

A STABLE METHOD FOR SOLVING NONLINEAR VOLTERRA INTEGRAL EQUATIONS WITH TWO CONSTANT DELAYS

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ABSTRACT. The main purpose of this paper is to propose a block by block method for a class of the Volterra integral equations (VIEs) with double constant delays. The convergence analysis is established and the fifth order of convergence is obtained. Then the stability analysis of the presented method is carried out with respect to the basic test equation

$$y(t) = 1 + \lambda \int_{t-\tau_2}^{t-\tau_1} y(x) dx, \quad t > 0.$$

The analytical behavior of the solution of test equation is investigated and the properties of the numerical solution are derived. Numerical examples are presented to illustrate the capability and efficiency of the proposed method.

1. INTRODUCTION

Consider the Volterra integral equation

$$(1.1) \quad y(t) = g(t) + \int_{t-\tau_2}^{t-\tau_1} k(t, x, y(x)) dx, \quad t \in [0, T] =: J,$$

with the constant delays τ_1, τ_2 ($\tau_2 > \tau_1 > 0$) and $y(t) = \phi(t), t \in [-\tau_2, 0]$, where $\phi(t)$ is a given function such that

$$(1.2) \quad \phi(0) = g(0) + \int_{-\tau_2}^{-\tau_1} k(0, x, \phi(x)) dx.$$

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