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The 15th Ukraine Algebra Conference

Book of Abstracts

July 8–12, 2025
Ivan Franko National University of Lviv

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These proceedings gather the papers presented at the 15th Ukraine Algebra Conference (XV UAC), held in a hybrid format from July 8–12, 2025 at Ivan Franko National University of Lviv. Traditionally co-organized by Taras Shevchenko National University of Kyiv and the Institute of Mathematics of the National Academy of Sciences of Ukraine, the UAC has met biennially since its inaugural meeting in Slovyansk (1997) to unite established and early-career researchers in algebra from Ukraine and around the world. Past venues include Vinnytsia (1999, 2019), Sumy (2001, 2023), Lviv (2003, 2013), Odesa (2005, 2015), Kamianets-Podilskyi (2007), Kharkiv (2009), Luhansk (2011), Kyiv (2017, 2021).

We thank all conference participants for their abstracts, the Editorial Committee for its dedicated efforts, and everyone for supporting Ukraine.

We trust these proceedings will both memorialize the conference's vibrant exchanges and inspire future developments in algebra. We look forward to continuing this tradition of collaboration at the 16th UAC in 2027.

— *The Scientific and Organizing Committees*

Contents

Nataliia Samaruk

SO(3)-quasimonomial families of Appell polynomials

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Definition. A family of polynomials $\{B_{m,n,k}(x,y,z)\}$ is called quasimonomial with respect to H if the group operators in two different bases $\{x^m y^n z^k\}$ and $\{B_{m,n,k}(x,y,z)\}$ have the same matrices. The polynomials $\{B_{m,n,k}(x,y,z)\}$ are called quasimonomials.

Let us consider the two polynomial families $\{V^{(s)}_{m,n,k}(x,y,z)\}$ and $\{U^{(s)}_{m,n,k}(x,y,z)\}$ defined by the exponential generating functions:

$$\frac{1}{(1-2(xu+yv+zw)+u^2+v^2+w^2)^{\frac{2+s}{2}}} = \sum_{m,n=0}^{\infty} V^{(s)}_{m,n,k}(x,y,z)\frac{u^m}{m!}\frac{v^n}{n!}\frac{w^k}{k!},$$

$$\frac{1}{((1-(ux+vy+wz))^2-(u^2+v^2+w^2)(x^2+y^2+z^2-1))^{\frac{s}{2}}} =$$

$$= \sum_{m,n=0}^{\infty} U^{(s)}_{m,n,k}(x,y,z)\frac{u^m}{m!}\frac{v^n}{n!}\frac{w^k}{k!}.$$

These polynomials are called Appell polynomials of type V and U. These polynomials first appeared in the works of Hermite, Didon, Appell, and Campe de Ferrier, see [1], [2]. These families of polynomials are quasimonomials.

The following theorem presents a simple criterion for the quasimonomiality of a polynomial family in terms of its exponential generating function.

Theorem. The polynomial family $\{B_{m,n,k}(x,y,z)\}$ defined by the exponential generating function

$$G = G(x,y,z,u,v,w) = \sum_{m,n,k=0}^{\infty} B_{m,n,k}(x,y,z)\frac{u^m}{m!}\frac{v^n}{n!}\frac{w^k}{k!}$$

is quasipolynomial with respect to $SO(3)$ if and only if G is a function of the three variables $ux+vy+wz, x^2+y^2+z^2$ and $u^2+v^2+w^2$.

[1] Appell P., Kampé de Fériet J. *Fonctions Hypergéométriques et Hypersphériques, Polynomes d'Hermite.* — Gauthier-Villars, 1926.

[2] Kampé de Fériet J. *Sur les fonctions hypersphériques.* Théses de l'entre-deux-guerres. — Paris, 1915.

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