СЕКЦІЯ МАТЕМАТИКИ

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TAYLOR SERIES OF $ca(\overline{m},\overline{n},w)$ SPECIAL *ATEB-FUNCTION*

The Taylor expansion of 2Π-periodic special function $ca(\overline{m},\overline{n},w)$ $[2]$, where

$$\overline{m}=\frac{2\nu_1+1}{2\nu_2+1};\ \overline{n}=\frac{2\mu_1+1}{2\mu_2+1};\ \nu_1,\nu_2,\mu_1,\mu_2=0,1,2,3...; \qquad (1)$$

$\Pi=\mathrm{B}\left(\frac{1}{\overline{n}+1};\frac{1}{\overline{m}+1}\right)$ - Beta - function is under consideration. Basing on the rules for differentiation of *Ateb*-functions $\frac{d\,sa(\overline{n},\overline{m},w)}{dw}=\frac{2}{\overline{n}+1}\left(ca(\overline{m},\overline{n},w)\right)^{\overline{m}}$, $\frac{d\,ca(\overline{m},\overline{n},w)}{dw}=-\frac{2}{\overline{m}+1}\left(sa(\overline{n},\overline{m},w)\right)^{\overline{n}}$ and their values at $w=0$ $(sa(\overline{n},\overline{m},w)=0,\ ca(\overline{m},\overline{n},w)=1)$ it is obvious $[3]$ that *Ateb*-functions $ca(\overline{m},\overline{n},w)$ and $sa(\overline{n},\overline{m},w)$ have the derivatives of all orders in the neighborhood of $w=0$ when $\overline{n}=2k-1$ $(k\in\mathrm{N})$ and arbitrary values $\overline{m}$. Thus, the Taylor expansion of *Ateb*-functions can be constructed. By the analogy to $[1]$ the Taylor expansion of $ca(\overline{m},\overline{n},w)$ special *Ateb*-function have been obtained.

Theorem Let $ca(\overline{m},\overline{n},w)=\sum_{k=0}^{\infty}c_k w^k$ be the Taylor expansion of $ca(\overline{m},\overline{n},w)$ in the neighborhood of the point $w=0$ and $\overline{n}$ is of the form (1). Then $c_0=1$ and $c_s=0$ $(s\geq 2)$ when s is not a multiple of $\overline{n}+1$ while $\overline{m}$ takes arbitrary possible values.

According to the theorem 2 the Taylor expansion of $ca(\overline{m},\overline{n},w)$ in the neighborhood of $w=0$ can be written

$$ca(\overline{m},\overline{n},w)=1+\frac{d_{\overline{n}+1}}{(\overline{n}+1)!}w^{\overline{n}+1}+\frac{d_{2(\overline{n}+1)}}{(2(\overline{n}+1))!}w^{2(\overline{n}+1)}+...+\frac{d_{k(\overline{n}+1)}}{(k(\overline{n}+1))!}w^{k(\overline{n}+1)}+..., \qquad (2)$$

where $k\in\mathrm{N}$; $d_{\overline{n}+1},d_{2(\overline{n}+1)},...,d_{k(\overline{n}+1)}$ can be obtained directly.

When $\overline{m}=\overline{n}=1$ one can obtain the Taylor series of $\cos w$.

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