BOOK REVIEW

Computational Hydraulics

C. A. Brebbia and A. Ferrante

In spite of giant strides taken over the past two decades towards making computational fluid mechanics a design aid, most UK students in mechanical and civil engineering leave university with an exceedingly scant, if any, knowledge in the subject. One reason for this lies in the lack of text books which integrate traditionally taught fluid-mechanics material with numerical methods. At best, a small selection of final-year students attend optional courses in numerical analysis which are normally totally divorced from fluid mechanics. A recent book by C. Y. Chow ('An introduction to computational fluid mechanics') attempts to alleviate the problem by providing a good mix of fluids routinely taught to mechanical engineering undergraduates and simple, easily grasped finite-difference methods. The present book by Brebbia and Ferrante aims to do the same in respect of interfacing hydraulics and fluids, taught to civil engineers, and finite/boundary element formulations.

From a fluid-mechanics point of view, the level of material presented is modest. Hydrostatics, fully-developed pipe flow and network analysis are covered extensively, occupying, together with related numerical treatments, about one half of the total text. The remaining half is devoted to open channel flow, potential flow and basic aspects of the Navier-Stokes equations. A final section on turbomachinery, which may arguably be desirable in a self-contained course on hydraulics, seems out of place in this book and is, moreover, in no way linked to a numerical treatment.

The pipe-network chapter offers the first opportunity in the book to introduce basic concepts of finite-element analysis and associated matrix methodology. This well presented introduction is followed by a series of Fortran routines for linear and non-linear network problems which, together with results, occupy no less than 43 pages out of the 62 for the entire chapter.

Open-channel-flow material is presented along lines similar to many other texts, and the computational content of this chapter is formed by a small code (not related to finite elements) for calculating depths of uniform channel flow at given discharge and slope using Manning's formula.

The following section on potential flow presents traditional material on flow nets such as sources, vortex, doublets and their combinations. This naturally involves the stream-function and velocity-potential equations, and the latter Laplace equation provides the starting point for finite-element and boundary-element solution schemes, the former via the Galerkin approach. The introductory material to the methods is well presented though it is complex, at least at undergraduate level. Related Fortran codes are included here too.

In summary, this attractively produced book presents traditional material at a modest level interfacing some of it with finite-element based treatments.

It may be argued that the finite-element method, in contrast to the finite-difference approach, is not an ideal medium for introducing students to numerical methods with a minimum of conceptual obstacles which may deter students from further explorations. The idea of including self-contained packaged programs is good, in principle, but to be useful, these require a substantial investment in time and effort for full comprehension and implementation.

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Transient Two-phase Flow

Ed. M. S. Plesset

This book contains the Proceedings of the 3rd CSNI (Committee on the Safety of Nuclear Installation) Specialist Meeting on transient two-phase flow. As such it is not an introductory text. It is a book for the research worker not the student. Consequently, it is a book that will be bought by institutions rather than by individuals.

The objectives of the meeting, which was held in Pasadena, USA, in March 1981, were to bring together specialists in two-phase flow modelling, numerical analysis, and experimentation and instrumentation to exchange information and to discuss the direction in which future research should go. To this end the meeting had five sessions: measurement techniques, experimental studies, fundamentals of transient two-phase flow, numerical methods, and computer code application and development. For each of these sessions a Chairman's report is presented. Some of these reports are very helpful in giving a balanced view of the meeting's proceedings.

Since the primary objective of research in this field is assured nuclear reactor safety, most work is directed towards major computer program development and validation. This is recognised by the incorporation of a panel discussion entitled 'How good do codes have to be?'. The discussion may prove to be of interest to many.

This book is an important reference for those seeking an appreciation of recent work in the two-phase flow aspects of plant safety (not necessarily nuclear plant). For institutions undertaking research in the area the book is good value for money.

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