REVIEW

by the official opponent on dissertation work by
Ing. Marie Klimešová
«Stochastic Calculus and Its Applications in Biomedical Practice» for the degree of Ph.D.:
Brno, Technical University in Brno,
Department of Mathematics, Faculty of Electrical and Communications

Dissertation Work by Marie Klimešová «Stochastic Calculus and Its Applications in Biomedical Practice» is devoted important problems of applied mathematics, specifically stochastic differential equations and its application in biomedicine. Stochastic differential equations are used to describe physical phenomena, which are also influenced by random effects. Solution of the stochastic model is a random process. Objective of the analysis of random processes is the construction of an appropriate model, which allows understanding the mechanisms. Knowledge of the model also allows forecasting the future and it is possible to control and optimize the activity of the applicable system. On probability space defined the stochastic differential equation and the basic properties are indicated. The final part contains biology model illustrating the use of the stochastic differential equations in practice. Problems of this type are very actually. Thus, dissertation has plenty of great practical value.

The work has a range of 106 pages and is written in English.
PhD thesis consists of an introduction(commoncharacteristicofwork), sixchapters, the conclusion and the list of references.
In thefirst chapter contains a very briefintroduction to the issues. Additional knowledge along with references to the used literature are in the introductions to chapters 2, 3, 5 and 6.
In the second chapter are summarized the basic findings of the theory of systems of ordinary differential equations and their stability.
The third chapter deals with the stochastic differential equations and systems of such equations. Here are the summarized findings of their solutions and stability. The author works with the stability of the according A.M. Lyapunov.

The main and new results are contained in chapter from four to six.
The fourth chapter deals with the stochastic matrix equations, where the order of the matrix is successively equal to 2, 3 and 4 are listed conditions of solutions and stability. For some specific types of matrices are directly derived criteria for stability. It is always a specially simplified matrix. The shape of the general matrix is doing not yet anything like proven. This chapter contains are original author's results.
The fifth chapter deals with the delayed stochastic systems.
The sixth chapter is the most extensive. It paid to the specific biomedical model, which is illustrated by the application of the previous theory. A detailed interpretation is accompanied by a number of images and mostly uncluttered graphs of individual functions. In a brief final chapter summarizes the results and formulates options for further research, which may further go in several different directions, which are here indicated.
The work has a very good graphical level. It is clear and nicely legible. I particularly appreciate the processing of graphs (chapter 6). All results derived by the author are new, hasconstructivecharacterandallowcomputing concretenumericalcharacterization. Reliabilityof obtained results is basedon known facts and their exact mathematical proofs.
After a careful study of the dissertation, I can state:

1. The author has chosen a difficult but even in the currently very fast developing branch of mathematics. The theory of stochastic equations is still new and new possibilities of use. Reached here new results and was able to demonstrate their applicability in practice. I can therefore conclude that the chosen topic and its treatment is current
2. The work contains new and original results. The main results concern systems of stochastic equations of the third and fourth order.
3. The main results of the dissertation are included in the WoS.
4. The author during published 13 works both independently and in co-authorship with your supervisor.
5. A good approbation of results of PhD thesis was done on several international conferences and seminars. Abstract   fully and adequately reflects the content of PhD thesis.
6. The author has fulfilled the objectives set.

Some of the inaccuracies and deficiencies in the work have occurred:
1. On page 8 the abbreviations RNA, EEG, ECG. I miss their clarification.
2. In the sentence 3.5.1 are given conditions for the stability of the trivial solution and the trivial solution is not defined.
3. Equation (6.3) deserves a more detailed derivation. The same applies for equations (6.5) and (6.7).
4. List of publications of the author would be appropriate to add about the percentage of authors in individual publications.
5. In the defense should the applicant indicate which direction will take her next professional work.

The submitted work the author demonstrated his wide view and knowledge of the literature, which relates to the particular field of study his surroundings.
The work contains new, original results and confirms the ability of the author scientifically to work. Particularly, worth noting a direct application of their results in medical practice.

Based on the above, I recommend that after a successful defense, will Ing. Marie Klimešová awarded the academic title of Ph. D.

Believe that the dissertation work "Stochastic Calculus and Its Applications in Biomedical Practice" in terms of research, relevance, scientific level, quantity and quality of a publication meets all the requirements, and its author Ing. Marie Klimešová deserves conferment degree of Ph.D.

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Prof. Irada Dzhalladova, Dr.Sc.
Head of Department Computer Mathematics
and Information Security
Institute of Information Technology in Economics
Kyiv National Economic University
after named Vadym Getman
Kyiv, Ukraine