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Review of Thesis
on
“Issues of solvability of some classes of convolution type
integral equations generated by non compact operators”

for attaining a scientific degree of
Candidate of Phys-Mathematical Sciences

submitted by
Arpenik Kroyan

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Integral equations appeared sporadically in the 1830's. Certain classifications have long been used in order to separate types of integral equations. The class of convolution type integral equations is one of them that has been well studied by several authors. These equations arise from a large variety of physical situations and it is natural that the issues of existence and uniqueness of a solution will be useful in many areas of applied mathematics and mathematical physics.

The present work of Arpenik Kroyan is a contribution in the field of convolution type integral equations and is devoted to the issues of solvability of some nonlinear integral equations and their discrete analogues. The equations studied in the work can be applied in the radiative transfer theory, kinetic theory of gases, theory of p -adic open-closed strings as well as in modelling of spatial-temporal spread of epidemics diseases.

The work and obtained results

The dissertation of Arpenik Kroyan consists of two chapters:

1. In the first chapter an integral equation on the whole line with power-law nonlinearity is considered. By imposing natural conditions on the kernel, Mrs Arpenik Kroyan proved the existence of a nontrivial, odd, continuous and bounded solution on the whole line in Theorem

1.1. Moreover she was able to obtain an asymptotical behaviour of the solution at $+\infty$ and $-\infty$.

Later, in Theorem 1.2, the uniqueness of the solution in the class of continuous functions on \mathbb{R}^+ has been proved as well.

Starting from paragraph 1.5 Mrs A. Kroyan considered a boundary value problem for one class of singular nonlinear integral equation on the entire axis. The existence of a nontrivial and odd solution on the whole line has been proved. In addition, a number of properties of the resulting solution have been obtained in paragraphs 1.7-1.8.

2. The first part of the second chapter of the thesis is devoted to the solvability of one class of nonlinear infinite system of algebraic equations with Toeplitz matrices. Here again the author succeeds to prove the existence of a solution in the space of bounded sequences (see Theorem 2.1).

In the last part of the second chapter Mrs Kroyan discussed the issues of solvability of systems of integral equations with monotone and convex nonlinearity on the positive half line. Under some natural assumptions she was able to prove that the indicated system of algebraic equations has a nontrivial, componentwise nonnegative and essentially bounded solution. Moreover, two sided estimates for the solution have been obtained and its asymptotic behavior at infinity has been investigated (see Theorem 2.2).

It is worth to mention that at the end of each part of the work the author gives applied examples of functions for which the conditions of the formulated theorems are fulfilled. The examples are very important, meantime they provide a good understanding of obtained theoretical results.

Evaluation

The work of Arpenik Kroyan is written well and does not contain any mathematical mistakes. All proofs of theorems and auxiliary lemmas are done in detail and with high accuracy. The obtained results are very interesting and can be applied in different areas of mathematical physics and epidemics.

Some critical remarks in favour of Mrs. Kroyan's work can be made as well. The constructive approach for solutions allows to compute the solutions numerically. The equations are highly applicable in real life and it would be very interesting to see how the solutions look like.

A small section with open problems and further discussions might be helpful, as one could be then able to see how the author handles the possible extensions of the present work.

Nevertheless, the critical remark does not affect the well done study of Mrs. Arpenik Kroyan. The equations discussed in the work are highly nonlinear, the investigation of which contain a solid background of several mathematical theories.

Summary

In general, the content of Mrs. Kroyan's thesis gives a very good impression. The scientific work done by the author can be considered to be an important contribution in the field of differential and integral equations.

I endorse that the thesis of Arpenik Kroyan fulfils the requirements of the Qualifying Committee of the Republic of Armenia, and Mrs Kroyan deserves to obtain the scientific degree of

Candidate of Phys-Mathematical Sciences

in the field of Differential Equations and Mathematical Physics (A.01.02).

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