**Earthline Journal of Mathematical Sciences**
ISSN (Online): 2581-8147
Volume 4, Number 1, 2020, Pages 99-113
https://doi.org/10.34198/ejms.4120.99113

# Cubic B-spline Least-square Method Combine with a Quadratic Weight Function for Solving Integro-Differential Equations

**Hameeda O. Al-Humedi[1] and Zahraa Adnan Jameel[2]**

[1]Department of Mathematics, College of Education for Pure Sciences, Basrah University, Basrah, Iraq
e-mail: ahameeda722@yahoo.com

[2]Department of Mathematics, College of Education for Pure Sciences, Basrah University, Basrah, Iraq
e-mail: zahraad788@yahoo.com

## Abstract

In this article, a numerical scheme was implemented for solving the integro-differential equations (IDEs) with the weakly singular kernel by using a new scheme depend on the cubic B-spline least-square method and a quadratic B-spline as a weight function. The numerical results are in suitable agreement with the exact solutions via calculating $L_2$ and $L_\infty$ norms errors. Theoretically, we discussed the stability evaluation of the current method using the Von-Neumann method, which explained that this technique is unconditionally stable.

## 1. Introduction

The integro-differential equations appear in a wide range of disciplines including physics, chemistry and engineering.

Consider the following IDE with a weakly singular kernel:

$$u_t(x,t) + mu_x(x,t) - bu_{xx}(x,t) = \int_0^t K(t-s)\,u(x,s)ds + f(x,t), \quad x \in [a,b],\ t > 0 \tag{1}$$

where $K(t-s) = (t-s)^{-\alpha},\ 0 < \alpha < 1$

Received: January 23, 2020; Accepted: March 10, 2020

2010 Mathematics Subject Classification: 65R20.

Keywords and phrases: B-spline method, least-square method, integro-differential equation, Von-Neumann.