Solution of the established Redlich–Kister finite difference for two-point boundary value problems using 4EGMKSOR method

ABSTRACT

In this article, we propose the use of two newly established second-order Redlich–Kister finite difference (RKFD) discretization schemes and the Four-Point Explicit group Modified Kaudd Successive Over Relaxation (4EGMKSOR) to solve the two-point boundary value problems (TPBVPs). In order to study the efficiency of the proposed method, first, discretize the RKFD scheme into all necessary derived terms of the proposed problem to obtain the RKFD approximate equation. This approximate equation is then used to generate the large-scale sparse linear system of the proposed problem. Due to these characteristics of the generated linear system, the advantages of the 4EGMKSOR iterative method considered and the generated linear system is solved iteratively over this iterative method, in which its approximate solution has been compared with the iterative methods Gauss–Seidel (GS), Kaudd SuccessiveOver Relaxation (KSOR)and the Four-Point Explicit group Kaudd Successive Over Relaxation (4EGKSOR). Then, a few examples of the proposed problem are provided to investigate the performance of all the iterative methods considered, and to compare them based on threemeasurement parameters: iterations, time and maximum norm. The finding in this paper shows that the 4EGMKSOR method is more effective than the GS, KSOR and 4EGKSOR methods accord to iteration and time.