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CONSTRUCTION OF DEGENERATE q-CHANGHEE POLYNOMIALS WITH WEIGHT α AND ITS APPLICATIONS

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Abstract: The aim of the present paper is to deal with introducing a new family of Changhee polynomials which is called degenerate q-Changhee polynomials with weight α by using p-adic q-integral on $\mathbb{Z}_p$. From this definition, we obtain some new summation formulae and properties. We also introduce the degenerate q-Changhee polynomials of higher-order with weight α and obtain some new interesting results.

Keywords and Phrases: Degenerate q-Changhee polynomials and numbers with weight α; higher-order degenerate q-Changhee polynomials and numbers with weight α, Stirling numbers of the first and second kind.

2020 Mathematics Subject Classification: 11B68, 11B83, 11S80.

1. Introduction

Let p be a fixed odd prime number. Throughout this paper, $\mathbb{Z}_p$, $\mathbb{Q}_p$ and $\mathbb{C}_p$ will denote the ring of p-adic integers, the filed of p-adic rational numbers and the completion of an algebraic closure of $\mathbb{Q}_p$. The p-adic norm $|\ .\ |_p$ is normalized by $|\ p\ |_p = \frac{1}{p}$. For $q, x \in \mathbb{C}_p$ with $|\ q-1\ |_p < p^{-\frac{1}{p-1}}$. We define the q-analogue of a number x to be $[x]_q = \frac{1-q^x}{1-q}$. Note that $\lim_{q\to 1}[x]_q = x$. Let $C(\mathbb{Z}_p)$ be the space of continuous function on $\mathbb{Z}_p$. For $f \in C(\mathbb{Z}_p)$, Kim introduced the fermionic p-adic q-integral $I_{-q}(f)$ on $\mathbb{Z}_p$ (see [11, 12, 13])

$$I_{-q}(f) = \int_{\mathbb{Z}_p} f(x)d\mu_{-q}(x) = \lim_{N\to\infty} \frac{1}{[p^N]_{-q}} \sum_{x=0}^{p^N-1} f(x)(-q)^x, \text{(see [8, 19])}. \tag{1.1}$$