EXPONENTIAL CUBIC B-SPLINE BASED SOLUTIONS OF ADVECTION-DIFFUSION EQUATION

Alper KORKMAZ[1], **Hakan Kasım AKMAZ**[2]

[1,2] *Çankırı Karatekin University, Çankırı, Turkey*

Abstract

Differential quadrature method (DQM), which was first proposed by Bellman et al. [1], based on exponential cubic B-spline functions [2] has been set up to simulate the solutions of the Advection-Diffusion equation numerically. The reduction of the equation to an ordinary differential equation system (ODS) has been performed by the use of differential quadrature method. Then, the resultant ODS has been integrated in time by using Fehlberg fourth-fifth order Runge-Kutta method with degree four interpolant.
Two initial boundary value problems modeling the transport of the initial concentration along a channel and fade out of an initial pulse have been studied. Existence of analytical solutions for both problems provides to measure the error between exact and numerical solutions. In order to check the efficiency and validity of the method, the discrete maximum error norm has been computed for various space step sizes and time step sizes.

Keywords: Differential quadrature method; Exponential cubic B- spline; Advection-Diffusion equation

References

[1] R. Bellman, B. G. Kashef and J. Casti, Differential quadrature: A tecnique for the rapid solution of nonlinear differential equations,*Journal of Computational Physics* 10 (1972) 40-52.

[2] B.J. McCartin, Theory of exponential splines, *Journal of Approximation Theory* 66 (1991) 1-23.

[1]akorkmaz@karatekin.edu.tr
[2]hakanakmaz@karatekin.edu.tr