outside Bulgaria, which shows that the studied problems are of interest to colleagues from around the world. The publications included in the application for the academic position, summarizes some results and gives many applications from other fields of science. The publication of a monograph and a book in Bulgarian also makes a good impression, which will be useful for students and PhD students working in the field of fixed points. All of the presented works are in the field of mathematical analysis, functional analysis, operations research and their applications.

I have not found "plagiarism" in the works of the candidate in the sense of the "Law on the Development of the Academic Staff in the Republic of Bulgaria" in the Republic of Bulgaria.

According to the regulations for the development of the academic staff of the Technical University of Varna, only if more than two candidates participate, then they are evaluated by educational activities, research activities (including participation in projects, scientific and applied research, applied results in practice) and artistic creative activity, which I will not comment on in the review.

CRITICAL NOTES

I recommend Diana Nedelcheva to publish a textbook for students from the Technical University of Varna on the subjects, that she teaches. I recommend to continue the joint research with colleagues from France with whom she has two publications in journals with Q2 and to start participating in conferences outside Bulgaria.

CONCLUSION

In my opinion the candidate Assist. Prof. Diana Nedelcheva has obtained enough results both in quality and quantity. The presented documents meet the requirements, conditions and criteria of the Law on the Development of the Academic Staff in the Republic of Bulgaria, Rules for applying of the mentioned above law, the additional requirements of the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences to occupy the academic position "Associate Professor". Therefore I give my **strictly positive assessment and I recommend to the Scientific Jury to prepare a report-proposal to the Honorable Scientific Council of the Faculty of Computer Sciences and Automation for the election of Assist. Prof. Diana Kirilova Nedelcheva, PhD for the academic position "Associate Professor"** in the Technical University of Varna in Research area: 4. Natural sciences, mathematics and informatics, Professional field 4.5. Mathematics (Mathematical analysis and Operations research)

Plovdiv
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Signature: .....
/Prof. Boyan Zlatanov, PhD/