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Master Thesis Defense

Entitled

*THE REPRODUCING KERNEL METHOD FOR SOLVING INTEGRO-DIFFERENTIAL AND VOLTERRA
INTEGRAL EQUATIONS*

By

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Abstract

Integro-differential equations are a class of mathematical equations that involve both derivatives and integrals. They have applications in a wide range of fields, including physics, engineering, finance, and biology such as the spread of diseases, population dynamics, and the behavior of financial markets. The study of these equations requires advanced mathematical techniques, including functional analysis, approximation methods, and numerical analysis. They are a rich area of research with many open questions and challenges.

In this thesis, we will develop and implement the reproducing kernel method to solve a class of integro-differential and Volterra integral equations. We discuss both cases when the equation is homogeneous and nonhomogeneous. Several theoretical results are investigated such as the existence and uniqueness of the exact solution, the convergence of the approximate solution, and the stability of the proposed numerical approach. Several numerical results are presented to show the efficiency of the proposed method. Comparisons with other methods are given.

Keywords: Integro-differential equation, Volterra equation, Reproducing kernel method, Convergence.