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AN EFFICIENT COMPUTATIONAL TECHNIQUE FOR SOLVING GENERALIZED TIME-FRACTIONAL BIOLOGICAL POPULATION MODEL

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Abstract: In this paper, we apply an efficient computational technique based on the coupling of the Sumudu transform method and the iterative method to solve the generalized time-fractional biological population model within the Caputo fractional derivative. This method is termed as Sumudu transform iterative method (STIM). The series form approximate analytical solutions are obtained in a closed form, having components of the converging behavior towards the exact solution. Furthermore, the outcomes of this investigation are illustrated graphically using the mathematical software Maple, and the solution graphs demonstrate that the approximate solution is closely related to the exact solution.

Keywords and Phrases: Sumudu transform, Generalized time-fractional biological population model, Iterative method, Caputo fractional derivative, Mittag-Leffler function, Fractional differential equations.

2020 Mathematics Subject Classification: 26A33, 33E12, 35R11, 44A20.

1. Introduction

Various physical phenomena can be explained effectively in the natural sciences and engineering by designing models based on the principle of fractional calculus. In last few years, the use of fractional differentiation for mathematical modeling of real-world physical problems such as earthquake modeling, traffic flow models with