Redlich-Kister Finite Difference solution for solving two-point boundary value problems by using KSOR iteration family

ABSTRACT

In this paper, we are concerned to investigate the efficiency of the second-order RedlichKister Finite Difference (RKFD) discretization scheme together with the Four Point Explicit Group Kaudd Successive Over Relaxation (4EGKSOR) iterative method for solving twopoint boundary value problems (TPBVPs). In order to apply this block iteration to solve any linear system, firstly we discretize all derivative terms via the second-order RKFD discretization scheme over the proposed problem in order to get the second-order RKFD approximation equation. Due to the main characteristics of the coefficient matrix for the generated linear system which are large-scale and sparse, the best choice for solving this linear system is using one of the iterative methods. Therefore, the formulation of the Kaudd Successive Over Relaxation method together with the Explicit Group iteration method mainly on the Four-Point Explicit Group Kaudd Successive Over Relaxation (4EGKSOR) iterative method has been presented to solve this linear system iteratively. In order to show the efficiency of the 4EGKSOR, another two iterative methods have also been considered which are the Gauss-Seidel (GS) and the Kaudd Successive Over Relaxation (KSOR) to solve three examples of the proposed problems in which all numerical results obtained were recorded based on the number of iterations, execution time and maximum norm. Based on the performance analysis, clearly, the 4EGKSOR iterative method shows substantiated improvement in terms of the number of iterations and execution time.