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THE RELIABLE MODIFIED LAPLACE ADOMIAN DECOMPOSITION METHOD TO SOLVE FRACTIONAL VOLTERRA-FREDHOLM INTEGRO DIFFERENTIAL EQUATIONS

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Abstract. This paper demonstrates a study on some significant latest innovations in the approximation technique to find the approximate solutions of Caputo fractional Volterra-Fredholm integro-differential equations (FVFIDE). To apply this, the study uses modified Laplace Adomian decomposition method. The reliability of the method and reduction in the size of the computational work give this method a wider applicability. Also, the behavior of the solution can be formally determined by analytical approximate. Moreover, we proved the convergence and uniqueness of the solution. Finally, an example is included to demonstrate the validity and applicability of the proposed technique.

Keywords. Laplace transform, Adomian decomposition method, Volterra-Fredholm integro differential equation, Caputo fractional derivative.

AMS (MOS) subject classification: 44A10, 26A33, 45J05, 49M27.

1 Introduction

In recent years, numerous papers have been concentrating on the development of analytical and numerical methods for fractional integro-differential equations. In this paper, we consider the Caputo fractional Volterra-Fredholm integro-differential equations of the form:

$$^cD^{\alpha}y(x) = g(x) + \int_0^x k_1(x,t)F_1(y(t))dt + \int_0^1 k_2(x,t)F_2(y(t))dt, \quad (1)$$

with the initial condition

$$y(0) = y_0, \quad (2)$$