

Report on the Ph.D. thesis "THE CAUCHY PROBLEM FOR DIFFERENCE EQUATIONS IN LATTICE CONES AND GENERATING FUNCTIONS FOR ITS SOLUTIONS"
"by SREELATHA CHANDRAGIRI

The thesis of Sreelatha Chandragiri is devoted to the important mathematical problem of the contemporary complex analysis, namely the investigation of the Cauchy problem for multidimensional difference equations in pointed lattice cones. The main goal of this thesis to give an analogue of the Chaundy-Bullard identity for vector partition functions and derive generating functions of solutions to restricted lattice path problems by using difference equations with non-constant coefficients.

In the last decade, the number of papers devoted to the theory of multidimensional difference equations appeared. In particular, in the paper written by M. Bousquet-Mélou, M. Petkovšek in 2000 the existence and uniqueness of their solutions has been proved. Different formulations of the Cauchy problem for multidimensional difference equations in unimodular cones were suggested in 2004-2019 by E.K. Leinartas, A.P. Lyapin, M.S. Apanovich (Rogozina), T.I. Yakovleva (Nekrasova).

The Ph.D. thesis under review consists of three chapters.

In chapter 1 the author considers a version of the Cauchy problem for a multidimensional difference with constant coefficients, which connected with a lattice path problem in enumerative combinatorial analysis.

The new formulae are obtained in which the generating function of the solution to the Cauchy problem is expressed in terms of generating functions of the Cauchy data and a solution to the Cauchy problem is expressed through its fundamental solution and Cauchy data.

In chapter 2 the author introduced a vector partition function with weight, which is a generalization of vector partition functions used by M. Brion and M. Vergne (1997), A.V. Pukhlikov and A.G. Khovansky (1993), B. Sturmfels (1995), and derived the identity for generating series of such functions associated with solutions of basic recurrence relation of combinatorial analysis. A new sort of a Chaundy-Bullard identity is obtained for vector partition functions with weight.

In chapter 3 the author deals with a difference equation in a two-dimensional pointed lattice cone K spanned by a set of vectors including n linearly independent vectors. The identity for the generating functions based on which we derived generating functions of solutions to restricted lattice path problems.

The author widely demonstrated the knowledge of modern mathematics, including the theory of multidimensional power series and amoebas of algebraic hypersurfaces, and the theory of generating functions. The obtained results are illustrated by very elegant examples. The results of dissertation were published in three original paper by the author and reported on various international conferences. They are well recognized by the international mathematical

community. All the main ideas of Ph.D. are fresh and new and belong to the author. The logical structure of the is excellent. All the obtained results are justified by strong mathematical arguments. The proofs given in Ph.D. clear demonstrate the author's knowledge of the contemporary literature on multidimensional complex analysis. The language of the present investigation is very light and completely understandable for the experts.

In conclusion, I recommend without any hesitation the defense of Sreelatha Chandragiri's thesis. I should honestly say that the scientific level of the dissertation corresponds to the highest international standards and conferring a Ph.D degree to the candidate.

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