SOME BILINEAR GENERATING RELATIONS INVOLVING CLASSICAL HERMITE POLYNOMIALS VIA MEHLER’S FORMULA

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Abstract: In this paper, using series decomposition technique in Mehler’s formula, we obtain some bilinear generating relations associated with classical Hermite’s polynomials of even and odd degree.

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1. Introduction and preliminaries

Throughout in present paper, we use the following standard notations:
\( \mathbb{N} := \{1, 2, 3, \ldots\} \), \( \mathbb{N}_0 := \{0, 1, 2, 3, \ldots\} = \mathbb{N} \cup \{0\} \) and \( \mathbb{Z}^- := \{-1, -2, -3, \ldots\} = \mathbb{Z}_0^- \setminus \{0\} \). Here, as usual, \( \mathbb{Z} \) denotes the set of integers, \( \mathbb{R} \) denotes the set of real numbers, \( \mathbb{R}_+ \) denotes the set of positive real numbers and \( \mathbb{C} \) denotes the set of complex numbers.

The Pochhammer symbol (or the shifted factorial) \((\lambda)_{\nu}\) \((\lambda, \nu \in \mathbb{C})\) is defined, in terms of the familiar Gamma function, by

\[
(\lambda)_{\nu} := \frac{\Gamma(\lambda + \nu)}{\Gamma(\lambda)} = \begin{cases} 
1 & (\nu = 0; \lambda \in \mathbb{C} \setminus \{0\}) \\
\lambda(\lambda + 1)\ldots(\lambda + n - 1) & (\nu = n \in \mathbb{N}; \lambda \in \mathbb{C}) 
\end{cases},
\]

(1.1)