On a general class of q-polynomials suggested by basic Laguerre polynomials

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Having defined a q-extension of the polynomial $L_n^{\alpha,\beta}(x)$, we investigate its fundamental properties such as q-generating relation, q-partial difference equation and recurrence relations. A generalized q-generating function for the said polynomial is also established. It has further been shown that the newly defined polynomial is closely related to the q-Laguerre polynomial $L_n^{\beta}(x;q)$. Certain interesting limiting cases in the form of the known results due to Prabhakar and Rekha [Math. Student, 40(1972), 311-317] and Prabhakar [Pacific J. Math. 35(1)(1970), 213-219] have also been discussed. Some of the main results proved in this paper are as under:

(a) A q-extension of $L_n^{\alpha,\beta}(x)$:

$$L_n^{\alpha,\beta}(x;q) = \frac{\Gamma_q(\alpha n+\beta+1)}{(q;q)_n} \sum_{j=0}^{n} \frac{(q^{-n};q)_j \ (xq^n)^j \ q^{j(j-1)/2}}{(q;q)_j \ \Gamma_q(\alpha j+\beta+1)}, \tag{1}$$

where $Re(\alpha) > 0$ and $Re(\beta) > -1$.
(b) q-generating function:

$$\sum_{n=0}^{\infty} \frac{L_n^{\alpha,\beta}(x;q)t^n}{\Gamma_q(\alpha n+\beta+1)} = e_q(t)\phi(\alpha,\beta+1;q,-xt), \tag{2}$$

where $\phi(\alpha,\beta+1;q,-xt)$ is q-Bessel-Maitland function.

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