STANDPOINT

regarding competition for the occupation of an academic position "Associate Professor" in a professional direction 5.2. "Electrical engineering, electronics and automation", study discipline "Management of mechanical systems" at the department "Automation of production" at the Faculty of Computing and Automation of the Technical University - Varna, announced in State Gazette no. 53/20.06.2023.

candidate chief assistant professor PhD. Eng. Zivko Stevkov Zhekov, TU-Varna

Member of the scientific jury: Assoc. Prof. PhD. Eng. Marin Slavov Marinov – TU-Varna

1. General characteristics of the candidate's research and activity in applied science

The research and activity in applied science of Ch. Assist. PhD. Eng. Zhivko Stevkov Zhekov, which is reflected in the publications and in the projects in which he participated, is aimed at the management of mechanical systems and is entirely in the field of the competition.

I accept the basic directions of scientific and scientific-applied research formulated by the candidate, which are summarized as:

1. Systems for vector control of synchronous and asynchronous motors based on an adaptive system with a reference model, as well as neural regulators of speed and flux linkage have been developed. Online trained backpropagation neural networks were used for controllers. Simulation studies have been carried out, confirming the system's operability when changing the speed assignment, the load moment and the moment of inertia within very wide limits.

2. Systems for sensorless vector control of asynchronous motors are presented, using: adaptive and neural regulators of speed and flux linkage; direct control of the moment; neural speed estimators, iterative speed estimators, rotor flux and active motor resistances. They are characterized by working ability when changing the speed assignment, the load moment and the moment of inertia within wide limits.

3. Systems have been developed for the identification of DC motors using principal component analysis for fault detection and recursive methods for estimating motor parameters, as well as DC motor control using digital signal controllers.

4. Control of multi-motor electromechanical systems has been developed, including:

4.1. Manipulator robot control systems using neural regulators, neural kinematics approximators, the slave control principle, and the linearizing feedback method. The simulation studies confirm the effectiveness of the synthesizing control, and the results of the conducted experimental studies prove the operability of the control system.

4.2. Control systems for underwater robotic manipulators using neural controllers. Hydrostatic and hydrodynamic forces are reported. The adaptive properties of the neural control network were researched for different parameters of the load. The operation of the control system in case of inaccurate positioning and orientation of a vehicle under water, as well as the effects of water currents, were investigated.

4.3. Dual-motor electric drive control systems in which two motors are controlled in a synchronized manner, with the second electric drive adjusting its movement based on the state of the first electric drive. The system has been modeled in a specific programming environment and simulation studies have been carried out at different settings of the regulators, confirming its operability. A system for controlling the horizontal stabilization of an aircraft around its longitudinal axis has been researched in practice.

The research activity of PhD Eng. Zivko Stevkov Zhekov defines him as a scientist with high theoretical and practical knowledge, necessary to successfully deal with research tasks in parallel with the teaching activities, as well as with a high potential for future development.

2. Evaluation of the candidate's pedagogical preparation and activity

PhD. Eng. Zhivko Stevkov Zhekov is an established lecturer in the "Production Automation" department at the Faculty of Computing and Automation of the Technical University - Varna. Conducts lectures on disciplines: for OCS "Bachelor" - "Fundamentals of automation", "Fundamentals of automatic control", "Automated production systems", "Robot drive", "Industrial robots", "Fuzzy control systems", "Intelligent control systems", "Control of electromechanical systems"; for OCS "Master" - "Management of electric drives", "Management of building electric drives", "Electric drive systems", "Industrial robots and manipulators". He has published 2 textbooks in co-authorship. He actively participates in enriching the material and technical base of the department.

I believe that his educational and teaching work meets the requirements for holding the position of associate professor.

3. Contributions in science and applied science

The scientific work of PhD Eng. Zhivko Stevkov Zhekov is generally in the field of mechanical systems management. The proposed ideas, methods and approaches for solving the specific tasks have been solved by simulation, and some of them have been verified experimentally. In general, contributions can be categorized as follows: scientific - 2 pcs; scientific and applied – 7 pcs.; applied - 4 pcs.

For me, there is no doubt that the main contributions in theoretical and applied science in the works presented for the competition are the personal work of the candidate and with his direct participation.

4. Significance of contributions for science and practice

The relevance of research in the field of mechanical systems management makes the teaching and research work, as well as the works of PhD Eng. Zhivko Stevkov Zhekov, significant for science and education, which can be judged from the publications in national journals and his participation in international scientific conferences. He is well known to the scientific community in the country and abroad and is undoubtedly a leading specialist in the field of production automation and in particular the management of mechanical systems.

5. Critical notes and recommendations

I have no significant comments on the materials submitted for participation in the competition. I have some recommendations and technical notes:

- In the candidate's materials, there are no submitted documents about the results of scientific research applied in practice;

- To work to modernize the material and technical base of the department, by attracting funds from donations or sponsorship;

- I would recommend that in his future work, PhD Eng. Zhivko Stevkov Zhekov should also include work with doctoral students and young professors on research projects.

CONCLUSION

The presented scientific works referenced in the Scopus and Web of Science databases, as well as the interests and citations of other researchers in the field of mechanical systems control give me reason to believe that undoubtedly PhD Eng. Zivko Stevkov Zhekov has established himself as a leading specialist in this scientific field with a marked interest in modern achievements and great potential for future development.

The minimum requirements for occupying the academic position "associate professor" in professional direction 5.2 "Electrical engineering, electronics and automation", determined by the Regulations for the terms and conditions for occupying academic positions in TU-Varna, which also cover the minimum national requirements according to the Regulations for the application of law on the development of academic staff in the republic Bulgaria are overfilled.

Based on the presented scientific work, its importance, the scientific and its contributions to the field, I find it reasonable to propose Chief assistant, Ph.D. Eng. Zivko Stevkov Zhekov to take the academic position of "associate professor" in the professional direction 5.2 "Electrical engineering, electronics and automation" in the discipline "Management of mechanical systems" for the needs of the department "Automation of production" at the Technical University - Varna.

Date: 02.11.2023

Prepared the star

Assoc. prof. Phl