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Finite Element Solution to the Strongly Reaction-Diffusion System

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Abstract: This research is devoted to demonstrating a numerical solution that adopts the cubic Hermite finite element method for a strongly reaction-diffusion system. L_2 and L_∞ error norms computed at varying time points are employed to draw comparisons between the numerical solutions attained by virtue of the presented technique and both the exact solutions and the analogous numerical ones already available in the literature. Evaluating the accuracy and efficacy of the technique utilized in this study, a perfect agreement with the exact solution is concluded.

Keywords: *finite element method; strongly reaction-diffusion system; cubic Hermite element.*

Mathematics Subject Classification (2010): 74S05, 76M10, 35K57, 70K99.

1 Introduction

The reaction diffusion system occurs in multifarious physical, biological and chemical problems. Numerous numerical techniques such as a cubic B-spline method [1], linearized finite difference scheme based upon the order reduction method [2], exponential cubic B-spline collocation algorithms [3], and trigonometric quintic B-spline collocation method [4] have been used to solve the strongly reaction-diffusion system. On the other hand, global solutions for this system have been addressed in [5]– [9]. The finite element method is one of the most accurate, flexible, and powerful techniques for approximating the solution to a wide range of linear and nonlinear partial differential equations. Examples of its implementation include: the Rosenau-RLW equation by Atouani and Omrani [10], fourth order parabolic equation by Chai et al. [11], biharmonic equation by

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