O P I N I O N
of Prof. D.Sc., Snezhana Georgieva Gocheva-Ilieva,
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on the materials submitted for participation in the competition
for holding the academic position of "professor"
in the area of higher education 4. Natural sciences, mathematics and informatics,
professional field 4.5 Mathematics (Computational Mathematics)

In the competition for professor, announced in the State Gazette, issue 50 / 15.06.2021 and on the website of TU-Gabrovo for the needs of the Department of Mathematics, Informatics and Natural Sciences at the Faculty of Economics, as the only candidate is Assoc. Prof. Dr. Todor Dimitrov Todorov.

1. Overview of the content and results in the presented works

In the materials for the professorship Assoc. Prof. Dr. Todor Todorov presented a total of 34 scientific papers. Of these, 32 were published (including A60 and A61 after the submission of documents) and two papers were accepted for publication, with notes from the journal. All papers were published after 2007, after the habilitation of the candidate as an associate professor in 2006.

The conducted research of the candidate falls entirely in the field of the professional field 4.5 and the scientific specialty of the competition - Computational mathematics. Of all publications, 7 are classified as a habilitation work, with the topic "Conformal methods for dividing a bounded area into multidimensional Euclidean spaces". New theoretical results in this direction have been obtained and appropriate algorithms have been developed, examples and numerical results have been given.

The results of the candidate are mainly with the following directions: theory and algorithms in numerical analysis - finite element methods (FEM) for boundary value problems involving partial differential equations, development of the apparatus of n-dimensional polytopes from the theory of convex and discrete geometry, multigrid methods with finite elements and strategies for refinement in various domains, non-local problems for elliptic operators and solutions with neural networks, and others.

2. 2. General characteristics of the candidate's activity

2.1. Educational and pedagogical activity (work with students and doctoral students)

Assoc. Prof. Dr. Todor Todorov has over 35 years of experience, of which 32 years as a lecturer at TU-Gabrovo. From 1989 to 2006 he was successively assistant, senior and chief assistant, and since 2006 he has been an associate professor of mathematics. Since 2020 he is the head of the Department of Mathematics, Informatics and Natural Sciences. To ensure the learning process, 5 textbooks have been issued, of which 4 textbooks are included in the professorship documents - 3 in higher mathematics: first, second and third part, and one in competitive mathematics. I will note that the large number of carefully selected tasks and solved examples in the presented textbooks makes a good impression.

Assoc. Prof. Todorov was the co-supervisor of a successfully defended full-time doctoral student in the professional field 5.3 Communication and Computer Engineering.

2.2. Scientific and scientific-applied activity

The candidate for professor has submitted a sufficient number of scientific papers that meet the legally required minimum national requirements of the Regulations for the Implementation of the Law for the Development of Academic Staff in the Republic of Bulgaria. The criteria for the scientific and teaching activity of the candidates for professor from the Regulations for acquiring scientific degrees and holding academic positions in TU-Gabrovo are: minimum 30 publications, of which at least 5 standalone papers, and 3 with impact factor (IF), minimum 20 citations, at least 2 textbooks, one defended doctoral student and management of at least 3 projects / contracts. In the current procedure, Assoc. Prof. Todorov presents a total of 34 publications, of which 9 with IF, 9 standalone articles, 68 citations, 4 textbooks, 1 PhD student and 7 projects led by him, funded by TU-Gabrovo. I will add that regardless of the submitted materials, I found directly that the candidate has in the SCOPUS database Hirsch index $h = 4$ and 51 independent citations after his election as an associate professor, of which over 40 articles with IF. Of the total number of citations, 43 are on publication A18 (by candidate numbering).

I believe that with the indicators of his educational, pedagogical and scientific activity Assoc. Prof. Todorov significantly exceeds the requirements for holding the academic position of professor.

3. Contributions (scientific, scientific-applied, applied). **Significance of contributions to science and practice**

The contributions of Assoc. Prof. Todorov are mainly of scientific and scientifically applied nature, insofar as in addition to the purely theoretical results, appropriate algorithms have been developed, numerical experiments and simulations have been conducted to test and confirm the analytical achievements.

In the publications, separated as the habilitation work, new conformal methods for division of limited areas (refinement methods) into FEM have been developed and various measures for degeneracy and similarity classes have been established. The conditions for the conformal connection of hypercubic and simplicial networks are derived. Dissipative algorithms for separation and intersection of convex polytopes in Euclidean spaces and subspaces have been developed.

A group of publications examines a class of nonlinear elliptic boundary value problems with a nonlocal multiplier in the differential operator or in boundary conditions. Approaches for bringing the tasks into weak form, discretization and their effective numerical solution are proposed, including with the apparatus of neural networks and iterative methods.

With FEM, a linear telegraph equation with periodic boundary conditions, a reaction-diffusion equation and a problem for calculating the flow through a two-dimensional closed Lipschitz boundary are solved. Theorems for the rate of convergence and error estimation are proved. Some quadrature formulas on unstructured meshes are also obtained. Other main topics of the candidate's research are related to the development of the theory of finite element meshes and methods for triangulation, and numerical analysis of neural networks and voice recognition systems.

The significance of the contributions to science can be assessed by the level of the editions, where they are published and by their repercussions in the scientific community - the independent citations of other authors. The main articles of Assoc. Prof. Todorov have been published in the authoritative journals with impact factor and the highest quartile Q1, such as Computers and Mathematics with Applications (3 publications), Applied Mathematics and Computation (2 publications), Neural Computing and Applications and Numerical Algorithms (by 1 publication). His citations by other authors in the same scientific field are several times more and for the most part (over 40) are published in renowned editions with IF, and others.

4. Assessment of the candidate's personal contribution

About ¼ of the presented works are standalone papers, 16 are with two co-authors and the other 9 works are with more than two co-authors. I believe that the order of the authors' names in publications is not a factor in their contribution and I accept without any doubt that the personal contribution of the candidate is predominant. I did not detect plagiarism.

5. Critical notes and recommendations

I can recommend in future textbooks and teaching aids in higher mathematics to include in each section practical tasks, oriented to engineering specialties and also solved with the help of specialized mathematical software, for example Wolfram Mathematica, well known to the candidate. This will update the material studied and would increase students' interest in mathematics.

6. Personal impressions

Although I have no recent contacts, I have excellent impressions of the work of my colleague Todorov and I wish him further success in the chosen field.

7. Conclusion

Based on the above, I conclude that the achieved results of research and teaching activities of the candidate, and the quality of scientific papers and contributions fully meet the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria, exceed the national minimum requirements of the Regulations of the same low and the Regulations for obtaining scientific degrees and holding academic positions at the Technical University - Gabrovo. I give a convincingly **positive assessment** and propose Assoc. Prof. Dr. Todor Dimitrov Todorov to take the academic position of "professor" in the area of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5 Mathematics (Computational Mathematics), for the needs of TU-Gabrovo.

29 October 2021   Member of the jury: /signature/
                                                               /Prof. D.Sc. S. Gocheva-Ilieva/