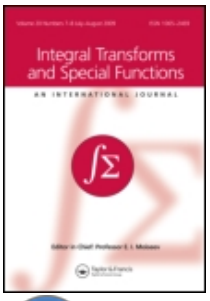
Integral Transforms and Special Functions

Volume 25, Issue 9, 2014



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DOI:
10.1080/10652469.2014.894041

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pages 680-685

Publishing models and article dates explained

- Received: 12 Nov 2013
- Accepted: 10 Feb 2014
- Published online: 18 Mar 2014

Abstract

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Vol. 25, No. 9, 680–685, http://dx.doi.org/10.1080/10652469.2014.894041

On the integral of the product of the Appell polynomials

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(Received 12 November 2013; accepted 10 February 2014)

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2010 Mathematics Subject Classifiction: Primary: 11B68; Secondary: 11B65, 11B83

1. Introduction

The Bernoulli polynomial $B_n(x)$ is given by

$$\sum_{n=0}^{\infty} B_n(x)\frac{t^n}{n!} = \frac{t\,\mathrm{e}^{xt}}{\mathrm{e}^t - 1}.$$

In particular, set the Bernoulli number $B_n = B_n(0)$. As early as 1924, Nörlund [1] proved that

$$\int_0^1 B_k(z)B_l(z)\,\mathrm{d}z = (-1)^{k+l}\frac{k!l!}{(k+l)!}B_{k+l}, \tag{1.1}$$

where $k + l \geq 2$. Later, Carlitz [2] extended (1.1) to the products of three and four Bernoulli polynomials. And Wilson [3] obtained an explicit formula for

$$\int_0^1 \bar{B}_k(az)\bar{B}_l(bz)\bar{B}_m(cz)\,\mathrm{d}z,$$

where $\bar{B}_k(x)$ is the periodic extension of $B_k(x)$ on $[0, 1)$ and a, b, c are pairwise coprime integers.

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Details

- **Citation information:** Web of Science ®
- **Received:** 12 Nov 2013
- **Accepted:** 10 Feb 2014
- **Published online:** 18 Mar 2014

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