OPINION

Of PhD thesis for acquiring the educational and scientific degree **'PhD'**
Scientific field: **5. Technical sciences**
Professional field: **5.2. Electrical engineering, electronics, and automation**
PHD program: **Automated systems for information processing and management**
on the topic: **Decision-making in the management of technological facilities**
Author of the dissertation: **M.Sc. Eng. Radoy Strezimirov Dukovski**
Scientific Supervisor: **Acad. Vasil Stoyanov Sgurev**
Member of the Scientific Jury: **Prof. Dr. Eng. Ivan Krumov Kurtev**

By Order No.340/22.12.2025 of the Director of the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences (IICT-BAS), based on Article 4, paragraph 2 of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) and the Decision of the Scientific Council (SC) of IICT-BAS (protocol No. 10/19.12.2025) regarding the procedure for obtaining the educational and scientific degree of 'PhD' by **Eng. Radoy Strezimirov Dukovski**, I have been included as a member of the Scientific Jury for this procedure. The scientific advisor of the PhD student is **Acad. Vasil Stoyanov Sgurev**. At its first meeting on 23.12.2025, the Scientific Jury appointed me to prepare an opinion of the PhD thesis.

As a member of the Scientific Jury, I have received in electronic format:

1. Order No. 340 of 22.12.2025 from the Director of IICT-BAS;
2. PhD Thesis;
3. Abstract of the PhD Thesis;
4. Publications related to the PhD Thesis;
5. Accompanying documents for this procedure.

In my evaluation of the PhD Thesis, the requirements of the LDASRB and the Regulations for its Application (RALDASRB) are decisive. Therefore, they will be presented exactly as follows:

1. According to Article 6 (3) of the LDASRB, the dissertation: "...must contain scientific or applied scientific results that represent an original contribution to science. **The PhD Thesis must demonstrate that the candidate possesses in-depth theoretical knowledge in the respective field and the ability to conduct independent scientific researches."**

2. According to Article 27 (2) of the RALDASRB, the PhD: "...must be presented in a form and volume corresponding to the specific requirements of the primary unit of the scientific institution. **The PhD thesis must contain: a title page; table of contents; introduction; exposition; conclusion – a summary of the results obtained with a declaration of originality; bibliography"**.

The participant in that procedure, **Radoy Strezimirov Dukovski**, graduated from HTMU-Sofia and in 2021 earned a master's degree with distinction in **production automation engineering**. In the period 2023-2025, he is a doctoral student at IICT-BAS. He is the recipient of the "Young Engineer of the Year" award from FNTS for 2023.

The PhD thesis is 193 pages long and consists of an introduction, four chapters, a conclusion - summary of the obtained results, containing: a list of PhD thesis's publications – 5 items, of which 4 are single-authored; main scientific and applied scientific contributions – 7 items; declaration of originality; acknowledgments; bibliography of 146 titles.

The goal of the presented PhD thesis is to develop, using modern design and automatic control systems, models of real technological objects to assist in the decision-making process in their management.

The following **tasks** have been formulated to achieve the set goal:

1. **To conduct an in-depth theoretical analysis** of decision-making systems and the challenges that arise in their application, as presented through the means of modern theory;

2. **To analyze the operation** of a thermal energy technological control object - a steam generator, by developing models of the decision-making systems for controlling the steam-water mixture level and the drum level;

3. **To propose a decision-making system** for the automatic regulation of the steam-water mixture level in the drum during real-time operation of an industrial steam generator;

4. **To design** a membrane bioreactor for the production of Hansenula polymorpha yeast, determining the required aeration rate to achieve a minimum shear rate of the material in the membrane boundary layer of 0.8 [s-1]. Also, to determine the required stirring rate to achieve the desired maximum shear rate in the cell growth chamber of 15 [s-1];

5. **To analyze the operation** of a chemical engineering control object - a cricket filter, by performing simulation modeling of the decision-making systems in its management;

6. **To propose a decision-making system** for real-time operation of an industrial cricket filter;

7. **To analyze the operation** of a chemical engineering control object - a double-layer heater, by performing simulation modeling of the decision-making systems in its management;

8. **To propose a decision-making system** for real-time operation of an industrial double-layer heater.

I confidently believe that **the set goal and the formulated tasks** for its fulfillment **demonstrate the relevance and significance of the presented dissertation**, as well as **the application of the results obtained in practice described therein**.

A list of 5 (five) publications on the topic of the PhD thesis's research is presented, four of which are single-authored. As of the date of the defense, all have been published, and it is evident from the attached report on the fulfillment of the minimum requirements of IICT-BAS for PhD studies that two of them are refereed and indexed in internationally recognized scientific databases, while 3 (three) are in non-refereed journals with scientific review or in edited collective volumes. All are on the topic of the present PhD thesis. The above gives me grounds to conclude that the PhD thesis has been provided with the necessary publicity. From that report, it is evident that the candidate meets and even exceeds the minimum requirements of IICT-BAS for a PhD degree.

I accept the seven (7) contributions achieved with this dissertation, which I propose to define as **scientific – No.4 and No.5**, **scientific-applied – No.3, No.6, and No.7**, and **applied – No.1 and No.2**. I consider that they complement each other, fully meet, and exceed the requirements of a dissertation for obtaining a PhD degree.

I do not dispute and accept the submitted **Similarity Report**, as well as the **Declaration of Originality of the results** both included in the PhD thesis.

The literature used by the doctoral student is presented in the **Bibliography** of this work. It contains 146 titles, almost all in English, with only 6 in Bulgarian. I consider it **directly related to the topic of the PhD thesis and very up-to-date**.

The abstract, comprising 48 pages, accurately and precisely reflects the essence and content of the PhD thesis, including its goal, the tasks of the PhD thesis research, the ways they were accomplished, and the proposed contributions achieved.

The PhD thesis and its abstract are very well presented and are written in correct Bulgarian and scientific style, with no noticeable serious grammatical or stylistic errors. As **a note and recommendation**, I would point out the author's omission in specifying the type of each contribution – scientific, scientific-applied, or applied. That does not cast doubt on or diminish the results achieved by the doctoral student, as indicated in the contributions of that PhD thesis.

CONCLUSION

I accept that **the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria** and the Regulations for its Application, the Regulations on the Conditions and Procedure for Obtaining Academic Degrees and Holding Academic Positions at the Bulgarian Academy of Sciences, and the Regulations on the Specific Conditions for Obtaining Academic Degrees and Holding Academic Positions at the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences **have been met**.

After reviewing the presented PhD thesis and abstract, as well as the publications related to this work, analyzing their significance and the contributions contained therein, I allow myself to give my **positive evaluation** and recommend to the esteemed **Scientific Jury** to award **mag. eng. Radoy Strezimirov Dukovski** the educational and scientific degree of '**PhD**' in the scientific field **5. Technical Sciences**, professional field **5.2. Electrical Engineering, Electronics, and Automation**, doctoral program: **Automated Information Processing and Control Systems**.

На основание
ЗЗЛД

January 12, 2026
Sofia