

# OPINION

**on the competition for the occupation of the academic position**

**Associate Professor**

**in the professional field 4.5 Mathematics (Differential Equations),**

**at Sofia University “St. Kliment Ohridski” (SU),**

**Faculty of Mathematics and Informatics (FMI),**

**announced in State Gazette no. 65 of 16.08.2019 and on the web pages of FMI and SU**

This opinion is prepared by: Assoc. Prof. Todor Pavlov Popov, PhD from Faculty of Mathematics and Informatics, Sofia University “St. Kliment Ohridski”, professional field 4.5 Mathematics, as a member of the scientific jury for the competition according to Order No. RD 38-593/11.10.2019 by the Rector of Sofia University.

**One candidate** has submitted documents for participation in the announced competition:

Chief Assistant Professor Tsvetan Dimitrov Hristov, FMI at Sofia University “St. Kliment Ohridski”

## **I. General description of the submitted documents**

### **1. Application Details**

The documents submitted by the applicant comply with the requirements of the Act of the Development of the Academic Personnel of the Republic of Bulgaria (ZRASRB), the Rules for the Implementation of the ZRASRB (PPZRASRB) and the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University “St. Kliment Ohridski” (PURPNSZADU).

For participation in the competition the candidate Chief Assistant Professor Tsvetan Hristov has submitted: application for admission to the competition, curriculum vitae, diploma for higher education and diploma for educational and scientific degree "Doctor", document for academic position at Sofia University and a certificate of internship in the specialty, documents proving the fulfillment of the requirements of art. 105, para. 1, item 2 of PURPNSZADSU, medical certificate, judicial certificate, full list of publications and a separate list of publications submitted for participation in the competition, datasheet for the applicant from the Sofia University’s information system “Authors”, reference for the fulfillment of the minimum national requirements and the requirements of SU for the professional field 4.5 “Mathematics” and 6 appendices with proofs, citation report, reference for original scientific contributions and habilitation extended reference, reference for the indicators under Art. 112, para. 2 from PURPNSZADSU, copies of the scientific papers submitted for participation in the competition with abstracts in Bulgarian and English, copy of the announcement for the competition

in the State Gazette, recommendation from a Professor; declarations by co-authors for equal contribution in joint publications.

The documents are clearly labeled, well ordered and in compliance with the requirements.

## **2. Biographical data for the applicant**

Tsvetan Hristov graduated from the Faculty of Mathematics and Informatics at Sofia University and received his master's degree in mathematics in 1998. Between 1998 and 2001 he worked as a "mathematician" at the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences. Since 2005 he is an Assistant Professor at the Department of Differential Equations at the FMI of Sofia University, and since 2007 – Chief Assistant Professor, after defending his dissertation and obtaining a doctorate degree in 2006. The applicant has 19 years of professional experience in the field.

## **3. General characteristics of the applicant's scientific work and achievements**

For participation in the competition ch. asst. prof. Tsvetan Hristov has submitted 13 scientific publications, which do not repeat those of the procedure for the obtaining his doctoral degree. The applicant's research interests and specifically the submitted scientific papers are in the field of competition. There is no lawful evidence for plagiarism in the submitted scientific publications.

According to the indicators under Art. 2b, para. 2 of ZRASRB, described in the Annex to Art. 1a, para. 1 of the PPZRASRB, the following points are achieved from the documents submitted for the competition. By Indicator Group A, Indicator 1: Applicant has a PhD degree - 50 points. For Group B, Indicator 4, two articles are presents - [1] and [2] from the submitted publications submitted Publication List for the Competition (9b): 75 points for the article [1] in Boundary Value Problems, which is in Q1 of Web of Science for 2017 (no. 51 of 310 journals in the section Mathematics); 36 points for the article [2] in Advances in Mathematical Physics - in Q4 for 2017 (no. 48 of 55 in the section Mathematical Physics) - 111 points in total. The applicant has also submitted an Extended Habilitation Report (14) as required in Note 12 to the Annex to Art. 1a, para. 1 of the PPZRASRB. In group  $\Gamma$ , indicator 7: 36 points for articles [3] and [11] in Comptes rendus de l'Académie bulgare des Sciences - in Q4 for 2007 and for 2017 (respectively, no. 46 of 50 and no. 62 of 64 in Multidisciplinary Sciences); 30 points for each of the articles [4, 5, 7-10, 12] and [13] published in Siberian Advances in Mathematics and AIP Conference Proceedings, that have Scopus SJR. Group  $\Delta$ , Indicator 11: 8 points for 60 citations in scientific journals indexed in Web of Science and Scopus, listed in the provided Citation Report (12).

Group	A	B	$\Gamma$	$\Delta$
Applicant's points	50	111	312	480
Minimum points required	50	100	200	50

Thus, on the basis of the documents presented, I conclude that Ch. Asst. Prof. Tsvetan Hristov meets and even exceeds significantly the minimum national requirements (under Art. 2b, para 2 and 3 of the ZRASRB) and the additional requirements of Sofia University “St. Kliment Ohridski” for the academic position Assistant Professor in the scientific area and the professional field of the competition – 4.5 Mathematics.

#### **4. Characterization and evaluation of the applicant's teaching activity**

Ch. Asst. Prof. Tsvetan Hristov has extensive teaching experience. He has taught over 20 different compulsory and elective courses in the field of ordinary differential equations, private differential equations, mathematical analysis and their applications. He has taught compulsory subjects to students of almost all bachelor's degree programs at FMI, as well as at the Faculty of Physics at Sofia University. For at least 7 years, he has been a regular lecturer in compulsory courses in FMI's undergraduate programs. He has taught at the master's degree programs at the FMI “Equations of the Mathematical Physics” and “Equations of the Mathematical Physics and Applications” and has been a research supervisor for a graduate student who successfully defended his master's thesis. He has taught in English language foreign students from the master's programs at FMI, as well as at Karlsruhe Institute of Technology, Germany.

The candidate has developed 5 lecture courses on differential equations and mathematical analysis. I will especially note the computer laboratory exercises developed in the compulsory courses for the bachelor's degree programs “Computer Science” and “Software Engineering”. In the computer lab classes, a system for scientific calculating is used to numerically and symbolically solve different problems for ordinary or partial differential equations. Using computer simulation and visualization of real processes, modeled by differential equations, the basic definitions, methods and ideas from the course are illustrated. In this regard, for the current competition Ch. Asst. Prof. Tsvetan Hristov has submitted also two chapters, contributed by him to a textbook, which we provide in electronic format in recent years to students attending courses in differential equations.

Alongside with his teaching activities, Tsvetan Hristov has been member of numerous committees for state and admission exams. He was the organizer of the Mathematics Section of the Student Scientific Session at the FMI in 2009, as well as of section “Differential Equations” of the Spring Scientific Session of the FMI in 2015. He has been the acting secretary of the Department of Differential Equations for more than 10 years.

#### **5. Substantive analysis of the scientific and applied scientific achievements of the applicant, according to the submitted publications**

Of the 13 publications submitted for the competition, four [1–3, 11] are research papers in scientific journals with Impact Factor and eight [4, 5, 7–10, 12, 13] – with Impact Rank (SJR).

Publications [1–12] are in the scientific field of the competition. The applicant has submitted declarations by co-authors for equal contribution in the joint publications [1–7, 9–11].

Boundary-value problems for weakly hyperbolic partial differential equations with degeneration on a part of the boundary of the domain are studied. In the papers [3] and [5] Protter's problems are discussed for  $(2 + 1)$ -dimensional equations (i.e., with two spatial variables  $x_1, x_2$  and one time  $t$ ) of the Tricomi type – with power degeneracy  $t^m$ ,  $m > 0$ , multiplied to the derivatives of the spatial variables in the principal part. In [1, 2, 4, 6–12], Protter-Moravetz problems for Keldysh-type equations are formulated and investigated - the degeneracy  $t^m$  is the coefficient of the time derivative. In terms of classical solvability, these problems are not well-posed. Despite the formal similarity to classic two-dimensional problems (for example, Darboux or Cauchy-Goursat problem), multidimensional problems are not even Fredholm, since they have infinite-dimensional cokernels. Instead, quasi-regular or generalized solutions that may have singularities over a part of the boundary are defined and considered. Results for existence and uniqueness are obtained, the growth of the singularity of the solution is studied, and asymptotic formulas are found, showing the exact behavior of the generalized solution depending on the smooth right side of the equation. The approach is based on the construction of an integral representation for the generalized solution of the multidimensional problem under consideration. This is achieved by finding Riemann-Hadamard functions for certain, connected with the multi-dimensional, two-dimensional boundary-value problems. The properties of the solution are studied by careful examination of the special functions involved in the representation. I think that these are strong results in an unconventional situation, where even finding an appropriate statement of the problem is challenging.

The Citation Report lists a total of 78 citations, 10 of which are in journals with Impact Factor, 50 in scientific publications, indexed in Web of Science or Scopus, 8 in peer-reviewed publications, and 10 in dissertations.

In the appendix “Reference for the indicators under Art.112 ...”, Ch. Asst. Prof. Tsvetan Hristov has presented a list of 36 international and 18 national conferences and scientific forums in which he has participated in papers. The candidate has participated in 4 specializations abroad. In 2010 he received an award for scientific novelty and originality for a report by a young scientist at an international conference in Nalchik, Russia.

Ch. Asst. Prof. Tsvetan Hristov was a member of the scientific teams of 6 projects at the Bulgarian National Science Fund at the Ministry of Education and Science. He regularly participates in projects at the Sofia University's Science Fund, and was the principal researcher of one of them.

## **6. Critical notes and recommendations**

I have no significant critical notes. The submitted contest materials are well-structured and their content reflects extensively and accurately the applicant's achievements.

## 7. Personal impressions of the applicant

I have known Tsvetan Hristov for over 20 years. From the beginning of his work at FMI, almost every year we both have been members of same teaching team of a compulsory discipline for a bachelor's degree program. He has a serious and responsible approach to student teaching. As a lecturer he is organized and hardworking. I also have a high regard for his efforts to illustrate to the students the mathematical theory through computer visualization and modeling of real processes.

I can say that I am familiar with the applicant's research work. We have been co-members of research teams of several national projects at the Bulgarian National Science Fund, Ministry of Education and Science. I have listened to his talks at national and international conferences, seminars at FMI. I have referred to his results in my research work. I think he is a thorough and consistent scientist.

Ch. Asst. Prof. Tsvetan Hristov takes an active part in the academic life of FMI. He has a well-intentioned and professional attitude towards the colleagues from the academic community. An evidence for the positive opinion of the faculty colleagues is the fact that he was elected as a member of the Faculty Board as well as a representative of FMI at the General Assembly of Sofia University.

## 8. Conclusion on the application

Having become acquainted with the materials and the scientific works submitted in the competition and on the basis of the analysis of their significance and the scientific and applied contributions contained therein, I confirm that the scientific achievements meet the requirements of the ZRASRB, the PPZRASRB and the corresponding Regulations of Sofia University "St. Kliment Ohridski" for the occupation by the candidate of the academic position "Associate Professor" in the scientific field and professional direction of the competition. In particular, the applicant meets the minimum national requirements in the professional field and no plagiarism was found in the scientific works submitted at the competition.

I give a **positive assessment** to the application of Ch. Asst. Prof. Tsvetan Hristov.

## II. GENERAL CONCLUSION

Based on the above, I **recommend** the scientific jury to propose to the competent electoral body of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" to elect Ch. Asst. Prof. Tsvetan Dimitrov Hristov for the academic position "Associate Professor" in the professional field 4.5 Mathematics (Differential Equations).

10.12.2019

Prepared by:

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