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Solutions for Magnetohydrodynamic Channel Flows The Navier-Stokes Equations Shallow Water Hydraulics Computation of Laminar and Turbulent Flow in Curved Ducts, Channels, and Pipes Using the Navier-Stokes Equations Stationary Flow Solution for Water Levels in Open Channels Flow Augmenting Effects of Additives on Open Channel Flows Unsteady Open Channel Flow with Lateral Inflow Unsteady Flow in Open Channels Non-stationary Flow Solution for Water Levels in Open Channels for TOXSWA Proceedings of the Advanced Seminar on One-dimensional, Open-Channel Flow and Transport Modeling Numerical Solution of the Complete Navier-Stokes and Energy Equations for Developing Channel Flow Including Thermal Radiation, Free Convection and Variable Viscosity Lagrangian Simulations of Turbulent Drag Reduction by a Dilute Solution of Polymers in a Channel Flow Application of Space-marching and Sequential Function Specification Methods to the Solution of an Inverse Problem in Open Channel Flow Numerical Solution of Turbulent Flow Past a Backward Facing Step Using a Nonlinear K-epsilon Model Channel Flow, Ductile Extrusion and Exhumation in Continental Collision Zones

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Both laminar and turbulent flows in strongly curved ducts, channels, and pipes are studied by numerical methods. The study concentrates on the curved square-duct geometry and flow conditions for which detailed measurements have been obtained recently by Taylor, Whitelaw, and Yianneskis. The solution methodology encompasses solution of the compressible ensemble-averaged Navier-Stokes equations at low Mach number using a split linearized block implicit (LBI) scheme, and rapid convergence on the order of 80 noniterative time steps is obtained. The treatment of turbulent flows includes resolution of the viscous sublayer region. A series of solutions for both laminar and turbulent flow and for both two- and three-dimensional geometries of the same curvature are presented. The accuracy of these solutions is explored by mesh refinement and by comparison with experiment. In summary, good qualitative and reasonable quantitative agreement between solution and experiment is obtained. Collectively, this sequence of results serves to clarify the physical

structure of these flows and hence how grid selection procedures might be adjusted to improve the numerical accuracy and experimental agreement. For a three-dimensional flow of considerable complexity, the relatively good agreement with experiment obtained for the turbulent flow case despite a coarse grid must be regarded as encouraging. (Author). This book presents the theory and computation of open channel flows, using detailed analytical, numerical and experimental results. The fundamental equations of open channel flows are derived by means of a rigorous vertical integration of the RANS equations for turbulent flow. In turn, the hydrostatic pressure hypothesis, which forms the core of many shallow water hydraulic models, is scrutinized by analyzing its underlying assumptions. The book's main focus is on one-dimensional models, including detailed treatments of unsteady and steady flows. The use of modern shock capturing finite difference and finite volume methods is described in detail, and the quality of solutions is carefully assessed on the basis of analytical and experimental results. The book's unique features include: • Rigorous derivation of the hydrostatic-based shallow water hydraulic models • Detailed treatment of steady open channel flows, including the computation of transcritical flow profiles • General analysis of gate maneuvers as the solution of a Riemann problem • Presents modern shock capturing finite volume methods for the computation of unsteady free surface flows • Introduces readers to movable bed and sediment transport in shallow water models • Includes numerical solutions of shallow water hydraulic models for non-hydrostatic steady and unsteady free surface flows This book is suitable for both undergraduate and graduate level students, given that the theory and numerical methods are progressively introduced starting with the basics. As supporting material, a collection of source codes written in Visual Basic and inserted as macros in Microsoft Excel® is available. The theory is implemented step-by-step in the codes, and the resulting programs are used throughout the book to

produce the respective solutions. Open channel hydraulics has always been a very interesting domain of scienti c and engineering activity because of the great importance of water for human l- ing. The free surface ow, which takes place in the oceans, seas and rivers, can be still regarded as one of the most complex physical processes in the environment. The rst source of dif culties is the proper recognition of physical ow processes and their mathematical description. The second one is related to the solution of the derived equations. The equations arising in hydrodynamics are rather comp- cated and, except some much idealized cases, their solution requires application of the numerical methods. For this reason the great progress in open channel ow modeling that took place during last 40 years paralleled the progress in computer technique, informatics and numerical methods. It is well known that even ty- cal hydraulic engineering problems need applications of computer codes. Thus, we witness a rapid development of ready-made packages, which are widely d- seminated and offered for engineers. However, it seems necessary for their users to be familiar with some fundamentals of numerical methods and computational techniques applied for solving the problems of interest. This is helpful for many r- sons. The ready-made packages can be effectively and safely applied on condition that the users know their possibilities and limitations. For instance, such knowledge is indispensable to distinguish in the obtained solutions the effects coming from the considered physical processes and those caused by numerical artifacts. Primarily intended as a textbook for the undergraduate and postgraduate students of civil engineering, this book provides a comprehensive knowledge in open channel flow. The book starts with the concept of open channel flow, types of forces acting on the flow, types of channel flow, velocity distribution and coefficients, and basic continuity in 1D and 3D. Then it moves on to steady gradually varied flow, its differential equation, hydraulics of alluvialchannel, design of channel and hydraulic jump. Finally, the text

concludes with Saint-Venant equations and its solutions by few numerical methods in flood routing and dam-break situations. KEY FEATURES : Includes computer programs for steady gradually varied flow Provides various numerical methods of solving the equations Explains dam-break problem in detail Contains numerous solved examples Two fourth-order methods, based on cubic-splines approximations, are proposed to solve parabolic differential equations. The cubic-splines approximation has a second-order accuracy, which is improved in both methods to fourth-order in different ways. In the first method, the second-order truncation term is estimated by differentiating twice the basic equations. In the other method a local Richardson extrapolation is applied at each marching station to obtain fourth-order accurate values at every two points; subsequent quintic Hermite interpolation is then used to obtain equally accurate values at the remaining points. A von Neumann stability analysis shows that the methods are unconditionally stable. Both methods are applied to a simple boundary-layer problem. The method with local Richardson extrapolation is employed to solve simultaneously the continuity and energy equation describing the behaviour of the electron gas along the cathode wall in an MHD channel. The results indicate that it is worthwhile to reconsider the model of the electrode-plasma interface. (Author). Two model open channel configurations (trapezoidal and rectangular) and three water soluble polymers (Polyox Coagulant, Polyox WSR-301, and Separan AP-30) were used to experimentally determine the effects of injecting dilute polymer solutions into open channel water flows. It was found that for all test cases, injection of the three polymer additives produced flow characteristic changes reflected as either a water surface level decrease at constant flow rates or a flow rate increase at constant static heads. These flow characteristic changes were found to be dependent, in varying degrees, on channel slope, surface roughness, injection point location, polymer injection method, flow Reynolds number, and

injected polymer concentration. I PLIFI C NEL Flow probl ms for hich exact olu io c b fou r i cu Bo h dy s te n r i probl r co i r ccou t i k of flux ll v loci y i ribu io CO RY FLO RE LSO I CU BULK OF OLU IO S R V LI FOR RBI RARY M AG IC Reynol s nu bers al ough so c l flo it on-uniform m gne ic fi l ll G TIC R Y OL U B R RE DISCU u or - $ +* N Open Channel Flow, 2nd edition is written for senior-level undergraduate and graduate courses on steady and unsteady open-channel flow. The book is comprised of two parts: Part I covers steady flow and Part II describes unsteady flow. The second edition features considerable emphasis on the presentation of modern methods for computer analyses; full coverage of unsteady flow; inclusion of typical computer programs; new problem sets and a complete solution manual for instructors. A comprehensive treatment of open channel flow, Open Channel Flow: Numerical Methods and Computer Applications starts with basic principles and gradually advances to complete problems involving systems of channels with branches, controls, and outflows/ inflows that require the simultaneous solutions of systems of nonlinear algebraic equations coupled with differential equations. The book includes a CD that contains a program that solves all types of simple open channel flow problems, the source programs described in the text, the executable elements of these programs, the TK-Solver and MathCad programs, and the equivalent MATLAB® scripts and functions. The book provides applied numerical methods in an appendix and also incorporates them as an integral component of the methodology in setting up and solving the governing equations. Packed with examples, the book includes problems at the end of each chapter that give readers experience in applying the principles and often expand upon the methodologies use in the text. The author uses Fortran as the software to supply the computer instruction but covers math software packages such as MathCad, TK-Solver, MATLAB, and spreadsheets so that readers can use the instruments with which they are the most familiar. He emphasizes the basic

principles of conservation of mass, energy, and momentum, helping readers achieve true mastery of this important subject, rather than just learn routine techniques. With the enhanced understanding of the fundamental principles of fluid mechanics provided by this book, readers can then apply these principles to the solution of complex real-world problems. The book supplies the knowledge tools necessary to analyze and design economical and properly performing conveyance systems. Thus not only is the book useful for graduate students, but it also provides professional engineers the expertise and knowledge to design well performing and economical channel systems. Basic concepts of fluid flow;the energy principle in open channel flow;the momentum principle in open channel flow;flow resistance;flow resistance, nonuniform flow computations;channel controls;channel transitions;unsteady flow;flood routing;sediment transport;similitud and models. It is the purpose of this study (1) to obtain a set of equations, that when solved, will give an approximate solution for the velocity profile for arbitrary conductivity variation, and (2) to verify the approximate method by comparing the approximate solutions to exact solutions for the same parameters. A clear, up-to-date presentation of the principles of flow in open channels A fundamental knowledge of flow in open channels is essential for the planning and design of systems to manage water resources. Open-Channel Flow conveys this knowledge through the use of practical problems that can be solved either analytically or by simple numerical methods that do not require the use of computer software. This completely up-to-date text includes several features not found in any other book on the subject. It derives one- dimensional equations of motion using both a simplified approach and a rigorous approach, and it explains the distinction between the momentum and mechanical energy equations. The author places great emphasis on identifying the types and locations of the control sections that are essential in analyzing flow profiles, and he includes a section on recently recognized nonunique

flow profiles. Offering numerous worked examples that are helpful in understanding the basic principles and their practical applications, this book: * Presents the latest computational methods for profiling spatially varied and unsteady flow * Includes end-of-section exercises that measure and build understanding * Fully explains governing equations in algebraic and differential form * Brings sluice-gate analysis completely up to date * Covers artificial channel controls such as weirs, spillways, and gates, and special topics such as transitions in supercritical flow and flow through culverts Written in metric units throughout, this excellent learning tool for senior- and graduate-level students in civil and environmental engineering programs is also a useful reference for practicing civil and environmental engineers. This book provides a unifying framework for understanding and computing unsteady flow and transport in shallow one-dimensional open-water systems. This collection of 27 review and research papers provides an overview of the geodynamic concepts of channel flow and ductile extrusion in continental collision zones. The focal point for this volume is the proposal that the middle or lower crust acts as a ductile, partially molten channel flowing out from beneath areas of over-thickened crust, such as the Tibetan plateau, towards the topographic surface at plateau margins. This controversial proposal explains many features related to the geodynamic evolution of the plateau and, for example, extrusion and exhumation of the crystalline core of the Himalayan mountain chain to the south. In this volume thermal-mechanical models for channel flow, extrusion and exhumation are presented, and geological and geophysical evidence both for and against the applicability of such models to the Himalayan-Tibetan Plateau system, as well as older continental collision zones such as the Hellenides, the Appalachians and the Canadian Cordillera, are discussed. Since the publication of its first edition in 1999, 'The Hydraulics of Open Channel Flow' has been praised by professionals, academics, students and researchers alike

as the most practical modern textbook on open channel flow available. This new edition includes substantial new material on hydraulic modelling, in particular addressing unsteady open channel flows. There are also many new exercises and projects, including a major new revision assignment. This innovative textbook contains numerous examples and practical applications, and is fully illustrated with photographs. Dr Chanson introduces the basic principles of open channel flow and takes readers through the key topics of sediment transport, hydraulic modelling and the design of hydraulic structures. ·Comprehensive coverage of the basic principles of key application areas of the hydraulics of open channel flow ·New exercises and examples added to aid understanding ·Ideal for use by students and lecturers in civil and environmental engineering This 2006 book details exact solutions to the Navier-Stokes equations for senior undergraduates and graduates or research reference. An examination of the effects of compressibility, variable properties, and body forces on fully developed laminar flows has indicated several limitations on such streams. Open Channel Flow, 2nd edition is written for senior-level undergraduate and graduate courses on steady and unsteady open-channel flow. The book is comprised of two parts: Part I covers steady flow and Part II describes unsteady flow. The second edition features considerable emphasis on the presentation of modern methods for computer analyses; full coverage of unsteady flow; inclusion of typical computer programs; new problem sets and a complete solution manual for instructors.

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