

ON THE Q -EXTENSION OF THE P -ADIC BETA FUNCTION

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Abstract

Let p be a fixed prime number. By $\mathbb{Z}_p, \mathbb{Q}_p$ and \mathbb{C}_p we denote the ring of p -adic integers, the field of p -adic numbers and the completion of the algebraic closure of \mathbb{Q}_p , respectively. Y. Morita (1975) defined the p -adic gamma function $\Gamma_p : \mathbb{Z}_p \rightarrow \mathbb{Q}_p$ by the formula

$$\Gamma_p(x) = \lim_{n \rightarrow x} (-1)^n \prod_{\substack{1 \leq j < n \\ (j,p)=1}} j$$

Let $q \in \mathbb{C}_p$ with $|q - 1|_p < 1$ and $q \neq 1$, the q -extension of the p -adic gamma function is defined by

$$\Gamma_{p,q}(x) = \lim_{n \rightarrow x} (-1)^n \prod_{\substack{1 \leq j < n \\ (j,p)=1}} \frac{1 - q^j}{1 - q} \quad \text{for } x \in \mathbb{Z}_p,$$

where n runs over positive integers. We recall that $\lim_{q \rightarrow 1} \Gamma_{p,q} = \Gamma_p$.

In the present work we consider the q -extension of the p -adic beta function which is defined by

$$B_{p,q}(x, y) = \frac{\Gamma_{p,q}(x) \Gamma_{p,q}(y)}{\Gamma_{p,q}(x + y)}.$$

We obtain some properties of the q -extension of the p -adic beta function $B_{p,q}$.

Keywords and phrases: p -adic number, q -extension of the p -adic gamma function, q -extension of the p -adic beta function.

References

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