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Annex No. 11 to the MU Directive on Habilitation Procedures and Professor Appointment Procedures

HABILITATION THESIS REVIEWER'S REPORT

Masaryk University	
Faculty	Faculty of Science
Procedure field	Mathematics – Mathematical Analysis
Applicant	Dr. András Rontó
Applicant's home unit, institution	Brno University of Technology, Faculty of Business and Management
Habilitation thesis	Parametrisation Methods for Constructive Analysis of Boundary Value Problems for Ordinary Differential Equations
Reviewer	Prof. Dr. Nino Partsvania
Reviewer's home unit, institution	Director & Chief Researcher of A. Razmadze Mathematical Institute of TSU, Tbilisi, Georgia

The habilitation thesis of András Rontó is devoted to the constructive investigation of boundary value problems for systems of ordinary differential equations. It is a commented collection of 8 papers published by him jointly with co-authors.

The thesis consists of four chapters and includes offprints of 8 published papers.

Chapter I is devoted to the constructive investigation of periodic and two-point boundary value problems for systems of ordinary differential equations. The effective method of periodic successive approximations is developed for systems with nonlinear terms Lipschitzian in a compact set. One should note that the technique can be used in the cases of large nonlinearities (with large Lipschitz constants), which makes it stand out from other methods. Theorems containing sufficient conditions for the solvability of the problem are established. The conditions appearing in the theorems depend on expressions computed in a finite number of steps and can be effectively verified. The application of the idea to a class of functional differential equations is treated.

Chapter II deals with the adaptation of the approach based on parametrization to more general nonlocal problems. In particular, parametrization at several nodes is considered.

In Chapter III, systems of differential equations with impulses at surfaces are treated. After suitable adaptation, the technique using parametrization at multiple nodes proves to be effective for approximate finding of solutions. Since the impulse times are not known beforehand, the approach using parametrization is very natural in this case. This, in a certain

way, fills the gap due to the unavailability of effective methods of treating such problems under reasonably general assumptions.

Chapter IV deals with the problem on finding a solution of the nonlinear system that vanishes at certain points, which remain unknown. The method suggested in this case is close to Chapters II, III and allows to approximately construct the solution and determine the unknown zero points.

In my opinion, the habilitation thesis contains new and interesting scientific results. It is well and clearly written and organised. Dr. András Rontó has made a significant contribution to the theory of boundary value problems and I consider him as one of the leading experts in this field. His results are published in high-reputable international journals and discussed at many international scientific conferences. I highly appreciate the scientific activity of Dr. András Rontó.

Reviewer's questions for the habilitation thesis defence

1. Is it possible to say something on the optimality of the constants in conditions (53) and (56)?

Conclusion

The habilitation thesis entitled “Parametrisation Methods for Constructive Analysis of Boundary Value Problems for Ordinary Differential Equations” by András Rontó **fulfils** requirements expected of a habilitation thesis in the field of Mathematics – Mathematical Analysis.

Date: March 15, 2021 Signature: