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THE HOMOGENEOUS q-SHIFT OPERATOR FOR POLYNOMIALS WITH DOUBLE q-BINOMIAL COEFFICIENTS

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Abstract. Within this document, a homogeneous q-shift operator is constructed and we form a polynomial with double q-binomial coefficients $L_n^{(\tilde{j},\tilde{k})}(\beta,u,m,o,r,s,p)$. The generating function, the Rogers type, Mehler's formula, and mixed generating functions and all of its extension are inferred for the polynomials $L_n^{(\tilde{j},\tilde{k})}(\beta,u,m,o,r,s,p)$. When we take a few special values for a polynomials $L_n^{(\tilde{j},\tilde{k})}(\beta,u,m,o,r,s,p)$ are provided for the purpose of find the polynomials' identities for $L_{(\tilde{j},\tilde{k})}(\beta,u,o,r)$ and $L_n^{(\tilde{j},\tilde{k})}(\beta,u,m,o,r)$. Also we develop the generating functions of a class mixed. Using generating functions for $L_n^{(\tilde{j},\tilde{k})}(\beta,u,m,o,r,s,p)$, a transformation formula is derived.

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Key words and phrases. homogeneous q-shift operator; generating function; Rogers formula; Mehler's formula; double q-binomial coefficients; mixed generating function.

1. Introduction

This section, the q-series symbols and definitions used in [15] shall be adhered to. Our hypothesis is that $|q| < 1$.

The q-shifted factorial for $c \in \mathbb{C}$ is defined as [13–15].

$$(c;q)_0 = 1, \quad (c;q)_m = \prod_{k=0}^{m-1}(1-cq^k), \quad (c;q)_\infty = \prod_{k=0}^{\infty}(1-cq^k),$$

The following relation is true:

$$(c_1, c_2, \ldots, c_r; q)_g = (c_1;q)_g(c_2;q)_g \cdots (c_r;q)_g,$$

where $g \in \mathbb{Z}$ or ∞.

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