



جامعة الإمارات العربية المتحدة  
United Arab Emirates University

The College of Graduate Studies and the College of Science Cordially Invite  
You to a

**Master Thesis Defense**

Entitled

*Wavelet-Based Multi-Step Methods for Initial-Value Problems*

by

Athar J. S. Bsharat

Faculty Advisor

Dr. Mohamed Ali Hajji, Department of Mathematical Sciences

College of Science

Date & Venue

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Abstract

Wavelets have been a popular tool since the late 1980s in many areas of engineering and mathematics. A major contribution of wavelets is their adaptation in the JPEG2000 picture format standard in 2000 and in the compression and storage of finger print scans. Since then wide applications of wavelets in different areas have emerged. Popular wavelets are the compactly-supported wavelets constructed by I. Daubechies. In this work, we use Daubechies' wavelets to develop multistep algorithms for the solution of initial value problems (IVPs) in the context of Galerkin method. Though, such wavelet basis functions have good approximation property, they do not have explicit formulae, making finding inner products a challenge. This work tackles this point and uses the order of approximation of the wavelets to derive implicit multistep methods with comparable stability property to other methods. The derived methods are tested on linear and non-linear test equations.

**Keywords:** Wavelet Basis, Daubechies' Wavelets, Multiresolution Analysis, Multi-step methods, Initial Value Problems, Galerkin Method.