<<流体动力学专论>>

图书基本信息

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内容概要

A Treatise in Fluid Dynamics is a
textbook for beginning engineering students who have background of basic calculus and physics. This textbook follows a typical sequence of topics of dynamics of fluids by starting with an introduction to the subject, concentrating on terminologies, simple concepts, and clarifying adoption of the system and control volume approach to describe the motion of the fluid. It then follows by unsteady im-pressible incompressible flows, impressible potential flows, numerical computation of fluid dynamic problems,viscous flows, and open channel flows. A large numbers of examples, such as sluice gate, a sharp crested weir, jet-plate interaction, etc. ,
are presented throughout the textbook to emphasize the applications of fluid dynamics to various practical problems. Some simple Fortran computer programs are provided for calculating incompressible potential flow past simple geometrical bodies based upon surface source distributions and other problems. As this textbook is the extended version of the lecture notes prepared by the first author throughout his career of teaching and research in the areas of gas dynamics, fluid dynamics and thermodynamics at the University of Illinois at Urbana-Champaign and Florida Atlantic University, it can serve as a useful reference book for graduate students and researchers in the related technical fields.

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书籍目录

章节摘录

版权页：插图：To study the motion of a fluid, we must identify a fluid element and describe the flowevents associated with it. One way of doing this is to identify a particular element of fluidand describe the detailed motion of this element. This is the familiar kind of descriptionadopted to study the dynamics of a particle or a rigid body, and is called the particle orLagrangian approach. However, this is not a convenient way to study the motion of a fluid.Another way to describe a fluid motion is to specify the flow properties of the fluid at aspecific location within a physical region; this is the field or Eulerian approach~ and isadopted here to study the motion of the fluid. The weather map is a good example of theEulerian approach. Since all principles of conservation are always referring to a specific massof fluid（the Lagrangian approach）, and we shall adopt the Eulerian approach in our study,we must discuss these two schemes in detail and establish the relationship of transformationbetween them.1.2. 1 Lagrangian FormulationWithin the Lagrangian scheme, we focus our attention on a particular element of thefluid and describe its flow events as time proceeds. For example, we may express the spatiallocation of an element of fluid as a function of time, t. X（t）, Y（t）, and Z（t）. The velocityand acceleration of this element of fluid is found by differentiating these functions withrespect to t. We may also use functions of the form P（t）, T（t）, and p（t） to express,respectively, the pressure, temperature, and density of this element of fluid as functions oftime. However, to make this representation meaningful, we must have some means toidentify these quantities for each fluid element in the flow field. One way of identifying afluid element is to define its spatial location at a given time.

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