REPORT

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

on the papers and documents of

Assoc. Prof. DSc Emilia Grigorova Bazhlekova

submitted in competition for the Academic position "Professor",

announced in State Gazette № 43/17.05.2024

in direction of higher education 4 Natural sciences, Mathematics and Informatics

Professional field 4.5. Mathematics, Specialty Mathematical Analysis (Applications of fractional calculus),

for the needs of the Institute of Mathematics and Informatics, Bulgarian Academy of Sciences

I present my report on this competition as a member of the Scientific Jury, determined by the Order № 206/16.07.2024 of the Director of Institute of Mathematics and Informatics (IMI), Bulgarian Academy of Sciences (BAS).

The report was 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 Rules on the Terms and Conditions for Acquisition of Academic Degrees and Holding Academic Positions at BAS and at IMI of BAS.

1. General information about the applicant

According to the documents submitted for the competition, Assoc. Prof. Emilia Bazhlekova acquired the Master's degree at the Faculty of Mathematics and Informatics of Sofia University "St. Kliment Ohridski". Until 2001 she was a doctoral student at the Technical University of Eindhoven, the Netherlands, in the scientific field 4.5 Mathematics, specialty "Mathematical Analysis" and defended her dissertation on "Fractional evolution equations in Banach spaces" to obtain the degree of PhD. The teaching experience of Assoc. Bazhlekova began in 1991 as an assistant professor at the Faculty of Physics of Sofia University "St. Kliment Ohridski", as a teacher in mathematics at the high schools "Hr. Botev" and "Hr. Smirnenski", city of Septemvri (1993-1994) and as an associate professor in the Section of Analysis, Geometry and Topology at IMI-BAS (since 2014). In 2022, she successfully defended a dissertation thesis on "Subordination Principle of Generalized Fractional Evolution Equations" for the degree Doctor of Science in professional field 4.5 Mathematics, scientific specialty Mathematical Analysis. Assoc. Prof. Emilia Bazhlekova is distinguished by her active research activity. She participates in the editorial board of the international scientific journal "Fract. Calc. Appl. Anal.", she is a reviewer in more than ten international scientific journals, participates as a member of international contracts, contracts to the FSR-MES, IMI-BAN and OP "Science and Education for Smart Growth".

2. General characteristics of the submitted scientific works

For participation in the competition Assoc. Prof. Bazhlekova has submitted 22 articles, which were not used to obtain the PhD degree, the degree Doctor of Sciences and to hold the AP "Associate Professor". All the articles have been published in international refereed and indexed journals, 4 of them are single-authored and the rest are co-authored, 11 have an impact factor (IF) and 7 have an impact rank (SJR). Therefore, according to the Annex 1 of the Regulations of the BAS for the Implementation of ZRASRB, giving the minimum scientific metrics to the candidates participating in the competition for holding the academic position "Professor" in the professional field 4.5 Mathematics, the following table can be given:

	Q1	Q2	Q3	Q4	SJR	other	sum
Number of publications	9	-	-	2	7	4	22
points	450	-	-	48	140	48	686

It is clear, that the presented publications of the candidate far exceed the minimum requirement of 320 points in Group of indicators V and G (686 points) of the Annex 1 to Rules of BAS for the Implementation of the ZRASRB. Moreover, the total IF of Assoc. Prof. Bazhlekova's articles is 24.918, indicating a high level of results presented in them.

According to the attached list, the candidate's papers for this competition are cited in 220 scientific publications in international journals, referenced and indexed in Web of Science and / or Scopus. According to Indicator D.11 of the Annex 1 to Rules of BAS for the Implementation of the ZRASRB, the citation index of Assoc. Prof. Bazhlekova equals 1320 points, which far exceeds the minimum requirement of 140 points.

3. Main scientific contributions of the submitted papers

The 22 publications of Assoc. Prof. Emilia Bazhlekova submitted for the competition can be grouped into five main thematic areas.

The first direction is devoted to the study of solutions of some fractional evolution equations and obtaining the Duhamel representations by the method of convolution calculus of Dimovsky. This includes the papers [1], [2], [3], [9], [12] and [13], which are presented as equivalent to a monography according to Group of indicators V.4.

The second thematic area can be defined as analysis of linear viscoelastic models with fractional derivatives. It includes publications [7], [8], [10], [19] and [20], which deal with fractional generalizations of some classical models, such as Maxwell's and Jeffrey's fractional laws and Zener's generalized law.

In the third direction are the papers [15], [16] and [22], which consider the existence and uniqueness of inverse problems for fractional derivative equations. The papers [15] and [16] solve a nonlocal boundary value problem with different types of convolution derivatives, while paper [22] proves uniqueness for the inverse problem of finding the potential function in

the corresponding equation.

The next thematic area is devoted to the analysis of numerical methods for fractional evolution equations, to which belong the works [4], [5] and [17]. Here, suitable numerical methods (such as modified finite difference and Adams' method) for some equations with fractional derivatives are considered and developed.

The last fifth scientific area is related to various applications of fractional calculus for modelling complex physical processes and papers [6], [11], [14], [18] and [21] can be referred there. For example, the work [6] considers peristaltic flow of a visco-elastic fluid with an Oldroyd-B constitutive law of fractional kind, while [11] considers diffusion-controlled adsorption of a surfactant at the air/liquid interface described by the Ward-Tordai equation. In [18], a fractional-order generalization of Maxwell's classical model for axisymmetric flow of a visco-elastic film between two interacting droplets is considered. In paper [21], a class of equations that generalize Jeffrey's fractional model is studied.

After using the free platform “Plagiarism checker” (https://plagiarismdetector.net/) I can confirm the absence of plagiarism in the scientific works presented by the candidate.

4. Critical comments and recommendations

I have no critical remarks to the papers and documents submitted by Assoc. Prof. Emilia Bazhlekova for participation in this competition.

5. Conclusion

In conclusion, I consider that the submitted documents of Assoc. Prof. DSc Emilia Grigorova Bazhlekova for the present competition fully meets 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 and the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Holding Academic Positions at BAS and at IMI of BAS.

Therefore, I strongly propose to the respected scientific jury to positively evaluate the candidature of Assoc. Prof. DSc Emilia Bazhlekova and to recommend to the Scientific Council of IMI-BAS her election for holding the Accademic position “Professor” in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5. Mathematics, scientific specialty "Mathematical Analysis" (Applications of fractional calculus).

12.09.2024 г.

Sofia (Prof. Georgi Venkov, PhD)