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Numerical Solutions of Fractional Chemical Kinetics System

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Abstract: The aim of this paper was to investigate a fractional model of chemical kinetics system. The numerical solution of this fractional model is obtained by Bernstein polynomials. The basic idea is to apply operational matrices of fractional integration and multiplication of Bernstein polynomials. The important point to note here is the given problem turns into a set of algebraic equations by expanding the solution as Bernstein polynomials with unknown coefficients. Then, by solving algebraic equations, the numerical solutions are obtained. This result may be explained by the fact that the suggested technique is computationally efficient.

Keywords: *fractional model; chemical kinetics system; Caputo derivative; Bernstein polynomials.*

Mathematics Subject Classification (2010): 26A33, 34A08.

1 Introduction

One of the most significant current subjects in pure and applied mathematics is fractional calculus. Many applications have appeared in different areas of applied sciences such as physics and engineering [1–3]. A model is a simplified representation of a real world process. These models are an equation, a differential equation, an integral equation, a system of integral equations, etc. A chemical kinetics system is represented by a nonlinear system of ordinary differential equations.
Consider this model of a chemical process consisting of three species, which are denoted by A, B and C. The three reactions are:

$$A \longrightarrow B, \tag{1}$$

$$B + C \longrightarrow A + C, \tag{2}$$

$$B + B \longrightarrow C. \tag{3}$$

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