## DEDICATION

… To My parents

To My brothers, Sisters, teachers, and

… To Lovely Friends

## ACKNOWLEDGMENT

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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 uniqeness 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 اللاّسين التكعيبى على تقسيم شبكى منتظم.

أعطينا بعض النظريات فى الوجود و الوحدانية لدالة اللاّسينى. أيضاً أعطينا بعض الخصائص للتقارب . ووضحنا الإجراء المنُظّم لتحديد صيغة لُسينية طبيعية تكعيبية من بيانات استكمال مجدولة. قارنا الحلول المضبوطه مع الحلول التقريبية لبعض الامثلة باستخدام الماتلاب.

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