EXACT SOLUTIONS OF BOUSSINESQ EQUATION

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Abstract. By considering the Boussinesq equation as a zero curvature representation of some third order linear differential equation and factorizing this linear differential equation, the hierarchy of solutions of Boussinesq equation has been obtained from the eigen spectrum of constant potentials.

1. Introduction

Integrable systems of nonlinear partial differential equations are among the central and fundamental problems of physics and mathematical physics, consequently they have attracted much interest both in theoretical physics and mathematics. They have numerous applications in many different branches of physics and at the same time they show a rich mathematical structure. These structures include Lax pairs, Miura maps, Bäcklund transformations, infinitely many local conservation laws and applicability of inverse scattering methods [4–6, 16].

Here we are concerned with Boussinesq equation [4, 7], which describes one-dimensional weakly nonlinear dispersive water waves [6, 10]. The Boussinesq equation has also a wide application in different branches of physics. For examples it can appear as a special limit of unelastic magnetohydrodynamic equations for modeling solar and stellar convection zones [17, 18], the electromagnetic field in dispersive nonlinear dielectrics is governed by a Boussinesq equation that has solitary solutions [26] and it can be appropriate for the propagation of