S.m.11. NIRMALA ANTHERRJANAM, N.--Studies on Korteweg-De Vries Equations--1988--Dr. M. Jathavedan

The Korteweg-de Vries (KdV) equation is one of the most widely studied evolution equations in non-linear waves, which was derived in the last century by Korteweg and de Vries as a model equation for non-linear dispersive long waves (1895). The most outstanding property of this equation is that it admits solitary waves, first reported by J.S. Russel (1645) as solutions. The interest in the study of KdV equation was revived after a numerical experiment by Sabusky and Kuskal in 1965. They found that two solitary waves after interaction emerge unchanged but for a phase shift. Since then KdV equation has found application in different fields like gravity waves, plasma waves and waves in lattices.

The thesis deals with studies on KdV equations. Chapter I is introductory. It contains a brief account of non-linear hyperbolic waves, dispersive waves and the KdV equation in the context of water waves.

R.S. Johnson has found (1973) that the propagation of waves on shallow water, when the depth changes abruptly forming a shelf, is given by a KdV equation, the coefficients being functions of the far field space coordinate. In Chapter II we study the interaction of waves given by this equation. The derivative expansion method is applied. It is seen that three waves interaction is possible transformation. In the last chapter it is shown that the equation is integrable, it can be transformed into KdV equations. Since the integrability of the equation is already known it follows that the method of conclusions in the case of this equation.

S.m.12. MATHEW, P.M.--On the Lattice and Boolean Spaces--1988--Dr. T. Thrivikram

Correspondence between order and topology in lattice and Boolean structures, is the topic of this thesis. In this thesis, the study is on the relation between the two concepts. Following contexts:

i) Relation between some known order and lattice concepts—determination of maximal and minimal elements of a lattice
ii) Order theoretic aspects of the lattice of all
iii) Studies on some classes of ideals in a B term and their topological interpretation using the
iv) Andrzej S. and T. J. defined (1978) a set two elements in the basic set has an upper bound and a characterisation maximal element, elements.

Notes: The equivalence of the
and there is exchange of energy between different wave numbers. The total energy is not conserved during interaction.

Johnson's equation is only a special case of the general form of KdV equation. There are many other KdV type equations arising in different contexts. In chapter III, we give an account of these. We introduce a KdV type equation with variable coefficients. In the remaining chapters we study this equation.

The test of integrability is an important branch of study of nonlinear evolution equations. The Painlevé Property (PP) is known to be related to the integrability of ordinary differential equations. In recent years the Painlevé analysis has been extended to the study of partial differential equations also. In Chapter IV we study the integrability of the above KdV equation using the method proposed by J. Weiss, M. Tabor and G. Carnevali (1983). The auto-Backlund transformation and Lax pairs are obtained by this method. Lax pair criterion enables to find the cases in which the equation is integrable.

In many cases when a differential equation cannot be integrated we can study the properties by qualitative methods. Similarly analysis is one such qualitative method which can give valuable informations regarding the solutions without solving the equation completely. Chapter V is devoted to a similarity analysis of the KdV equation. The Ablowitz-Ramani-Segur (ARS) conjecture is used to identify the integrability of the equation. It is found that in some special cases the equation may be integrable. The exact solution in a particular case is obtained.

The Weiss et al. analysis is not a fully satisfactory method for testing the integrability and it is known that the method may lead to incorrect conclusions, at least in some cases. But when a non-autonomous KdV system is integrable it can be transformed into an autonomous integrable KdV system by a suitable transformation. In the last chapter it is shown that the two cases in which the equation is integrable, it can be transformed into the plane KdV or cylindrical KdV equations. Since the integrability of the equation in these two cases is already known it follows that the method of Weiss et al. leads to correct conclusions in the case of this equation.