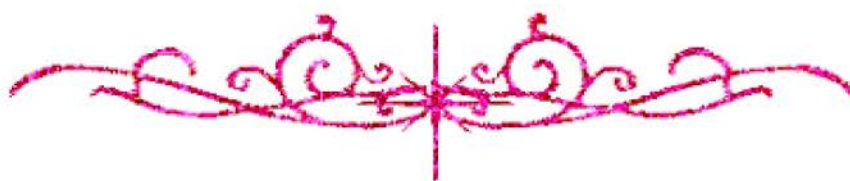


سامية محمد مصطفى



شبكة المعلومات الجامعية

# بسم الله الرحمن الرحيم



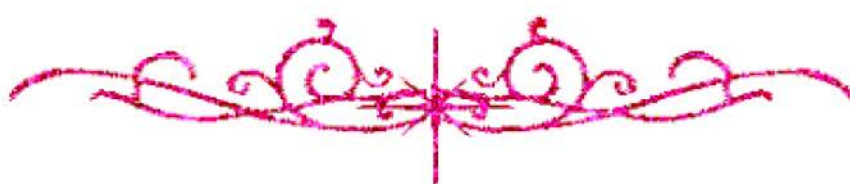
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# شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم





سامية محمد مصطفى



شبكة المعلومات الجامعية

# جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

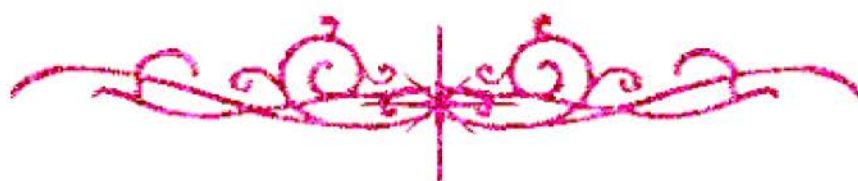
## قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



## يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



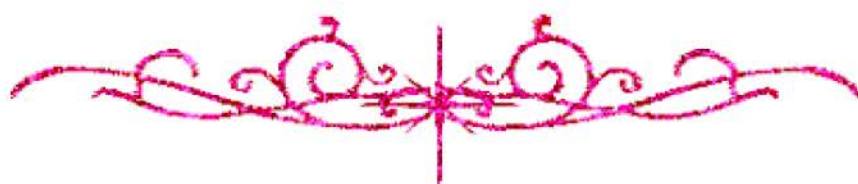
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# بعض الوثائق الأصلية تالفة





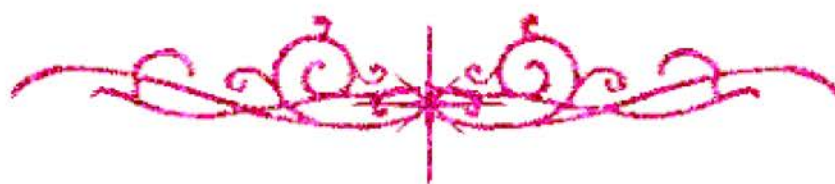
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# بالرسالة صفحات لم ترد بالأصل





**AIN SHAMS UNIVERSITY**  
**FACULTY OF ENGINEERING**  
Engineering Physics and Mathematics Department

**A Survey on a Numerical Solution of Boundary-  
Value Problems for Partial Differential  
Equations Using Multigrid Method**

**A Thesis**

Submitted in Partial Fulfillment for the Requirements  
of the Degree of Master of Science in Engineering Mathematics  
(Engineering Physics and Mathematics Department)

Submitted by

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B.Sc. of Electrical Engineering  
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**Cairo-2002**

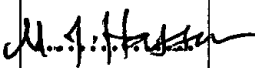
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بسم الله الرحمن الرحيم

## EXAMINERS COMMITTEE

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| <b>Name</b>       | Noha Medhat Kamel Abbas                                                                                             |
| <b>Thesis</b>     | A survey on Numerical Solution of Boundary-Value Problems for Partial Differential Equations Using Multigrid Method |
| <b>Degree</b>     | Master of Science in Engineering Mathematics                                                                        |
| <b>Department</b> | Engineering physics and mathematics department                                                                      |

|    | <b>Name, Title, and Affiliation</b>                                                                                                                  | <b>Signature</b>                                                                     |
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**Date: 23 /9 / 2002**





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# ABSTRACT

Noha Medhat Kamel. A survey on a Numerical Solution of Boundary-Value Problems for Partial Differential Equations Using Multigrid Method. Master of Engineering Mathematics. Faculty of Engineering. Ain Shams University. 2002.

The goal of this thesis is to present a survey on the use of multigrid method in the solution of the boundary-value partial differential equations (PDEs) numerically. The finite difference discretization technique has been introduced. Some classical numerical methods of solution for PDEs are presented showing their advantages & disadvantages. The concept of the multigrid method is introduced. The components of the multigrid algorithm and the advantages of this method over other numerical methods of solution are focused. The use of multigrid method in the solution of several PDEs in two-dimensional and three-dimensional spaces is presented.

In this thesis, a proposed multigrid algorithm has been developed for the solution of Poisson's equation on a unit circle subject to Dirichlet's boundary conditions using polar coordinates. A software program using FORTORAN95 is developed to solve this problem. This program can be simply modified to solve more general problems.

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**Keywords:** *Finite difference method, Multigrid method, Poisson's equation in polar coordinates.*



# STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Engineering Mathematics.

The work included in this thesis was carried out by the author at the Engineering Physics and Mathematics Department, Faculty of Engineering, Ain Shams University.

No part of this thesis has been submitted for a degree or qualification at other university or institution.

**Date** : / / 2002

**Signature** :

**Name** : Noha Medhat Kamel Abbas

