OPINION

by Assoc. Prof. Dr. Simeon Petrov Zamkovoy
on the dissertation for awarding the degree of Doctor of Sciences
in the capacity as a member of the scientific jury for the competition according to Order No. RD 38-113 / 19.02.2020 of the Rector of Sofia University.

Higher education: Natural Sciences, Mathematics and Computer Science
Professional Degree: 4.5 Mathematics
Author of the dissertation: Assoc. Prof. Dr. Ivan Minchev Minchev
Topic: "The geometry of quaternionic-contact manifolds and the Yamabe problem"

The dissertation presented is focused on current problems related to the theory of quaternion-contact manifolds. Specifically, I would point out the following main scientific contributions:

1. Basic concepts and methods of quaternion-contact geometry have been developed and a number of results have been obtained. The main theorems in this chapter are related to the partial solution of the Yamabe quartenion-contact problem on the Heisenberg quaternion group. Another basic theorem relates the Riemannian geometry of the 3-Sasaki manifolds to the geometry of quaternion-contact Einstein structures.
2. The geometry of the quaternion-contact Einstein manifolds was investigated. The results of previous studies have been expanded and complemented by the most complex case of a 7-dimensional manifold, proving that the quaternion-contact scalar curvature of each quaternion-contact Einstein variety is a constant. In addition, it has been shown that, depending on the value of the quaternion-contact slope curvature, the quaternion-contact Einstein manifolds are layers over quaternion-Kahler manifolds or hyper-Kahler manifolds.
3. A complete solution to the Yamabe problem on Heisenberg's 7-dimensional quaternion group is obtained.
4. The best constant in the Faland and Stein inequality on the Heisenberg quaternion group (for all dimensions) is determined, as well as the nonnegative extremals of this inequality.
5. The use of the left-invariant sub-Laplacian, while the quaternion-contact scalar curvature acts as the ordinary constant obtained from Kelly's transformation.

The dissertation is based on 2 scientific publications in journals with IF. They have their place in the education of students as well as in the theory and practice of future specialists in the field of differential geometry, partial differential equations and mathematical analysis. .

The abstract meets the requirements and fully reflects the results of the research in the dissertation.

CONCLUSION

The research in the dissertation deals with a topic in the field of mathematics, mechanics and physics, actively developed at the present time and of interest to both physicists of high international rank and to mathematicians. The dissertation presented contains scientific results which represent an original contribution to the differential geometry and meets all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for the implementation of the LDASRB and the corresponding Rules of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" for awarding the Doctor of Science degree.

The dissertation shows that Prof. Ivan Minchev Minchev possesses deep theoretical knowledge and professional skills in the specialty 4.5 Mathematics, demonstrating qualities and skills for conducting scientific research.

Because of the above, I am convinced of my positive assessment of the research, the results achieved and the contributions made and I propose to the venerable scientific jury to award Ivan Minchev Minchev the Doctor of Science degree in higher education 4. Natural sciences, mathematics and informatics, professional degree 4.5. mathematics.

04/22/2020 SIGNATURE: ..... .
Sofia / Assoc. Prof. Dr. Simeon Zamkovoy /