Review

by professor Dr Ivan Dimov Lirkov
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on documents, submitted for participation in a competition for the academic position of Professor in professional area 4.5 "Mathematics", scientific specialty "Computational Mathematics"
with candidate Milena Radoslavova Racheva

In the announced competition for the academic position of "Professor", for the needs of Technical university – Gabrovo as the only candidate participating Assoc. Prof. DSc Milena Radoslavova Racheva from Technical university – Gabrovo. The applicant has submitted a complete set of documents in accordance with the requirements of the Rules for the specific conditions for acquiring scientific degrees and for occupying academic positions at Technical university – Gabrovo, Art. 66. (1), to occupy the academic position "professor".

1. Short biographical information

   Milena Racheva graduated from the Sofia University "St. Kliment Ohridski" in 1990 with Master's Degree in Mathematics. In 2003 she defended her thesis on the topic "Numerical analysis and applications of fourth-order elliptic spectral problems". In 2006 she has been elected for the academic position "associate professor" at the Technical university – Gabrovo. In 2014 she defended her thesis for the degree "doctor of science" on the topic "New approaches in finite element analysis for elliptic problems".

2. General description of the presented materials

   Publications — 37, of which 9 are articles in scientific journals with Impact Factor, 4 are articles in series with Impact rank.

3. Impact of the candidate's scientific publications in the literature

   Eight from the publications have been cited in 96 scientific papers, referenced and

indexed in world famous scientific information databases (Scopus, Web of science, Zentralblatt).

4. General characteristics of the applicant's activities

   The submitted documents show that the applicant meets the minimum requirements for candidates to occupy the academic position of "professor" according to Art. 29.(1) of the ZRASRB, as follows:

   (a) She has a Ph.D. degree.

   (b) Has held the academic position of "Associate Professor" in the same university for more than two academic years.

   (c) He has presented publications in specialized journals, equivalent to the monograph which do not repeat the publications presented for acquiring educational and scientific degree "doctor", for occupying the academic position "associate professor", and for scientific degree "doctor of science".

   (d) She has also submitted other original research publications.

   (e) She meets the minimum national requirements of art. 2b, paragraph 2 and 3 respectively of the requirements of art. 2b, paragraph 5.

   (f) There is no legal plagiarism proven in scientific works.

   Milena Racheva presented a reference on the fulfillment of the minimum national and specific requirements of Technical university – Gabrovo for occupation of the academic position of "Professor" in professional direction 4.5. "Mathematics", scientific specialty "Computational Mathematics", which is true. It shows that the candidate fulfills, as some of them, significantly exceeds, the minimum requirements of for occupying the academic position of "professor".

   DSc Racheva is a leading specialist internationally recognized in the field of of finite element analysis. She has extensive experience in applying methods from computational mathematics for solution of the quadratic Sturm-Liouville problem, solution of a differential equation in an infinite domain, and solution of the resulting algebraic system with high dimensionality. Evidences for this are her publications in prestigious international journals and her participation in projects.

(a) Scientific and applied scientific activity

DSc Racheva has authored and co-authored more than 70 research publications and has participated in 4 research projects.

(b) Contributions

The applicant's contributions in the presented materials have scientific and applied scientific nature and are undoubted.

- Contributions in the field of accelerating convergence and minimizing requirements for finite element spaces.
  - linearization of the second and fourth order quadratic Sturm-Liouville problem
  - solving high and even order problems using linear finite elements
  - a lower bound is proved by an appropriate non-conformal method
  - nonconformal interpolants of the finite element solution have been constructed, which have been shown to give a lower bound for the eigenvalues
- Theoretical and theoretical-applied contributions.
  - estimates of the robustness of the discretization method were obtained
  - a priori estimates of the optimal order errors for the displacement and velocity functions were obtained
  - modifying and combining non-conformal finite elements
  - an algorithm for solving a differential equation in an infinite domain is proposed
  - qualitative characteristics for linear systems obtained after applying isoparametric FEM have been formulated and theoretically proven
- Computational mathematics for education and its direct application in engineering research and practice.
  - for models from technical mechanics, an analysis of different variational representations has been made
  - technical and economic aspects of obtaining energy from renewable sources are considered

5. Evaluation of the personal contribution of the applicant

   I have no doubt about the personal contribution of the applicant in the presented publications.

6. Critical remarks

   I have no critical remarks.

7. Conclusion

   The presented materials and scientific studies presented in the competition prove unambiguously the high professionalism of Assoc. Prof. DSc Milena Radoslavova Racheva. The analysis of the materials shows the importance of her scientific and applied contributions and their scientific impact. My personal impressions confirm the conclusions based on these materials.

   Given the above, I wish to propose to the Scientific Jury to make a recommendation Assoc. Prof. DSc Milena Radoslavova Racheva to be elected for the academic position "full professor" in professional area 4.5 "Mathematics", scientific specialty "Computational Mathematics".

November 7, 2025 Reviewer: .....
Sofia prof. Dr Ivan Lirkov