Numerical Solutions of One-Dimensional Parabolic Convection-Diffusion Problems Arising in Biology by the Laguerre Collocation Method

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In this work, we present a numerical scheme for the approximate solutions of the one-dimensional parabolic convection-diffusion model problems. Diffusion models form a reasonable basis for studying insect and animal dispersal and invasion, which arise from the question of persistence of endangered species, biodiversity, disease dynamics, multi-species competition so on. Convection-diffusion problem is also a form of heat and mass transfer in biological models. The presented method is based on the Laguerre collocation method used for these problems of differential equations,[1][2].

In fact, the approximate solution of the problem in the truncated Laguerre series form is obtained by this method. By substituting truncated Laguerre series solution into the problem and by using the matrix operations and the collocation points, the suggested scheme reduces the problem to a linear algebraic equation system. By solving this equation system, the unknown Laguerre coefficients can be computed. The accuracy and the efficiency of the method is showed by numerical examples and the comparisons by the other methods, [3].

References

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