بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

NUMERICAL SOLUTION OF SOME NON-LINEAR PARTIAL DIFFERENTIAL EQUATIONS USING VARIABLE MESH TECHNIQUE

by

Eng./ AMANY MOHAMMED M. ATEIA

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Mathematics

Under the supervision of

Prof. Dr./ **M. SH. EL-DEEN MOHAMEDEIN**
Professor of Mathematics
Faculty of Engineering-Cairo University

Prof. Dr./ **LABIB ISKANDAR**
Professor of Mathematics
Faculty of Engineering-Cairo University

Dr./**HANAFI SAYED ELZOHEIRY**
Assist. Professor of Mathematics
Faculty of Engineering-Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
1998

F-9

3-4029-15

NUMERICAL SOLUTION OF SOME NON-LINEAR PARTIAL DIFFERENTIAL EQUATIONS USING VARIABLE MESH TECHNIQUE

by

Eng./ AMANY MOHAMMED M. ATEIA

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Mathematics

Approved by the
Examining Committee

1) Prof. Dr. M.I. Hasen M.I. Hassan

2) Prof Dr. S.F. Ragab S.F. Ragab

3) Prof. Dr. M.S. Mohamedein Shams -

Prof Dr. L.I. Hanna L.I. Hanna

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
1998

FOR MY FAMILY

ABSTRACT

In this thesis, we have used the linearization technique combined with the finite difference method to develop new iterative implicit schemes for finding numerical solutions of the one dimensional BBM and Burgers' equations.

We use variable spatial step and constant time step in the finite difference schemes to solve the BBM and Burgers' equations. The accuracy and stability of the proposed schemes are analyzed and checked through solving numerical examples. The interaction of solitary waves has been studied and the obtained numerical results are compared with the available results in the literature.

The proposed numerical techniques can be extended for solving nonlinear partial differential equations arising in other applied areas.

ACKNOWLEDGEMENT

I would like to thank Prof. Dr. **Mohammed Shams El-DEEN MOHAMEDEIN**, Professor of mathematics, Faculty of Engineering-Cairo University, for his encouragement and advices.

I wish to express my deep appreciation to Prof. Dr. **LABIB ISKANDAR**, Professor of mathematics, Faculty of Engineering-Cairo University, for his discussions, criticisms, support, and advices during the course of this study.

Special acknowledgment are extended to Dr. **HANAFI ELZOHEIRY**, assist. Professor of mathematics, Faculty of Engineering-Cairo University, for his valuable advices.

I would also like to thank Eng. **WAEL ALDAHSHOORY**, assist. lecturer, Faculty of Engineering-Cairo University, Fayoum Branch, for his great help.