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Operational Properties of Two-Parameter Laguerre-Type Sheffer Polynomials

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Abstract

Sheffer polynomial sequences have been extensively studied due to their rich algebraic structure and numerous applications in applied mathematics, approximation theory, combinatorics, and mathematical physics [1, 2, 3]. Since both Appell and associated polynomial sequences belong to the Sheffer class, many well-known polynomial families can be treated within a common algebraic framework. Motivated by these works, we introduce a new family of two-parameter polynomials and study their generating function, explicit representations, recurrence relations, differential identities, and operational formulas. We also establish generating function identities and investigate the influence of the parameters on the structure of the polynomials. Furthermore, connections with several well-known polynomial families are discussed by considering appropriate parameter choices, showing that the proposed sequence provides a unified framework for a variety of classical polynomials. Illustrative examples of the first few polynomials are presented to demonstrate the theoretical results.

Keywords: Sheffer sequences, Laguerre polynomials, generating function.

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