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A reliable algorithm for a class of singular nonlinear two-point boundary value problems arising in physiology

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Abstract

In this paper, we present a reliable numerical algorithm to determine approximate solutions of the two-point boundary value problems having Robin boundary conditions that naturally occur in the investigation of distinct tumor growth issues, the dispersal of heat sources in the person head and steady state oxygen diffusion in spherical cell possessing Michaelis–Menten uptake kinetics. This approach is based on a modified concept of Adomian polynomials (AP), and the two-step Adomian decomposition method (TSADM) merged with Padé approximants. Furthermore a Maple package ADMP is applied to solve various problems, which is very easy to use and efficient and needed to input the system of equations with initial or boundary conditions and diverse essential parameters to deliver the analytic approximate solutions within a few seconds. The suggested scheme does not require linearization, perturbations, guessing the initial terms, a set of basis function or other limiting presumptions, which yields the solutions in closed form. Many examples are examined to make clear the scope and validity of the package ADMP.

Keywords: TSADM ▪ AP ▪ two-point boundary value problems ▪ ADMP

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