O P I N I O N

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Department of "Mathematics and Physics".

Regarding application for the procedure for acquiring the scientific degree "Doctor of Sciences" in: field of higher education 4. Natural sciences, mathematics and informatics; professional field 4.5. Mathematics (Calculus), with thesis topic: "Applications of Fixed Point Pairs and Best Proximity Point Pairs".

By Order РД-21-133/18.07.2022 . of the Rector of Plovdiv University "Paisiy Hilendarski", I have been appointed as a member of the scientific jury for acquiring the scientific degree "Doctor of Sciences" in: field of higher education 4. Natural sciences, mathematics and informatics; professional direction 4.5. Mathematics (Calculus).

At the first session of the jury, I have been appointed to present an opinion regarding the present procedure.

1. General characteristics and assessment of the candidate's scientific research and applied scientific work

As a member of the scientific jury, I have received all the necessary documentation presented by the only candidate Prof. Dr. Boyan Georgiev Zlatanov. He has submitted the necessary forms to satisfy the minimum national requirements. He presented a PhD Degree Diploma, acquired in 2001, which satisfies the minimum national requirements and according to indicator "А" the candidate has 50 points.

According to indicator "Г", the candidate presents 11 articles indexed in WoS and SCOPUS (four with Q1, four with Q2, two in SCOPUS with SJR>0 and one in WoS and SCOPUS without IF and SJR), which bring him 618 points from required 100 p.

Prof. Dr. Boyan Georgiev Zlatanov has presented 20 citations, 19 of which in WoS and SCOPUS and one in Zbl. and therefore satisfies the requirement under indicator group "Д" with 156 items out of the required 100 items.

The submitted documents prove both the good research activity of the candidate and the fulfillment of the minimum national requirements for obtaining the scientific degree "Doctor of Sciences".

2. Evaluation of the candidate's pedagogical training and activity.

From the attached curriculum vitae of the candidate, it can be seen that he has been a professor since 2019 until present, associate professor from 2008 to 2019, assistant, senior assistant and chief assistant from 2001 to 2008 at Plovdiv University “Paisii Hilendarski”, which shows the high level of pedagogical preparation and active pedagogical activity of the candidate.

3. Basic scientific and applied contributions.

The candidate has submitted a dissertation based on 18 publications (16 in journals and 2 conference papers). He presented 11 articles indexed in WoS and SCOPUS and 20 citations in total, 19 of which in WoS and SCOPUS and one in Zbl.

The candidate has correctly filled in that the points from article [B. Zlatanov. Best proximity points in modular function spaces. Arabian Journal of Mathematics, 4(3):215–227, 2015.] and article [B. Zlatanov. Error estimates for approximating of best proximity points for cyclic contractive maps. Carpathian Journal of Mathematics, 32(2):241–246, 2016.] (used in the previous procedure) are not included in the Reference for compliance with the National minimum requirements for obtaining the scientific degree "Doctor of Sciences" under 4.5. Mathematics. For the convenience of the reader, the results of these two publications are included in the dissertation.

The candidate has correctly described the main scientific and applied scientific contributions in the dissertation, as follows:

- Ekeland's variational principle is generalized for mappings with the mixed monotone property. Using this generalization, conditions for the existence and uniqueness of coupled fixed points for classes of mappings with the mixed monotone property are found, and the classes of problems for which coupled fixed points exist are extended.
- A technique developed in [B. Zlatanov. Error estimates for approximating of best proximity points for cyclic contractive maps. Carpathian Journal of Mathematics, 32(2):241–246, 2016.] for estimating the error for best proximity points is used to find an error estimate for coupled and tripled best proximity points.
- It is proved that for the cyclic mappings considered so far, the coupled fixed points or the coupled best proximity points (x,y) must satisfy x=y. The concept of ordered pairs of cyclic mappings is generalized by defining a new type of mappings and points, called modified cyclic mappings and modified coupled points, respectively.
- The notion of best proximity points in modular functional spaces is generalized. Moreover Generalizations of the key Lemmas of Eldred and Veermani are proved.
- The notion of an ordered pair of semicyclic mappings is introduced. A new model is presented to study the existence and uniqueness of market equilibrium in duopoly markets.
- A possibility of generalization of part of the researched problems in chapters 2-5 on tripled fixed points, tripled best proximity points and their application in the study of oligopoly markets with three participants using semicyclic mappings of three variables is considered.

During the procedure, the candidate received more citations of his works.

***41. S. Karaibryamov, B. Tsareva, B. Zlatanov.* Optimization of the Courses in Geometry by the Usage of Dynamic Geometry Software Sam, The Electronic Journal of Mathematics and Technology, Volume 7 Number 1, (2013) 22-51.**

- J. C. Silva, Implementation of an Educational Software to Reinforce the Learning of Geometry and Measurement in High School Students. Escuela Superior Politécnica de Chimborazo, 2023.
- Samuel Boateng, PhD Thesis, An Investigation of Students' Learning of Integral Calculus with Maple Software and Paper-Pencil Strategies in the Western Region of Ghana, University of Agder, Kristiansand & Grimstad, Norway, 2022
- Sava Grozdev, Veselin Nenkov, Tatiana Madjarova, Poncelet-Gergonne Circle, Symmetric Polynomials and Baricentric Coordinates, International Journal of Computer Discovered Mathematics (IJCDM), **Volume 7**, 338–343, 2022
- Sava Grozdev, Veselin Nenkov, Tatiana Madjarova, Poncelet-Gergonne Circle of a Triangle, Moving Between Two Fixed Circles, International Journal of Computer Discovered Mathematics (IJCDM), **Volume 7**, 324–337, 2022

50. V. Ivanova, B. Zlatanov, Implementation of fuzzy functions aimed at fairer grading of students' tests, Education Sciences, Volume 9, Issue 3, September 2019, Article number 214

- Beyza Esin Özseven, Naim Çağman. A Novel Student Performance Evaluation Model Based on Fuzzy Logic for Distance Learning. International Journal of Multidisciplinary Studies and Innovative Technologies, 6(1), 29-37 (2022). DOI:10.36287/ijmsit.6.1.29
- Daniel Doz, Darjo Felda, Mara Cotič, Combining Students' Grades and Achievements on the National Assessment of Knowledge: A Fuzzy Logic Approach, Axioms, 11(8), Article number 359, 2022 (Web of Science, IF=1.824, Q2, SCOPUS, SJR=0.441, Q3)

51. V. Ivanova, B. Zlatanov, Application of Fuzzy Logic in Online Test Evaluation in English as a Foreign Language at University Level, *AIP Conference Proceedings, 2172, Article number 040009,* 2019

- Daniel Doz, Darjo Felda, Mara Cotič, Combining Students' Grades and Achievements on the National Assessment of Knowledge: A Fuzzy Logic Approach, Axioms, 11(8), Article number 359, 2022 (Web of Science, IF=1.824, Q2, SCOPUS, SJR=0.441, Q3)

26. Tharmalingam Gunasekar, Saravanan Karpagam, B. Zlatanov. On p-Cyclic Orbital M-K Contractions in a Partial Metric Space, Mathematics, 6(7), (2018), 116

- E. Karapınar, R.P. Agarwal, S.S. Yeşilkaya, C. Wang. Fixed-Point Results for Meir–Keeler Type Contractions in Partial Metric Spaces: A Survey. Mathematics, 10(7), Article number 3109, 2022, (SCOPUS, SJR=0.538, Q2, Web of Science, IF=2.592, Q1)

Additionally, the publication [**Y. Dzhabarova, B. Zlatanov. A note on the market equilibrium in oligopoly with three industrial players, AIP Conference Proceedings, 2449, Article number 070013 (2022), ISSN 0094-243X, ISSN 1551-7616 (Web of Science, SCOPUS, SJR=0.189)**] is printed and its indexing in WoS and SCOPUS is pending.

I have not noticed "plagiarism" in the candidate's works according to the Development of the Academic Staff in the Republic of Bulgaria Low .

4. Significance of contributions to science and practice.

The significance of the candidate's contributions to science and practice is indisputable. Prof. Dr. Boyan Georgiev Zlatanov is a prominent scientist in the field of fixed point theory. The evaluation of the submitted works of the candidate shows that all the quantitative requirements for obtaining the scientific degree "Doctor of Sciences" according to the Development of the Academic Staff in the Republic of Bulgaria Low, have been met and even exceeded. The list of citations of the candidate's scientific works shows the high interest in the scientific work of Prof. Dr. Boyan Georgiev Zlatanov both in Bulgaria and abroad.

5. Conclusion

According to the presented documents and the above analysis of the candidate's works, as well as my personal conviction, I consider that the candidate satisfies all the quantitative requirements for obtaining the scientific degree "Doctor of Sciences", according to the Development of the Academic Staff in the Republic of Bulgaria Low (DASRBL), The Regulations for the Implementation of the DASRBL, The regulations for the terms and conditions for occupying academic positions at Plovdiv University "Paisii Hilendarski". Due to the above, I confidently give my positive assessment of the conducted research and propose to the honorable scientific jury to award the scientific degree "Doctor of Sciences" to Prof. Dr. Boyan Georgiev Zlatanov in the field of higher education: : 4. "Natural sciences, mathematics and informatics", professional field: 4.5 "Mathematics" (Calculus).

3.09.2022 Signature: .....

/ Assosiate Professor Diana Kirilova Nedelcheva /