The new realization of the LANCZOS Tau Method with minimal residue is proposed for the numerical solution of the second order differential equations with polynomial coefficients. The computational scheme of Tau method is extended for the systems of hypergeometric type differential equations [1]. A Tau method computational scheme is applied to the approximate solution of a system of differential equations related to the differential equation of hypergeometric type. Various vector perturbations are discussed. Our choice of the perturbation term is a shifted CHEBYSHEV polynomial with a special form of selected transition and normalization. The minimality conditions for the perturbation term are found for one equation. They are sufficiently simple for the verification in a number of important cases.

The new applications of modified KONTOROVITCH–LEBEDEV integral transforms and related dual integral equations for the simulation of some problems of mathematical physics are given. The algorithm of numerical solution of some mixed boundary value problems for the Helmholtz equation in wedge domains is developed. Observed examples admitting complete analytical solution demonstrate the efficiency of this approach for elasticity and combustion problems.

Several approaches for the numerical simulation of kernels of these transforms - modified BESSEL functions of the second kind with pure imaginary order $K_{i\beta}(x)$ and with complex order $K_{1/2+i\beta}(x)$ are elaborated. The programs of evaluation are prepared and tables of the modified BESSEL functions $K_{1/2+i\beta}(x)$ are published. The advantages of discussed algorithms and codes in accuracy and timing are shown [2].

References

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