



Finite-Element Method

Introduction to the Finite-Element Method. By C. S. Desai and J. F. Abel. Van Nostrand Reinhold Company, New York, 1972. Copyright. \$18.50

REVIEWED BY P. V. MARCAL¹

THIS is a good introductory book on the subject, that fills the gap between the more elementary structures books and other texts on finite elements. The material is well presented with a particular view to the beginner. The references are complete and the review of literature presents an integrated view of the subject.

The major portion of the book is concerned with the displacement method. Theory for linear and nonlinear analysis is presented. Finally, extended examples are used to illustrate the application of the method to a wide range of problems. The examples part of the book is particularly strong in civil engineering structures and soil mechanics problems.

The reviewer has found it to be a good text for teaching at the senior undergraduate level.

Multiphase Flow Problems

The Flow of Complex Mixtures in Pipes. By G. W. Govier and K. Aziz. Van Nostrand Reinhold Co., New York. 792 pages. \$37.50.

REVIEWED BY W. R. SCHOWALTER²

THE technology of multiphase flow in pipes is seldom given thorough coverage in the curricula of modern engineering schools. Since the subject cannot be conveniently developed around a few basic principles, multiphase flow is usually discussed, if at all, in a qualitative way (a description of the various regimes of cocurrent two-phase flow) or in terms of analyses of a few fundamental phenomena under limiting conditions (G.I. Taylor's treatment of drop deformation). Consequently the engineering graduate, at least in the U.S.A., is not prepared to undertake a realistic design problem dealing with multiphase flow in conduits. That is probably as it should be. One hopes that an engineer with a broad training in fundamentals will be able to acquire, evaluate,

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and extend specific technologies as the need arises during his career. In the field of multiphase flow, however, that hope could be questioned. The literature for the subject is scattered over a bewildering spectrum of reports and journals, and the degree of generality of many of the results is not clear.

The present book, merely by its existence, provides a convenient single reference source. The authors have done a commendable job of striking some balance between a cumbersome and encyclopedic treatise and an overly personal monograph. Though the book was developed to serve the needs of a graduate-level course, I believe that the chief function will be as a reference book for those needing guidance in formulation and solution of design problems associated with flow of multiphase mixtures through pipes.

Such a broad subject impinges upon many areas of engineering science, and hence the authors draw upon a wide variety of fundamental material. In most cases the equations used are stated without proof—a perfectly proper procedure for a reference book. However, the reader wishing to start from first principles will be obliged to consult other texts and articles.

In dealing with such a vast subject one of course runs the risk of possible conflict with more specialized monographs and texts in matters of notation, definitions, and even explanations. As an example, the authors distinguish between "time-dependent viscous fluids" and "viscoelastic fluids." Most rheologists would probably not feel qualified to distinguish between time-dependent structural changes which are of an "elastic" or "viscous" nature. No doubt the two are inextricably coupled.

In a compendium of this type an author index can be very helpful, and it is unfortunate that the publisher did not include one.

A particularly strong feature is the inclusion of specific design procedures for many situations. A case in point is a nine-step outline (p. 408, Chapter 9) on how one might discern bubble length and spacing, liquid flow rates, and film thickness in the vertical flow of gas-liquid mixtures. Equally refreshing is the admission of areas where technology can be of little help. For example, one reads in the same chapter that, "No methods are available for the accurate prediction of the effect of bends and fittings."

The authors are to be thanked for providing a useful book. I shall recommend it as a primary reference for design of multiphase flow problems.