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SOLITON SOLUTION

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OF CERTAIN NONLINEAR DIFFERENTIAL EQUATIONS A

thesis submitted to THE UNIVERSITY OF SCIENCE AND TECHNOLOGY, MEGHALAYA for the Degree of Doctor of Philosophy

under School of Applied Sciences By

Joseph Mathew, MSc (Maths)

Enrollment No: PHD13B 085

University of Science and Technology, Meghalaya Techno City, Kling Road, 9th Mile, Baridua, Ri-Bhoi Meghalaya-793101, India August 2016

COMPUTER CENTRE NORTHEASTERN HILL UNIVERSITY, PERMANENT CAMPUS SHILLONG-793022, INDIA Dr. Tapas Kumar Sinha (Retired) M.Sc. (Phy) BHU, MS (Phy) Cincinnati USA MS (Bio. Phy) Cincinnati USA, Ph.D. NEHU CERTIFICATE It is certified that the research work presented in this thesis entitled "SOLITON SOLUTION

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OF CERTAIN NONLINEAR DIFFERENTIAL EQUATIONS" submitted by Mr. Joseph Mathew to Department of Mathematics, University of Sc. and Technology (USTM) for the award of the degree of "DOCTOR OF PHILOSOPHY"

is bona fide record of the research work carried out by him under my supervision and guidance. This research work is original and has not been submitted before for any degree of this or any other university. This thesis is fit to be considered for the award of degree of Doctor of philosophy. Dr. Tapas Kumar Sinha Co-Guide Associate Professor (Retired) Computer Centre, North Eastern Hill University Shillong, India University of Science and Technology, Meghalaya Declaration by the Candidate This is to certify that the thesis titled "SOLITON SOLUTION OF CERTAIN NONLINEAR DIFFERENTIAL EQUATIONS" submitted by Mr. Joseph Mathew, Enrolment No. PHD13B85 under the supervision of the Guides Dr. S.M. Bujarbaruah, HOD Mathematics, University of Sc. and Technology (USTM) and Dr. Tapas Kumar Sinha, Associate Professor, Department of Computer, NEHU, Shillong and for award of Doctor of Philosophy Degree of the University carried out during the period of 2013 to 2016 embodies my original work

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and has not formed the basis for the award of any degree, diploma, associate ship, fellowship, titles in this or any other University or other similar institution of higher learning.

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Enrolment No. PHD13B85

Dr. S.M. Bujarbaruah Guide HOD Mathematics, USTM Date:

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Preface This thesis presents our work in the area of Nonlinear Dynamics. Nonlinear Dynamics represents an important area of present day research. The field gained prominence after the discovery of the Soliton by John Scott Russell in 1832. It was only in the 1970's the field was revived by the work of Norman J. Zabusky an American physicist and Martin David Kruskal, an American Mathematician and physicist who studied and discovered the Solitons in the Korteweg-de Vries (KdV) equation. This was followed by the celebrated work of

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M. J. Ablowitz, D. J. Kaup, A. C. Newell and H. Segur, (

AKNS) who showed that nonlinear differential equations can be looked upon as coupled linear equations which describe its spatial and temporal evolution. Thereafter a host of applied papers in the area began to appear. Foremost among them were the works of B. A. Malomed, Yuri S. Kivshar and Hidetsugu Sakaguchi. Since then Solitons have been found in numerous fields from elementary particles to fluid dynamics. The general areas covered in the chapters in the thesis are:

a) Solution of Nonlinear Differential Equations

Dr. F.R. Sumer

Deputy Librarian
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Chapter 2 Review of Literature, Chapter 12 References and reference to own papers have been excluded from the Anti-Plagiarism Check.