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On a p-adic interpolating power series of the generalized Euler numbers

By Kazuhito KOZUKA

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§1. Introduction.

Let $u\neq 1$ be an algebraic number. The n-th Euler number $H^{n}(u)$ belonging to u is defined by

$$\frac{1-u}{e^{t}-u}=\sum_{n=0}^{\infty}\frac{H^{n}(u)}{n!}t^{n}.$$

Let p be a prime number and χ a primitive Dirichlet character. Shiratani-Yamamoto ([**6**]) constructed a p-adic interpolating function $G_{p}(s, u)$ of the Euler numbers $H^{n}(u)$, and as its applications to the p-adic L-functions $L_{p}(s, \chi)$, they derived an explicit formula for $L_{p}'(0, \chi)$ including Ferrero-Greenberg's formula ([**2**]), and gave an explanation of Diamond's formula ([**1**]).

Let f_{χ} be the conductor of χ. As analogous to the generalized Bernoulli numbers, Tsumura ([**10**]) defined the n-th generalized Euler number $H_{\chi}^{n}(u)$ for χ belonging to u by

$$\sum_{a=0}^{f_{\chi}-1}\frac{(1-u^{f_{\chi}})\chi(a)e^{at}u^{f_{\chi}-a-1}}{e^{f_{\chi}t}-u^{f_{\chi}}}=\sum_{n=0}^{\infty}\frac{H_{\chi}^{n}(u)}{n!}t^{n}, \tag{1.1}$$

and he constructed a p-adic interpolating function $l_{p}(s, u, \chi)$, which is an extension of $G_{p}(s, \chi)$. Further, by considering the expansion of $l_{p}(s, u, \chi)$ at $s=1$, he obtained some congruences for the generalized Euler numbers.

Sinnott ([7]) showed how to calculate the μ-invariants of the Γ-transforms of rational functions, and gave a new proof of the well-known theorem of Ferrero-Washington that Iwasawa's μ-invariants are zero for the basic $\boldsymbol{Z}_{p}$-extensions of all abelian number fields. By similar technique, an analytic property of the interpolating power series of $L_{p}(s, \chi)$ was investigated in [8], and a new proof of the Friedman's result in [3] was given in [**9**].

In the present paper, by similar methods used in [7], [8] and [**9**] we shall investigate an interpolating power series of the generalized Euler numbers. In §2, we shall reconstruct the function $l_{p}(s, u, \chi)$ by constructing an interpolating power series $F_{\chi,u}(T)$, and calculate the μ-invariant of $F_{\chi,u}(T)$. (The power