effective property of composites by controlling the shapes, size distributions, and maybe the positioning of inclusions.

Chapter five treats the important topic of the mechanics of laminates. The two main topics are a classical theory of laminated plates; i.e., a thin-plate theory, based on a Kirchhoff-Love hypothesis, in which extension and flexure are coupled as a consequence of the layering; and a higher-order theory in which some restrained warping of a cross-sectional plane is allowed. The derivation of the higher-order theory appears to parallel derivations of dynamical thick-plate theories, by Mindlin and his students. This reviewer has a bit of a difficulty with this approach in the present application since the wish is to predict the stress variation across the plate thickness, a variation that is severely restrained by the assumed form for the warping.

Chapter six considers a collection of topics involving analysis, strength, and design; Chapter seven introduces some topics in wave propagation; Chapter eight some inelastic and nonlinear effects; and Chapter nine returns to predicting effective properties, this time thermal properties. This reviewer is less familiar with the subject matter of Chapters six and eight and cannot review these chapters critically. They are clearly written and would appear to be state of the art. The chapter on wave propagation was introduced for completeness. It provides a broad overview treating the effects of a layering on both CW and pulse propagation. Interest in such studies clearly pertain to propagation in laminates. Effects of the microstructure, on which inclusions can be observed, are largely ignored; although a source of attenuation due to a random positioning of inclusions is demonstrated. The chapter treating effective thermal properties mirrors those treating effective mechanical properties.

Energy Methods in Finite-Element Analysis. Edited by R. Glowinski, E. Y. Rodin, and O. C. Zienkiewcz. John Wiley & Sons, 1979. Pages xviii-361. Price $43.95.

REVIEWED BY T. H. H. PIAN[6]

This volume is dedicated to the memory of Prof. B. Fraeijs de Veubeke, who was well recognized in his contributions to the theory of energy (variational) methods in finite-element analysis. The papers in this volume may be divided into three categories:

1 Mathematical theories of variational principles.

2 Mechanics aspect of finite-element methods.

3 Problems in numerical analysis.

The first group includes a presentation of the modern theory of variational boundary-value problems and their applications to elastostatics, a derivation of the classical plate theory from the standard three-dimensional elasticity theory, a new mixed finite-element formulation for the solution of Stokes problem and a theoretical analysis of the duality between the static and kinematic theories of limit analysis in perfect plasticity. Three other papers are devoted to the mathematical analysis of the so-called "nonstandard" or "nonconventional" finite elements in solid mechanics, i.e., the equilibrium mixed and hybrid models.

Papers under the second category include the following topics:

1 A derivation of sufficient conditions for convergence of noncompatible elements for bending.

2 A review of finite-element methods in structural dynamics.

3 The coupling of standard finite-element method and boundary integral method.

4 The derivation of a linear-stress equilibrium element for plate stretching that can avoid spurious kinematic modes.

5 The use of a mutually supplementing displacement and equilibrium fields and a hybrid approach for finite-element stiffness formulation for thin shells.

6 The use of penalty function method for assumed stress finite-element formulation.

7 The formulation of incompressible material using low-order displacement elements.

8 The optimization of incremental finite-element solutions by monitoring the change in incremental stiffness.

9 A unified presentation of total and updated Lagrangian descriptions in nonlinear structural analysis.

10 Finite-element solutions for deformations of creeping structures under cyclic loading.

Finally, under the category of numerical analysis one paper is a discussion of some difficulties related to generalized splines and the other, an application of Lanczos algorithm for large eigenvalue problems.

It is seen that not all the 19 papers in this volume have stuck to the subject indicated by the title of the book. Some of the papers are extensions of the individual authors' previously published works. The book should attract readers who are doing research in different aspects of finite-element methods.

The volume includes a list of main publications of Professor Fraeijs de Veubeke, but it does not point out specifically the extent and impact of his contributions to the development of finite-element methods in structural mechanics. Also there is an apparent absence of a paper that discusses or extends Fraeijs de Veubeke's unfinished work on a new variational principle for finite displacements.

Formulas for Natural Frequency and Mode Shape. By Robert D. Blevins. Van Nostrand Reinhold. 1979. Pages 512, 107 Illustrations; $6\frac{7}{8} \times 10$. Price $29.95.

REVIEWED BY R. PLUNKETT[7]

Blevins is once more generously sharing the contents of his extensive library with his colleagues. The author of the widely used and cited "Flow Induced Vibration" has compiled an extensive and useful set of formulas and tables which cover the title topics. He also includes solid-fluid interaction and sloshing. The book is addressed to the person with a firm grasp of dynamics and deformable body mechanics and is not intended as a quick answer handbook. Each chapter starts with a very brief, clearly written introduction which serves primarily to define the conventions used and list the assumptions and limitations. The author then gives extensive tables of mode shapes and frequencies for specific cases with the presentation similar to that in Roark's tables. He includes some worked out examples using numbers of practical interest to illustrate the effect of various assumptions. Each chapter ends with an up-to-date bibliography which includes both general references and applications papers; these lists are meant to be informative rather than exhaustive. The author anticipates that the user will have access to a computer; as a result, he only gives representative tables for specific cases and formulas for calculator use for the rest. The one case covered exhaustively is that of the uniform beam where he gives the Felgar and Young beam tables with coefficients for the transcendental equations and graphs of mode shapes. He also includes 30 pages of Felgar's integral relationships among the beam modes and their derivatives which are extremely useful for modal expansion. The important chapter headings are: 6. Spring and Pendulum Systems (lumped masses), 19 references, mainly text books; 7. Cables and Cable Trusses, 8 references; 8. Straight beams (discussed previously), 41 references; 9. Curved beams and frames, 17 references; 10. Membranes, 8 references; 11. Plates, 89 references; 12. Shells, 55 references; 13. Fluid Systems, 29 references; 14. Structural Vibrations in a Fluid, 61 references. There is an eight page chapter on finite-element methods, expository rather

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