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Annex No. 10 to the MU Directive on Habilitation Procedures and Professor Appointment Procedures

HABILITATION THESIS REVIEWER'S REPORT

Masaryk University	
Applicant	RNDr. Lenka Přibylová, Ph.D.
Habilitation thesis	Applied nonlinear dynamics
Reviewer	Prof. RNDr. Michal Fečkan, DrSc.
Reviewer's home unit, institution	Department of Mathematical Analysis and Numerical Mathematics, Comenius University in Bratislava, Mlynská dolina, 842 48 Bratislava, Slovakia

Habilitation thesis of RNDr. Lenka Přibylová, Ph.D. is a summary of results from several of her published works, which are devoted to nonlinear phenomena using bifurcation theory. This is presented in five chapters with summaries of her contributions to published scientific papers. Chapter 6 collects the corresponding published articles that are relevant to the habilitation thesis. The Appendix presents her publications and other scientific activities during the period of the covid-19 pandemic. It is an interesting and useful supplementary part of the habilitation thesis.

The author studies a wide range of theoretical as well as practical tasks and problems. For example, the following results are designed:

- Bifurcations of equilibria and related phenomena: Fold of the equilibrium manifold, cusp bifurcation with switches and hysteresis.
- Bifurcations of cycles and related phenomena: Hopf bifurcation, fold of the cycle manifold, Neimark-Sacker bifurcation, Bogdanov-Tankens bifurcation, homoclinic loops, symmetry of 1:2 resonance bifurcation, Chenciner bifurcation and the cusp of the invariant loop.
- Chaotic dynamics: The period doubling bifurcation, Sharkovski-Yorke theorem, using the maximal Lyapunov exponents and a method of 0-1 test for chaos.
- Synchronization: Stable regions of so-called Arnold tongues, Hopf-Hopf bifurcation.
- Applications to concrete models with numerical simulations and computations in population biology, physics and economics like predator-prey models, ac-driven Josephson junction within the resistively and capacitively shunted junction model, macroeconomic model with foreign capital investment.

The results of the habilitation thesis are non-trivial, original and their proofs are technically demanding, where the author has shown good knowledge of the given issue. Overall, I assess the quality of the habilitation work at a high level, comparable to the international standard. The studied topic is current, which is proven by the fact that the articles are published in good journals and the comments in the introductions of these publications about the state of the issue. The processing and documentation of the results of the habilitation thesis is excellent, because the thesis is readable, easy to navigate, and its structure is optimally designed. The applicant's own contribution in the habilitation thesis is the derivation of the above-mentioned new results but also many others which cannot be presented here. The achieved results can be used for the analysis of other practical tasks. I have no comments on the habilitation work. In conclusion, I recommend her excellent work for the habilitation procedure in this field and support her appointment as associate professor.

Reviewer's questions for the habilitation thesis defence (number of questions up to the reviewer)

I am satisfied with habilitation thesis and thus I have no question.

Conclusion

The habilitation thesis entitled “Applied nonlinear dynamics” by Lenka Přibylová **fulfils** requirements expected of a habilitation thesis in the field of Mathematics – Applied Mathematics.

Date: 12. 1. 2023 Signature: