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On the construction of recurrence relations for the expansion and connection coefficients in series of Jacobi polynomials. (English) Zbl 1055.33007

J. Phys. A, Math. Gen. 37, No. 3, 657-675 (2004).

In the present paper the author considers the expansion of infinitely differentiable functions f in terms of the Jacobi polynomials $P_n^{(\alpha,\beta)}(x)$. In particular, he solved the problems

$$x^m P_j^{(\alpha,\beta)}(x) = \sum_{n=0}^{2m} a_{mn}(j) P_{j+m-n}^{(\alpha,\beta)}(x), \quad m, j \geq 0,$$

$$x^l \frac{d^q f(x)}{dx^q} = \sum_{i=0}^{\infty} b_i^{q,l} P_i^{(\alpha,\beta)}(x).$$

The obtained general expressions are very cumbersome and are given in term of double sums but in some cases they can be reduced to closed analytical formulas. Also he considers the connection problem involving the Jacobi polynomials and also the connection problem with the Hermite and Laguerre polynomials and obtain the corresponding recurrence relations that the connection coefficients satisfy. Finally, he briefly discusses an application for solving ordinary differential equations with varying coefficients.

Reviewer: Renato Alvarez-Nodarse (Sevilla)

MSC:

33C45 Orthogonal polynomials and functions of hypergeometric type (Jacobi, Laguerre, Hermite, Askey scheme, etc.)

42C05 Orthogonal functions and polynomials, general theory of nontrigonometric harmonic analysis

42C10 Fourier series in special orthogonal functions (Legendre polynomials, Walsh functions, etc.)

Cited in **54** Documents

Keywords:

orthogonal polynomials; Jacobi polynomials; connection problem

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