

**A NEW GENERALIZATION OF q -TRUNCATED
EXPONENTIAL-BASED APPELL POLYNOMIALS WITHIN THE
CONTEXT OF QUANTUM CALCULUS**

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Abstract: In this work, we set out on an exhaustive analysis of trivariate q -truncated exponential-based Appell polynomials (Tq -TEbAP), which are explicitly built by a generating function with a q -calculus profile. First, an analysis will be provided for these polynomials by means of quasi-monomiality, which will lead to the fundamental operational relations and a simple form for the operators. Subsequently, concrete forms for the operators will be obtained, along with the related q -differential and partial differential equations that these polynomials obey. Last but not least, a number of summation formulas will be provided to highlight the intrinsic analytic properties of these polynomials.

Keywords and Phrases: Quantum calculus, q -truncated polynomials, q -truncated-Appell polynomials, Quasi monomiality, Extension of monomiality principle, q -Dilatation operator, Partial differential equations, Differential equations.

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1. Introduction

Special functions occupy a central place in many areas of mathematics and the applied sciences. They appear naturally as solutions to differential equations, which model a wide range of physical and engineering phenomena. Traditional special functions, such as the Hermite, Legendre, Laguerre, and Bessel functions, play