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book reviews

Asymptotic Wave Theory. By Maurice Roseau. Publisher North-Holland Publishing Co., Amsterdam & Oxford; American Elsevier Publishing Co., Inc.—New York. Vol. 20. North-Holland Series in Applied Mathematics and Mechanics. 1976. 349 Pages. $29.50.

REVIEWED BY T. K. CAUGHEY[1]

This text should serve very nicely for a first graduate level course in wave-phenomena for students in applied mathematics and mechanics. The book provides a grounding in the mathematical tools required to treat numerous applied problems from the asymptotic point of view.

The first four chapters are devoted to detailed discussion of such mathematical tools as Fourier-Laplace transforms, operational calculus, special functions, and asymptotic methods. The remaining four chapters are devoted to the application of asymptotic methods to wave propagation phenomena such as open channel flow, seismic waves, and water waves. Chapter 5 develops the elements of scattering matrix theory and contains a discussion of the inverse problem and the Gelfand-Levitan integral equation. Considerable space is devoted in Chapter 6 to some investigations of problems of flow in open channels which, through suitable formulation,is developed into a basic discussion of linear and nonlinear wave theory. Chapter 7 is devoted to propagation of elastic waves in a layered spherical body and their relationship to seismic phenomena in the earth. The eighth and last chapter contains a discussion of problems associated with gravity waves in an incompressible fluid having a free surface.

The book is well written and can be read by any student acquainted with the elements of ordinary differential equations and the theory of functions of a complex variable.

The Mechanics of the Contact Between Deformable Bodies. A. D. de Pater and J. J. Kalker, Editors. Delft University Press. 1975. 414 Pages.

REVIEWED BY L. E. GOODMAN[2]

The cognate fields generally included under the terms contact stress analysis or "tribology" have flowered in the last decade. They form today one of the most active and fruitful branches of applied mechanics. Therefore, the decision of the governing body of the International Union of Theoretical and Applied Mechanics to convene a symposium on the subject was most appropriate. The present volume contains the complete text of the 26 papers presented by invitation at that symposium, held at Enschede, Netherlands, August 20–23, 1974. With a few exceptions they are presentations of new research results. Although the quality of the papers is not uniform, many of them are of outstanding technical value and will undoubtedly become standard references. Viewed collectively the articles provide what is, except for the deliberate omission of problems involving elastohydrodynamic lubrication, the best overview of research activity in contact stress analysis currently available in print. The volume should find a place in every university library.

In the limited space available in a brief book review, it is hardly possible to do justice to all of these contributions. The complete list below is followed by a regrettably brief comment.

1 Aspects of Contact Mechanics—J. J. Kalker.
2 Non-Hertzian Contact of Elastic Spheres—K. L. Johnson.
3 Signorini's Problem in Viscoelasticity—M. Boucher.
4 Properties of Elastic Bodies in Contact—J. Dundurs.
5 Similarity Considerations for Contact Between Dissimilar Elastic Bodies—D. A. Spence.
6 Consideration of the Theory of Cracks From the Point of View of Contact Problems of the Theory of Elasticity—A. Ju. Islinskij.
7 Certain Asymetrical Contact Problems for a Half Space—B. L. Abramjan.
8 Unbonded Contact Between a Circular Plate and an Elastic Foundation—G. M. L. Gladwell.
9 On the Two-Dimensional Contact Problem of a Rigid Cylinder Pressed Between Two Elastic Layers—J. B. Alblas.
10 Influence of an Elastic Layer on the Tangential Compliance of Bodies in Contact—L. E. Goodman and L. M. Keer.
11 Small Scale Plastic Flow Associated With Rolling—J. Christoffersen.
12 Heat Effects in Rolling Contact—F. F. Ling.
13 Thermoelastic Contact Problems—J. R. Barber.
14 An Axisymmetric Contact Patch Configuration for Two Slabs in Frictionally Heated Contact—R. A. Burton.
15 Dynamic Contact Stresses Produced by Impact in Elastic Plates of Finite Thickness—Y. M. Tsai.
16 Transition of Collision Contact Force Between a Viscoelastic Half Space and a Flat-Headed Rigid Body—K. Kawatate.
17 Impact on a Worn Surface—P. A. Engel.
18 The Normal Contact of Arbitrarily Shaped Multilayered Elastic Bodies—T. G. Johns and A. W. Leissa.
19 Contact Stresses for Multiply-Connected Regions—The Case of Pitted Spheres—K. P. Singh, B. Paul, and W. S. Woodward.
20 Stylus Profilometry and the Analysis of the Contact of Rough Surfaces—J. F. Archard, R. T. Hunt, and R. A. Onions.
21 The Interaction and Lubrication of Rough Surfaces—F. T. Barwell, M. H. Jones, and S. D. Probert.
22 Contact of Rough Surfaces of Work-Hardening Materials—J. Halling and K. A. Nuri.
23 Factors Influencing the Real Trend of the Coefficient of Friction of Two Elastic Bodies Rolling Over Each Other in the Presence of Dry Friction—H. Krause and A. Halim Demirci.
24 The Frictional Contact of Rubber—A. Schallamach.
25 Applications for Contact Theories in Nuclear Reactor Technology—L. A. Mitchell.
26 Linearized Contact Vibration Analysis—P. R. Nayak.

Broadly speaking, the papers fall into two groups of which the first is concerned with solutions of the field equations of thermoelasticity and plasticity that satisfy mixed boundary conditions and the second is concerned with experimentally based tribomechanical research of direct application in technology. The introductory paper by Kalker [1, above] presents a valuable review and classification of solved and (as yet) unsolved problems of the first group. Kalker also includes a welcome introduction to the variational theory of contact mechanics associated with the name of Signorini. This development of the Franco-Italian school is used by Boucher in his paper [3]. Other mixed boundary-value methods such as the elegant self-similar solution technique of Spence [5], integral equation, and integral transform techniques [7–10, 12, 15], and sophisticated computer-based approaches [18, 19] are exemplified. The relation of the complementary problem to the theory of hydraulic fracture developed in the USSR

[1] Professor, Division of Engineering and Applied Science, California Institute of Technology, Pasadena, Calif.
[2] University of Minnesota, Minneapolis, Minn.

