

OPINION

**By Associate Professor Dobrinka Kostadinova Gribacheva, PhD,
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of the materials submitted for participation in the competition
for the academic position of **Associate Professor**
at the Plovdiv University “Paisii Hilendarski”

In the field of higher education 4. *Natural sciences, mathematics and informatics*
professional direction 4.5. *Mathematics*
scientific specialty *Geometry and Topology*.

In the competition for the position of **Associate Professor**, announced in the State Gazette, no. 96 of 17.11.2023 and on the Internet page of the Plovdiv University “Paisii Hilendarski” for the needs of the Department Algebra and Geometry at the Faculty of Mathematics and Informatics, as the only candidate participates Chief Assistant *Iva Rumenoova Dokuzova*, PhD from the Department of Algebra and Geometry, Faculty of Mathematics and Informatics.

1. General Presentation of the Procedure and the Candidate

By order No. **RD-21-387** dated February 16, 2024 of the Rector of Plovdiv University “Paisii Hilendarski” (PU), I have been appointed as a member of the scientific jury of the competition for the academic position **Associate Professor**, in the field of higher education 4. *Natural Sciences, Mathematics and Informatics*, professional direction 4.5. *Mathematics* (scientific specialty *Geometry and Topology*), **announced for the needs** of the Department of Algebra and Geometry at the Faculty of Mathematics and Informatics.

Only one candidate has submitted documents for participation in the competition: Chief Assistant *Iva Rumenoova Dokuzova*, PhD from the Department of Algebra and Geometry at the Faculty of Mathematics and Informatics.

The presented by Chief Assistant *Iva Dokuzova* set of materials on paper and electronic media is in accordance with the Rules for the Development of the Academic Staff of the Plovdiv University.

The candidate has submitted a total of 15 scientific papers, 1 monograph and 2 textbooks and manuals. Sixteen scientific works are accepted for review, which are outside of the doctoral dissertation. In the final evaluation, 2 textbooks/manuals for students and participation in 3 scientific research and educational projects (2 university projects and 1 international project) will also be counted. Seven scientific works on the dissertation are not reviewed.

The distribution of scientific works by relevant headings, in the country and abroad, is as follows: 7 publications and 1 monograph are in Bulgarian peer-reviewed journals or conference proceedings, and 8 publications are in international peer-reviewed journals.

A list of a total of 41 citations of the candidate's works is presented (29 citations of the publications are part of the competition), 17 of which are cited in scientific publications referenced and indexed in Scopus/WoS, and 2 citations in journals referenced in Zentralblatt Math.

It is clear from the submitted documents and declarations that the scientific works presented by the candidate do not repeat those from previous procedures for acquiring a scientific title and academic position.

Chief Assistant Iva Dokuzova, PhD was born in 1971 in Sofia. She completed her secondary education in the city of Plovdiv in 1989. From 1989 to 1994, she was a student at the Faculty of Mathematics and Informatics, PU, completing her higher education with a master's degree: qualification as a mathematician (main major in *Mathematical Structures*) and second qualification as a teacher in mathematics and informatics.

From 1996 to 2009, she has worked at the Plovdiv University, Lyuben Karavelov Branch in Kardzhali, successively as Assistant, Senior Assistant and Chief Assistant.

In 2006, she obtained a PhD degree in the scientific specialty "Geometry and Topology" by defending a dissertation titled "*On the geometry of almost complex manifolds with Norden metric and Riemannian manifolds with an almost product structure*". Since 2009, she holds the position of Chief Assistant at the Department of Algebra and Geometry, Faculty of Mathematics and Informatics, Plovdiv University.

Chief Assistant Dokuzova has a rich 28-years of teaching experience. The educational and teaching activities of the candidate includes:

- Conducting lectures and seminars on the disciplines: Higher mathematics, Linear and analytical geometry, Synthetic geometry, Cluster data analysis, Geometry (differential and descriptive), Discrete geometric structures, Random process models, Graph theory in management.
- Conducting an elective course "Mathematical foundations of computer graphics".
- Development of seven new lecture courses and seminar exercises in the disciplines: Linear and analytical geometry, Synthetic geometry, Cluster data analysis, Geometry (differential and descriptive), Discrete geometric structures, Mathematical foundations of computer graphics, Models of random processes.

- Supervision of two successfully defended diploma graduates - one master's and one bachelor's.
- Two textbooks "A Guide to Solving Problems in Higher Mathematics" and "Mathematical Foundations of Computer Graphics" have been prepared. One of them is co-authored.

The average academic load of the candidate significantly exceeds the norm for a non-qualified teacher.

I have known Chief Assistant Iva Dokuzova since 2006. Her work with students is at a high professional level. She has a very good pedagogical training as a teacher at the Faculty of Mathematics and Informatics, as well as being a successful scientist and a responsible colleague in the department of Algebra and Geometry.

2. General Characteristics of the Candidate's Work

My assessment of the candidate's educational and teaching activity is **positive**. It is based on the submitted reference for her activity with students, the reference for the candidate's auditorium and outside the auditorium activity, as well as the presented study aids.

The candidate has a defended dissertation on the topic "*On the geometry of almost complex manifolds with a Norden metric and Riemannian manifolds with an almost product structure*", covering the required **50** points for group A, indicator 1.

The presented monograph, entitled "*Four-dimensional Riemannian manifolds with circulant structures and skew-circulant structures*", is refereed by two reviewers. The work is devoted to the in-depth study of the geometry of two types of 4-dimensional Riemannian manifolds equipped with an additional circulant or obliquely circulant tensor structure. The work has a scientific contributions, clear style and good layout, meeting the requirements of group C, indicator 3.

In group D, indicator 7, are presented: one journal publication with IF with $Q2$, two journal publication with IF with $Q3$, three journal publications with SJR and four journal publications indexed in Zentralblatt or MathSciNet. The total number of points in Group D is **312**, which exceeds the required 200 points.

The presented publications contain results on four types of differentiable manifolds with additional structures:

- **Riemannian almost product manifolds.** In the class of non-integrable Riemannian manifolds with an almost product structure, additional affine connections are defined. They are symmetric, but non-metric. Properties of manifolds when the connections are locally Euclidean are found.
- **Quasi-Kahler manifolds with Norden metric and almost complex structure.** Non-metric additional affine connection is defined. It is shown to be symmetric and to satisfy an identity

analogous to the definitional identity defining this class. Properties of manifolds from the class of B-manifolds where Riemannian connection is locally Euclidean have been found.

• **Three-dimensional Riemannian manifolds (M, g, q) with a metric g and an additional tensor structure q of type (I, I) .** The two structures have circulant component matrices and the third power of q is equal to the identity. Classes of the studied manifolds with special curvature properties are defined. Identities for the curvature tensor and the Ricci tensor, as well as a subclass of almost Einstein manifolds, Einstein manifolds, and manifolds with constant sectional and scalar curvatures, are obtained. An associated metric \tilde{g} is defined, which is necessarily indefinite. An associated manifold (M, \tilde{g}, q) is considered. Three-dimensional non-trivial examples of manifolds (M, g, q) and (M, \tilde{g}, q) are constructed on Lie groups.

• **Four-dimensional Riemannian manifolds (M, g, Q) with a metric g and an additional tensor structure Q of type (I, I) .** The two structures have circulant component matrices and the fourth power of Q is the identity. Classes of the studied manifolds with special curvature properties are defined. Classes of almost Einstein manifolds and of Einstein manifolds (M, g, Q) are obtained and some special sectional curvatures, Ricci curvature and scalar curvature are calculated. A transformation of the Riemannian metric g on (M, g, Q) is considered, which generalizes the classical conformal transformation in Riemannian geometry. An almost product manifold $(M, g, P=Q^2)$ associated with (M, g, Q) is considered. A classification of the manifolds (M, g, P) was made according to the classes of M. Staykova and K. Gribachev. Non-trivial examples of the manifolds (M, g, Q) and (M, g, P) are constructed. An indefinite associated metric on (M, g, Q) is introduced. Hypersphere, sphere, and circle equations are set with respect to \tilde{g} in special subspaces of T_pM and interpreted in terms of the Riemannian metric g .

In group E, indicator 11, evidence is presented for 19 citations (not including self-citations) in scientific publications, referenced and indexed in Web of Science and Scopus. The total number of points in group E is **144**, which exceeds the required 50 points.

Participation in *three* projects – 1 international and 2 university:

1. **NI15-FMIIT-004** – *Innovative fundamental and applied scientific research in computer science, mathematics and teaching pedagogy*, "Scientific Research" Fund, Plovdiv University, 2015-2016.
2. **FP17-FMI-008** – *Innovative software tools and technologies with applications in scientific research in mathematics, informatics and teaching pedagogy*, Scientific Research Fund, Plovdiv University, 2017-2018.
3. **BG05M2OP001-2.016-0007-C01 OMNIA**, Project under the procedure "Modernization of higher education" of the Operational Program "Science and education for intelligent growth" of the EU, 2021-2023.

Two textbooks for the needs of the students from the Plovdiv University are developed and printed at the University Press "Paisii Hilendarski".

Iva Dokuzova participates in the current competition with a scientific production that meets and even exceeds the minimum national requirements and those of the Faculty of Mathematics and Informatics at the Plovdiv University "Paisii Hilendarski" for the academic position of "Associate Professor".

3. Critical Remarks and Suggestions

After getting acquainted with all the materials and documents on the competition, provided by the candidate, I have no critical remarks about them. They are carefully and excellently arranged and presented. My recommendations are:

- After acquiring the academic position of "Associate Professor" to start working with doctoral candidates.
- Participation in more international forums and teaching mobilities.

CONCLUSION

Chief Assistant Dr. Iva Rumenova Dokuzova is a developed specialist with a wide range of scientific interests and a solid teaching experience. Her scientific research activity has a wide thematic scope. Scientific works contain important scientific contributions to the development of differentiable manifolds with additional structures.

Based on my overall assessment, I believe that the Chief Assistant. Iva Rumenova Dokuzova, Ph.D., meets all the requirements for occupying the academic position of "Associate Professor" reflected in the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the Implementation of LDASRB and the relevant Regulations of PU "Paisii Hilendarski".

After familiarizing myself with the materials and scientific works presented in the competition, I confidently give my **positive** assessment and recommend to the Scientific Jury, Chief Assistant Dr. Iva Rumenova Dokuzova to **be elected** for the academic position of "Associate Professor" at the Plovdiv University "Paisii Hilendarski" in the scientific area and the professional field 4.5. Mathematics (Geometry and Topology), at the Department of Algebra and Geometry of the Faculty of Mathematics and Informatics.

25.03. 2024 г.

The Opinion is prepared by:
(*sign*)

/ Associate Professor Dobrinka Gribacheva, PhD /