REPORT

by Prof. PhD Georgi Venkov, FAMI, TU – Sofia

at the competition for the academic position "Assoc. Professor"

for the needs of the Faculty of Mathematics and Informatics

Sofia University "Sv. Kliment Ohridsky"

in direction of higher education 4 Natural sciences, mathematics and informatics

Professional field 4.5. Mathematics, Specialty Differential equations

announced in SG No. 65/16.08.2019

with candidate: Assist.Prof. PhD Tzvetan Dimitrov Hristov

I present my report on this competition as a member of the Scientific Jury, determined by Order No. RD 38-593 from 11.10.2019 of the Rector of Sofia University "Sv. Kliment Ohridsky".

The report is prepared in accordance with the requirements of:

- the Law for the Development of Academic Staff in the Republic of Bulgaria (ZRASRB),

- the Rules for the Implementation of the ZRASRB,

- the Regulation on terms and conditions for acquiring scientific degrees and taking academic positions at Sofia University "Sv. Kliment Ohridsky".

1. General information for the candidate

According to the documents submitted for participation in the competition, Assist. Prof. PhD Tzvetan Hristov obtained a Master Degree at the Faculty of Mathematics and Informatics, Sofia University in 1998, specialty Mathematics. In 2006 he defends a thesis on the topic "Singularities of solutions to hyperbolic equations in domains with characteristic boundary" for acquiring the degree of Doctor. Assist. Prof. Hristov teaching experience begins in 1998 as a mathematician at IMI-BAS and from 2005 he takes the academic position "Assistant professor" in the Faculty of Mathematics and Informatics, Sofia University. The candidate has 25 scientific publications in peer reviewed journals and conference proceedings, 16 of them having impact factor (IF) or impact rang (SJR).

As a long-time lecturer at Sofia University, he teaches lectures and tutorials in the fields of Differential and Integral Calculus (parts 1 - 2), Selected topics in Mathematical Analysis, Differential equations, Differential equations and applications, Partial Differential equations, Equations in Mathematical Physics, Equations in Mathematical Physics using Scientific Computing for bachelor students, as well as tutorials on Variational Methods in Mathematical Physics for master students in FMI. He is a co-author of the textbook "Differential Equations and Applications with Mathematica, MatLab and Maple" – chapters 2 and 4. In addition to being an excellent teacher, Tzvetan Hristov is also distinguished for his active scientific research - he participates in more than 40 international scientific conferences in Bulgaria and abroad, as well as in more than 20 Research projects with the National

Science Fund and the Science Fund of Sofia University. Dr Tzvetan Hristov was a supervisor of one diploma student for acquiring the degree “Master” in FMI, Sofia University.

2. General characteristics of the works submitted for the competition

For participation in the competition, Assist. Prof. Hristov presented one textbook and 13 articles that were not used for the acquisition of the degree Doctor. All articles have been published in international refereed and indexed journals, 4 of them having impact factor (IF) and 8 having impact rang (SJR). Two of the papers belonging to quartiles Q1 and Q4 are grouped as equivalent to a monograph. According to Annex 1 to Rules for the Implementation of the ZRASRB, giving the minimal scientific indicators to applicants going to occupy the academic position “Assoc. Professor” in professional field 4.5. Mathematics, the following table is indicative:

	Q1	Q2	Q3	Q4	SJR	sum
public.	1	-	-	3	8	12
points	75			108	240	423

It is clear, that the presented publications of the candidate far exceed the minimum requirements of 100 points in Group of indicators B (B.4 = 111) and 200 points in Group of indicators Г (Г.7 = 312) of the Annex 1 to Rules for the Implementation of the ZRASRB. Moreover, the total IF and SJR of Dr. Hristov's articles are 2,242 and 1,369, respectively, indicating high level of results presented in them.

According to the attached list, the candidate's articles for this competition are cited in 60 scientific publications in international journals, referenced and indexed in Web of Science and/or Scopus. According to Indicator Д.11 of the Annex 1 to Rules for the Implementation of the ZRASRB, the citation index of Dr. Hristov equals 480 points, which far exceeds the minimum requirement of 50 points.

3. General characteristics of the applicant's research and pedagogical activity

Assist. Prof. Dr. Tzvetan Hristov is distinguished for his research and publishing activities among the colleges of the Faculty of Mathematics and Informatics, Sofia University. He has participated in numerous international scientific forums in Bulgaria and abroad, and has participated as coordinator or team member of research projects.

Furthermore, Assist. Prof. Hristov has a highly appreciated pedagogical activity. He teaches lectures and tutorials in the courses: Differential and Integral Calculus (parts 1 - 2), Selected topics in Mathematical Analysis, Differential equations, Differential equations and applications, Partial Differential equations, Equations in Mathematical Physics, Equations in Mathematical Physics using Scientific Computing, Variational Methods in Mathematical Physics for students in the specialties “Mathematics”, “Mathematics and Informatics”, “Informatics”, “Information Systems”, “Computer Sciences”, “Software Engineering”, “Statistics” at FMI. He actively participates in the creation of new curricula and the updating of existing curricula of specialties at the Faculty of Mathematics and Informatics and other faculties of Sofia University.

4. Basic scientific and applied contributions

Assist. Prof. Tzvetan Hristov's main scientific interests are in the field of Partial Differential equations and more precisely – in the study of three and four dimensional boundary value problems for degenerate hyperbolic equations of Tricomi and Keldysh type.

The main scientific and applied scientific contributions in these fields can be grouped as follows:

4.1. Papers, equivalent to a monograph

To this group belong publications [1] and [2] from the presented list, which study the four dimensional Protter-Morawetz problem for equations of Keldysh type. In publication [1] is defined new generalized solution to the Keldysh equation belonging to an appropriate weighted space. It is proved the existence of the corresponding Riemann-Hadamard function which enables one to find the integral representation of the generalized solution as a sum of hypergeometric functions. Moreover, the existence and uniqueness results are proved and it is obtained a priory estimate for the maximal order of possible singularity at point 0, when the right-hand side function is a harmonic polynomial. Paper [2] studies the asymptotic behavior of the generalized solution to the same problem at the singular point. New orthogonality conditions are found, which are necessary for the existence of solutions with fixed order of singularity.

4.2. Contributions of other publications

The contributions of the publications of Dr Hristov can be organized in the following directions:

- **Equations of Tricomi type**

To this group belong the results, stated in publications [3] and [5]. They treat different types of Protter boundary value problems for weakly hyperbolic Tricomi equations [3], as well as for strongly hyperbolic and degenerating hyperbolic equations [5]. In these works are proved the existence and uniqueness theorems for the corresponding generalized solution under appropriate conditions on lower order terms. Moreover, there are found conditions for the coefficients and the right-hand side function of the equation under which the generalized solution has isolated power type singularity.

- **Three dimensional Protter-Morawetz problem for Keldysh type equations**

To this group of results belong the publications [4, 6–9] and [12]. More precisely, these papers consider the existence and uniqueness of generalized solutions and the uniqueness of quasi-regular solutions in dependence of the coefficients, the lower order terms and the right-hand side function of the equation. In these works are obtained several a priori estimates, indicating the relation between the maximal singularity of the solution and the right-hand side function.

- **Four dimensional Protter-Morawetz problem for Keldysh type equations**

To this area of research interest belong publications [10, 11]. Work [10] studies the Protter-Morawetz problem for for Keldysh type equation without lower order terms and for this case it is found a generalized solution belonging to an appropriate weighted space. Then the existence and uniqueness of such a solution is established. Paper [11] considers the same equation when the right-hand side function is in the form of generalized harmonic polynomial. It is obtained an explicit formula for asymptotic expansion of the generalized solution in a neighborhood of the singular point 0, as well as orthogonality conditions closely connected with the growth of singularity of the solution.

- **Electronic assessment in Differential Equations Education**

This is the main topic of paper [13], which treats the modern form of assessment of student knowledge and skills in mathematical education. In this work are considered the problems for student identification and authorship in electronic assessment of their knowledge. It is presented an innovative model for e-assessment in the course “Differential equations and applications” in the bachelor program "Software engineering" at Sofia University. Some results of a survey of the students opinion in relation to the TeSLA identification software are presented and analyzed.

After using the free Crossref iThenticate's database platform (http://www.ithenticate.com/products/crosscheck) , I can confirm the lack of any plagiarism in the scientific papers submitted by the applicant.

5. Textbooks and teaching materials

For participation in the competition, Assist. Prof. Tzvetan Hristov presented one textbook on “Differential equations”, written for bachelor students in specialty “Software Engineering”. The book consists of two parts: “Linear differential equations and systems. Mechanical vibrations” and “Wave processes and wave equations. Well-posed and ill-posed problems in Mathematical Physics”. It covers the basic theoretical topics on ODE and PDE, a sufficient amount of problems and exercises on the subjects studied in the discipline, as well as examples for using the computer algebra system MatLab for visualization of the corresponding physical processes.

6. Critical notes and recommendations

I have no critical comments on the materials of Dr. Hristov for participation in this competition. A possible recommendation for the future development of the candidate is that he widens the area of research interest and intensifies his work with graduates and PhD students.

7. Conclusion

In conclusion, I think that the submitted materials of Assist. Prof. Tzvetan Hristov on this competition fully meet the requirements of the ZRASRB, the Rules for its implementation and the Regulation on terms and conditions for acquiring scientific degrees and taking academic positions at Sofia University "Sv. Kliment Ohridsky".

Therefore, I strongly suggest to the Honorable Scientific Jury to positively evaluate the candidature of Assist. Prof. Dr. Tzvetan Dimitrov Hristov and to unanimously recommend to the Faculty Council of the Faculty of Mathematics and Informatics, Sofia University "Sv. Kliment Ohridsky" his choice for the academic position "Assoc. Professor" in the field of higher education 4. Natural sciences, mathematics and computer science, professional field 4.5. Mathematics, specialty "Differential equations".

06.12.2019 г. Reviewer:

Sofia (Prof. PhD Georgi Venkov)