CHAPTER 58

TECHNOLOGY MATHEMATIC
APPLIED SCIENCES & HUMANITIES

Doctoral Theses

01. SAXENA (Monika)
Study of Propagation of Nonlinear Waves in Compressible Fluids.
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Abstract
(Not Verified)

The thesis consists of five chapters followed by the list of references useful for the development and application of the methods discussed in thesis. This first chapter is the introduction to various definitions and concepts used in the thesis related to solution of hyperbolic partial differential equations and propagation of waves in different mediums. In the second chapter we used Lie group of transformations to find out the self-similar solutions for the shock wave propagation problem at the stellar surface. In the third chapter we considered a system of PDEs describing the one-dimensional unsteady planar and radially symmetric flow of an relaxing gas with negligible viscosity and with van der Waals equation of state. The evolution of a characteristic shock is studied and the amplitude of the acceleration wave associated with the largest eigenvalue is evaluated. The collision of an acceleration wave with the characteristic shock is also studied in detail. In chapter four, a system of partial differential equations exhibiting one-dimensional unsteady planar flow of an vibrational relaxing gas with negligible viscosity containing very small solid particles (dusts) is considered. We used the method of characteristic perturbation to analyze the piston problem initially at rest and then, given a finite non-zero acceleration. Exact expressions of flow variables at wave front are obtained to see the effects of finite relaxation & dust particles on the behaviour of characteristic wave front. In chapter five, we considered a system of PDEs describing one-dimensional, inviscid, unsteady planar and radially symmetric flow of a relaxing gas containing very small solid particles and used parameterized perturbation method, which leads to a generalized Burger's equation. A two level implicit finite difference method is used to solve the Burger's equation and also, to study the effect of relaxation, dust particles and flow geometry on the solution.

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