

OPINION

by Prof. Dr. Vejdi Ismailov Hasanov,
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on the materials submitted for participation in a competition
for an occupation of the academic position "Professor"

in the field of higher education 4. Natural Sciences, Mathematics and Informatics,
professional field 4.5. Mathematics
scientific specialty *Computational Mathematics*

In the competition for "Professor", announced in SG no. 48/13.06.2025 and on the website of Technical University (TU) – Gabrovo for the needs of the department „Mathematics, informatics and natural science” in the faculty "Economics", participates the only candidate Assoc. prof. DSc. Milena Radoslavova Racheva from TU – Gabrovo.

According to Order No. 3-01-387/19.09.2025 of the Rector of the TU-Gabrovo, I have been appointed as a member of the scientific jury for the conduct of this competition.

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

The set of materials presented by Assoc. prof. DSc Milena Racheva is in accordance with the Regulations for acquiring scientific degrees and holding academic positions at TU – Gabrovo. From the presented report on the fulfillment of the minimal national requirements and those of TU – Gabrovo, it is evident that they are met and in some indicators they are more than twice as high.

For participation in the competition, 37 scientific publications were submitted, of which: 14 are in publications refereed in Web of Science and/or Scopus by IF and SJR respectively; 1 in a conference proceedings refereed in Scopus; 2 are in publications refereed in Zentralblatt Math. and the remaining 20 are in non-refereed journals with scientific review or in collective volumes.

For habilitation work, 4 equivalent publications were submitted, of which 2 in Web of Science with impact factor and 2 in Scopus with SJR according to the reference. Since the series of books "Lecture Notes in Computer Science" has an impact factor up to 2005, I accept publications submitted after 2005, including the above, as refereed in Scopus with SJR.

A detailed and correct description of the content of the candidate's works is made in the author's reference.

The 14 publications with impact factor and/or SJR (8.1 – 8.11; 8.13 – 8.15) presented are mainly devoted to numerical methods for solving the quadratic spectral problem of differential operators of second and higher order. In publications 8.1 – 8.4, presented as equivalent to a habilitation work, and publication 8.14, an approach for linearization of the quadratic problem is proposed, in which it is reduced to a system of equations with a linear participation of the spectral parameter. In publication 8.5, a spectral problem of a differential operator for functions defined in an unbounded domain is

considered. In a number of publications, including 8.9, 8.11 and 8.14, two-sided approximation of eigenvalues by using a conformal solution in FEM is studied.

The theoretical results in all publications are supported by numerical examples.

2. General characteristics of the candidate's activity

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

Assoc. prof. DSc. Milena Racheva began her teaching career in 1992, when she started working as an assistant at the Semi-Higher Institute of Mechanical Engineering and Electronics, Lovech, in 1994 she was appointed to the position of "assistant" at the TU – Gabrovo, in 2006 she was habilitated and appointed to the position of "Associate professor" and has been working at the same university until now. Along with the classical courses in higher mathematics, which Assoc. prof. Racheva leads, she has contributed to the introduction of the disciplines "Modern Mathematical Methods for Electrical Engineers" and "Applied Mathematics". Laboratory exercises using Wolfram Cloud are also planned in the training of both disciplines. Assoc. prof. Racheva has published one independent textbook "Applied Mathematics" and one in co-authorship - "Numerical Methods in Electrical Engineering - Part I". She is the scientific supervisor of a successfully defended PhD student (jointly with Assoc. Prof. Rachev).

2.2. Scientific and scientific-applied activity

The research activities and interests of Assoc. Prof. DSc. M. Racheva are in the field of computational mathematics. The numerical solution of differential equations with initial and/or boundary conditions and spectral problems are among the main tasks of computational mathematics.

The scientific activities of Assoc. prof. Racheva are predominantly related to the numerical solution of spectral problems for differential operators with boundary conditions. The research is mainly on linear or quadratic spectral problems with even order of the differential operator. Variants of FEM are used to approximate the studied differential operators, which achieves linearization of the quadratic spectral problem and a reduction in the order of the differential operator.

Assoc. Prof. Racheva is actively involved in the implementation of research projects – she coordinated the work on a national project at the Scientific Research Fund of the Ministry of Education and Science, led 4 intra-university projects, participated in the implementation of 2 projects at the Scientific Research Fund, 2 National Programs and 8 contracts at the Technical University of Gabrovo.

Assoc. prof. DSc. Milena Racheva is an established scientist in the field of computational mathematics. Evidence of this are: publications in prestigious scientific journals and reports at authoritative scientific forums; the remarkable number of citations in refereed and indexed journals; earned postdoctoral specialization in the Kingdom of Sweden and participation in a number of scientific juries in procedures for academic growth.

3. Contributions (scientific, applied science, applied). Significance of contributions for science and practice

The contributions of Assoc. prof. DSc. M. Racheva in the publications submitted for this competition are of a scientific and scientifically applied nature. The author's reference presents the main contributions correctly and comprehensively.

The following are some of the contributions in the publications equivalent to a habilitation thesis:

- A method for linearization of a quadratic spectral problem for even-order differential operators (second, fourth and sixth) has been applied. In some special cases, arising from applications in construction mechanics, hydrodynamics, etc., properties of the spectrum have been obtained;

- Along with the linearization of the spectral problem, a reduction in the order of differentiation has also been achieved. The resulting mixed variational formulations are in symmetric form.

7. Assessment of the personal contribution of the candidate

Of the 37 publications submitted for the competition, 5 are independent, of which 1 is in a journal with SJR, 22 have two co-authors, the majority with Prof. Andreev, of which 10 have an impact factor and/or SJR, and the remaining publications have more co-authors. The arrangement of the authors in the majority of the publications is in alphabetical order. I did not find a dividing protocol of the contributions in the submitted materials. All this gives me reason to believe that the contributions of all co-authors in the joint works are proportional.

8. Critical remarks and recommendations

I have no significant critical remarks. It is striking that most publications are the result of participation in international scientific forums. In this regard, I recommend that, in the future, Assoc. prof. DSc. Racheva make submissions for publication in scientific journals.

9. Personal impressions

I do not have close contacts with Assoc. prof. DSc. Racheva, but our few meetings and the way the documentation for this competition was presented leave me with the impression of a well-established, precise and correct researcher.

CONCLUSION:

Given the above, the assessment of the submitted materials and the contributions of the candidate, I strongly propose that Assoc. prof. DSc. Milena Radoslavova Racheva to be elected to the academic position "Professor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5. Mathematics, scientific specialty "Computational Mathematics".

November 06, 2025

Member of the jury:

/Prof. Dr. Vejdi Hasanov /