

then $u_j = 0, j \geq 2$.

In this case, we find the following Bäcklund transformation for the (3+1)-dimensional Burgers equation as

$$u = -\frac{2\gamma\varphi_x}{\varphi} + u_1, \quad (21)$$

where (u, u_1) satisfy the (3+1)-dimensional Burgers equation and

$$\varphi_t + \left(\frac{2}{F(y,z,t)}\right)u_1\varphi_x = \gamma(\varphi_{xx} + \varphi_{yy} + \varphi_{zz}), \quad (22)$$

when $u_1 = 0$, the Cole-Hopf transformation is obtained.

Thus $u = -\frac{2\gamma\varphi_x}{\varphi}$ is the Cole- Hopf transformation of the (3+1)-dimensional Burgers equation.

References

- [1] M .J. Ablowitz and P.A. Clarkson, Solitons, Nonlinear Evolution Equations and Inverse Scattering, Cambridge University Press, Cambridge, 1991.
- [2] T. Brugarino, “Painlevé property, auto - Bäcklund transformation, Lax pairs and reduction to the standard form for the Korteweg-de Vries equation with non uniformities”, J. Math. Phys., 30, 1013 - 1015, 1989.
- [3] N. Joshi, Painlevé property of general variable-coefficient versions of the Kortewegde Vries and non-linear Schrodinger equations”, Phys. Lett. A , V.125, 456-460, 1987.
- [4] A. Ramani, B. Grammaticos and T. Bountis, The Painlevé Property and Singularity Analysis of Integrable and Non integrable Systems, Phys. Rep.,180, (3), 159 - 245, 1989.
- [5] M.Tabor, Painlevé Property for Partial Differential Equations, in Soliton Theory: A Survey of Results, Editor: Fordy.A.P., Manchester University Press, 427-446, (1990).
- [6] J. Weiss., The Painlevé property for partial differential equations . II : Backlund transformation, Lax pairs and the Schwarzian derivative, J. Math. Phys.,24, 1405 - 1413, 1983.
- [7] J.Weiss, On classes of integrable systems and the Painlevé property, J. Math. Phys., 25, 13 -24, 1984.
- [8] J.Weiss, The Painlevé property and Backlund transformations for the sequence of Boussinesq equations, J. Math. Phys.,26, 258 - 269, 1985.
- [9] J.Weiss, M. Tabor and G. Carnevale, The Painlevé property for partial differential equations, J. Math. Phys., 24, 522 – 526, 1983.