STATEMENT

by Eng. Dimitar Mihaylov Tokmakov, PhD

Professor at the ECIT department, Faculty of Physics and Technology,

University of Plovdiv “Paisii Hilendarski”

on the dissertation for the award of the educational and scientific degree "PhD"

by: field of higher education: *5 Technical sciences*

Professional field : *5.3. Communication and computer engineering*

Doctoral programme: "*Automation of areas of the intangible sphere (medicine, education, science, administration, etc.)"*

Author: M.Eng Ivaylo Detelinov Uzunov

Title: 'A Model for Simulation and Final Solutions of Security Systems'

Scientific Supervisor: Prof. Dr. Slavi Lyubomirov

1. General presentation of the procedure and the PhD student

By Rector's Order No. RD-22-534 dated 25.02.2025 of the Rector of Paisii Hilendarski University of Plovdiv, I have been appointed as a member of the academic jury for the defense procedure of the dissertation titled 'A Model for Simulation and Final Solutions of Security Systems' by M.Eng. Ivaylo Uzunov, for acquiring the educational and scientific degree 'Doctor' in the field of higher education 5. Technical Sciences, professional field 5.3 Communication and Computer Engineering, Doctoral Program in Automation of areas in the non-material sphere (medicine, education, science, administrative activities, etc.). The scientific supervisor is Prof. Dr. Slavi Yasenov Lyubomirov.

All necessary and required documents and materials have been presented, according to Article 36 (1) of the Regulations for the Development of the Academic Staff at Paisii Hilendarski University of Plovdiv and the Law on the Development of the Academic Staff in the Republic of Bulgaria. All of them have been diligently and correctly prepared.

2. Topical relevance

The topic of the dissertation addresses one of the most important areas in the modern information era – the protection of critical information infrastructure through simulations, cryptographic models, and analysis of real cyber threats. The relevance is undeniable in the context

of increasing cyberattacks, digital transformation, and the need for resilient protective architectures in network systems. The topic fully meets the needs of modern society and industry.

3. Familiarity of the problem

The list of literary sources includes 94 publications. The majority of cited sources are journal articles indexed in Scopus and Web of Science. A thorough literature review has been conducted, covering both classical and contemporary sources. Numerous scientific publications and international reports are cited. It is evident that the doctoral candidate has a solid grasp of scientific terminology and is familiar with developments in cryptography and security technologies, including symmetric and asymmetric algorithms, SQL injection, MITM attacks, DoS simulations, and others.

4. Research methodology

The research methodology in M.Eng. Ivaylo Uzunov's dissertation is well-structured and combines theoretical analysis, experimental developments, and simulation models. It is based on modern scientific approaches and practical techniques used in the fields of information security, cryptography, and cyber protection. The main stages of the research include:

- Theoretical analysis and problem systematization:

A thorough literature review of current threats to information security is conducted, focusing on various types of cyberattacks (SQL Injection, DoS, Phishing, MITM, etc.). Established standards and models for information security management are discussed – including Public Key Infrastructure (PKI), digital signatures, cryptographic protocols (TLS/SSL), and principles of authorization and authentication.

- Development of simulation models:

Detailed simulation models are built in environments such as MATLAB and Simulink, modeling different types of attacks and defenses: AES encryption – implementation and testing of a simulation model based on real parameters.

- Empirical research using instrumental tools:

Practical studies are conducted using scanning and simulation tools: SEToolkit – for simulating phishing attacks; Discover – for analyzing vulnerabilities in network infrastructure; Action Search, SQL Injection test environments, PHP Injection – for simulating intrusions into web applications and databases.

- Processing and interpretation of results:

The results from simulations and instrumental tests are subjected to detailed statistical analysis.

5. Characteristics and evaluation of the thesis and contributions

The dissertation of Eng. Uzunov is a comprehensive and in-depth study of the topic. It includes a substantiated model, a multi-layered analysis of security risks, simulation and experimental verification of threats and protective measures. Its contributions are scientific-applied and relate to:

• Investigation, systematization, and analysis of existing methods, techniques, and tools for scanning network systems and their application in identifying vulnerabilities.

• Modeling of AES in MATLAB for testing the algorithm and understanding its key operations, demonstrating the algorithm's resilience against attacks.

• Development of simulation models for analyzing DoS, Replay, Delay, and MITM attacks, demonstrating the impact of these threats on information systems.

• Study of the Monte Carlo method in MATLAB, applied to assess the probability of successful password attacks, providing a quantitative risk assessment.

• Simulation and study of agent-based models for the dynamics between attacking and defensive agents, enabling research on the effectiveness of various protection strategies.

6. Assessment of publications and personal contribution of the PhD student

The main content, results, and contributions of the dissertation are presented in five publications. Three of the publications are in Bulgarian language and published in proceedings of the Union of Scientists in Bulgaria – Smolyan.

Two are in English and were presented at the international conference International Technology, Education and Development Conference, INTED2023, Valencia, Spain.

The personal contribution of the doctoral candidate to the publications is undeniable, as he is the first author in all five publications.

A noted weakness is that none of the publications are indexed in Scopus or WoS.

7. Abstract

The author's abstract is prepared in accordance with regulatory requirements and objectively presents the research results.

8. Recommendations for future use of the dissertation contributions and results

The developed models can be used in laboratory exercises on Cybersecurity and related disciplines.

It is recommended that in the future, the doctoral candidate publish the research results in peer-reviewed journals indexed in global databases such as Scopus and WoS.

CONCLUSION

The dissertation of M.Eng. Ivaylo Detelinov Uzunov contains scientific and applied results, which represent an original contribution to science and fully meets the requirements of the Law for the Development of the Academic Staff of the Republic of Bulgaria, the Regulations for its implementation and the Regulations for the Conditions and Procedure for the Acquisition of Scientific Degrees at Paisii Hilendarski University of Plovdiv. The attached abstract reflects the essence of the research and correctly presents the contributions. The dissertation shows that M.Eng. Ivaylo Detelinov Uzunov possesses in-depth theoretical knowledge and professional skills in the scientific specialty "Automation of areas of the intangible sphere (medicine, education, science, administrative activity, etc.)", demonstrating qualities and skills for independent scientific research. Taking into account the merits, topicality, significance of submitted dissertation, I give it a positive evaluation and propose to the jury to award to M.Eng. Ivaylo Detelinov Uzunov the educational and scientific degree "DOCTOR" in scientific field 5 Technical sciences, 5.3. Communication and computer engineering, doctoral program "Automation of areas of the intangible sphere (medicine, education, science, administrative activity, etc.)".

22.04.2025 Prepared by:…….

/prof. Dr. Dimitar Tokmakov/