

## **DEDICATION**

... To My parents

To My brothers, Sisters, teachers, and

... To Lovely Friends

## **ACKNOWLEDGMENT**

Firstly I specify my great thanks to my God for his benefits, facilities, and properties which cover me, then I want to thank deeply Dr. Mohammed Hassan Mohammed Khabir for his great help in all steps of .this research in spite of his great responsibility

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## **ABSTRACT**

We have studied in this thesis a class of numerical methods for interpolating and solving linear differential equations. The method based on the temporal semi-discretization by implicit Euler finite difference method and a cubic spline discretization in the spatial direction on uniform mesh. We give some theorems of the existence and uniqueness of the spline functions. We also give some considerable properties for convergence. A systematic procedure for determining the formula for a natural cubic spline from a table of interpolating values are explained. We compared the exact and the approximate solutions for some examples .using MATLAB

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تناولنا فى هذا البحث طريقة من طرق الإستكمال العددى لحل المعادلات التفاضلية الخطية. الطريقة تعتمد على التقسيم فى الاتجاه الزمنى على طريقة أويلر الضمنية للفروقات المنتهية والتقسيم فى الاتجاه المكانى على طريقة الأسين التكرىبى على تقسيم شبكى منتظم.

أعطينا بعض النظريات فى الوجود والوحدانية لدالة الأسينى. أيضاً أعطينا بعض الخصائص للتقارب. ووضحنا الإجراء المنظم لتحديد صيغة أسينية طبيعية تكعيبية من بيانات استكمال مجدولة. قارنا الحلول المضبوطة مع الحلول التقريبية لبعض الامثلة باستخدام الماتلاب.

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