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DIFFERENT OPERATORS FOR THE POLYNOMIALS $S_n(\delta, \zeta, \lambda|q)$

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Abstract. In 2010, Saad and Sukhi defined the polynomials $S_n(\delta, \zeta, \lambda|q)$. They simply derived its generating function by utilizing the operator $L(b\theta_{xy})$. In this study, we provide Rogers' formula using the q-exponential operator $T(bD_q)$, Mehler's formulas using the operator $L(b\theta_{xy})$, and a linearization formula for the polynomials $S_n(\delta, \zeta, \lambda|q)$. In addition, we employ the Cauchy companion operator $E(a, b; \theta)$ to recover the generating function and provide the Rogers formula, Mehler's formula, and an extended Rogers formula for the polynomials $S_n(\delta, \zeta, \lambda|q)$.

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1. Introduction

We assume that $0 < |q| < 1$. The q-shifted factorial is given for every $a \in \mathbb{C}$ as [10,13]:

$$(\beta; q)_0 = 1, \qquad (\beta; q)_r = \prod_{k=0}^{r-1}(1 - \beta q^k), \qquad (\beta; q)_\infty = \prod_{k=0}^{\infty}(1 - \beta q^k).$$

$$(\beta; q)_r = (\beta; q)_\infty / (\beta q^r; q)_\infty.$$

$$(\beta; q)_{r+k} = (\beta; q)_k \, (\beta q^k; q)_r.$$

and [1]

$$(\beta q^{-r}; q)_n = (-1)^r \beta^r q^{\binom{r}{2} - r^2} \, (q/\beta; q)_r. \tag{1.1}$$

The multiple q-shifted factorials is [13]

$$(\beta_1, \beta_2, \cdots, \beta_m; q)_r = (\beta_1; q)_r (\beta_2; q)_r \cdots (\beta_m; q)_r.$$

$$(\beta_1, \beta_2, \cdots, \beta_m; q)_\infty = (\beta_1; q)_\infty (\beta_2; q)_\infty \cdots (\beta_m; q)_\infty \, .$$

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