

# OPINION

in relation to a competition for the academic position “Associate Professor”  
in the Field of Higher education 4. Natural sciences, mathematics and informatics;  
Professional field 4.5. Mathematics (Mathematical analysis and Operations research).

for the needs of Technical University of Varna

**Author of the opinion:** Veselin Nenkov Nenkov, PhD,  
Professor in “Nikola Vaptsarov” Naval Academy, Faculty of Engineering

## 1. General presentation of the procedure

This opinion is prepared in accordance with Order № 639/21.10.2021 of the Rector of Technical University of Varna, in compliance with the announcement in State Gazette issue 61/23.07.2021 in relation to the occupation of academic position “Associate Professor” in the Field of Higher education 4. Natural sciences, mathematics and informatics; Professional field 4.5. Mathematics (Mathematical analysis and Operations research). The only candidate in the competition is Assist. Prof. Diana Kirilova Nedelcheva, PhD. No procedure irregularities were identified. As a member of the Scientific Jury I have received an access to the documents of Assist. Prof. Diana Kirilova Nedelcheva.

## 2. General presentation of the candidate and the presented materials

The documents and materials of the only candidate in the competition have been carefully presented and enable an objective and complete evaluation in accordance with the requirements of the National Acts (ЗПАСРБ) and the Regulations for the corresponding implementation. In 2001 Assist. Prof. Diana Kirilova Nedelcheva graduated from the High School of Mathematics „Dr Petar Beron“, Varna. In 2005 she received Higher education in Plovdiv University „Paisii Hilendarski“, specialization „Applied Mathematics“. Diana Nedelcheva worked as a teacher in Mathematics and presently is assistant professor in Technical University of Varna. In 2015 she successfully defended a dissertation for obtaining the educational and scientific degree "Doctor" on the topic „An Implicit Function Theorem for Generalized Equations” under the scientific supervision of Academician Julian Revalski. Assist. Prof. Diana Nedelcheva, PhD has participated with reports in several international conferences. She has taken part in specializations and different university and national projects.

**2.1.** Assist. Prof. Diana Kirilova Nedelcheva, PhD has 24 publications in scientific editions, which are indexed and referred in various data bases (in Scopus for example). In the present competition she participates with 8 publications – 6 papers in English and 2 books, including the monograph “Fixed point theory” in collaboration with a co-author. It should be mentioned that two lists of publications are presented correctly – the one in connection with the present competition and the other in connection with the defence of the dissertation for obtaining the educational and scientific degree "Doctor"

**2.2.** Assist. Prof. Diana Kirilova Nedelcheva, PhD has more than 15 citations in editions of repute and 10 of them are included in the competition for the academic position “Associated Professor”.

2.3. The results of the scientific works could be described according to groups of indicators in the next table:

Group of Indicators	A	B	C	D	E	F	Total number of points
Required minimum number of points for acquiring the academic position of "Associated professor"	50	-	100	200	50	-	400
Real number of points	50	-	100	260	76	-	<b>486</b>

It is noticed from the above table that Assist. Prof. Diana Kirilova Nedelcheva, PhD exceeds the minimal national requirements for the academic position "Associated Professor".

### 3. General characteristics of the candidate's contributions

The contributions are mainly in two directions – set optimization and fixed point in abstract spaces. The specific results are the following:

3.1. Investigation of the stability of several relaxed minimizers of set optimization problems. For the purpose a topology is introduced on ordered vector spaces and a concept for convergence is derived. It allows to study both the upper and the lower stability of the sets of relaxed minimizers.

3.2. Study of the asymptotic behavior of sequences of minimization problems in set optimization. More precisely, considering a sequence of a given set of optimization problems  $(P_n)$  converging to a set optimization problem  $(P)$  in some sense, the upper and lower convergences are investigated concerning the sets of minimizers of the problems  $(P_n)$  towards the set of minimizers of the problem  $(P)$ .

3.3. Some recent results on variational principles for constrained supinf problems of the form  $\sup_{x \in X} \inf_{y \in K_x} \{f(x, y)\}$  are presented. Conditions are proved that ensure the validity of the presented results in the case of the Stackelberg problem.

3.4. An up-to-date overview of the problems is realized in the monograph "Fixed point theory" concerning the fixed point theory. Some new theorems are proved about double fixed points for multi-valued contraction mappings and also corresponding results are obtained in the particular cases of single-valued mappings. The monograph is devoted to the

contemporary research and development of the fixed point theory. Mainly, it contains original investigations of the authors.

**3.5.** It is generalized the notion of coupled fixed (or best proximity) points for cyclic ordered pairs of mappings to  $p$ -cyclic ordered pairs. Sufficient conditions are found for the existence and uniqueness of the connected coupled fixed (or best proximity) points. The results are illustrated with an example that covers a wide class of mappings.

**3.6.** It is obtained a new class of ordered pairs of multi-valued mappings that have pairs of fixed points. The main result is illustrated with two examples that cover a wide range of models. It is applied to models of the duopoly markets to achieve market equilibrium and also for equilibrium in the aquatic ecosystems.

**3.7.** The paper *D. K. Nedelcheva, Altering Points in Partial Metric Space, Interability and Quantization, 2020, pp. 221-231* considers a composition of two multi-valued mappings in partial metric spaces. It is proved the existence of an “altering point” for two multi-valued mappings in complete partial metric spaces.

**3.8.** In the book *D. Nedelcheva, Methods for solving generalized equations. University Publishing House at the Technical University – Varna* the local dependence is studied of three methods for solving generalized equations. Some basic definitions and well known results are presented in Chapter I. Local convergence is proved in Chapter II of a Newton type method for solving generalized equations involving point based approximation. In Chapter III it is studied the local convergence of the chord method for solving non-smooth generalized equation. The local convergence is proved in Chapter IV of secant type method for solving generalized equations. The method is applied and an implicit mapping is defined involving sequences of iterations. A theorem for implicit function is proved.

#### **4. Judgment of the candidate’s personal contribution**

There is no doubt that the obtained results are personal achievements of the candidate. As quantity and quality they are fully sufficient to satisfy the requirements of the law and the regulations for the academic position “Associate Professor”.

#### **5. Critical remarks**

I have no critical remark.

#### **6. Conclusion**

After reviewing the materials and scientific works presented for the competition and analyzing their significance, I find that Assist. Prof. Diana Kirilova Nedelcheva, PhD satisfies the requirement conditions and criteria of the Act on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations on its implementation, as well as the Regulations for the conditions and order for acquiring academic degrees and academic positions at Technical University of Varna. Therefore, **I give my strictly positive evaluation** of the conducted study and I would like to propose to the honourable members of the Scientific Jury to support this application and to submit a proposal for the election of Assist. Prof. Diana Kirilova Nedelcheva, PhD to occupy the academic position “Associate Professor” in the Field of Higher education 4. Natural sciences, mathematics and informatics; Professional field 4.5. Mathematics (Mathematical analysis and Operations research).

27. 12. 2021

Signature: Заличена информация  
по Регламент (ЕС)  
2016/679 7

Beli Osam, Bulgaria

(Prof. Veselin Nenkov, PhD)