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Book review

Nonclassical Thermoelastic Problems in Nonlinear Dynamics of Shells by J. Awrejcewicz and V.A. Krys'ko, Springer, Heidelburg, 2003, pp. x + 428, price € 79.95, £56.00, SFr 133.00, US$89.95, ISBN 3-540-43880-7

Thermoelasticity has been an area of keen research interest ever since man shrink-fitted seamless circular iron bands as tyres to the wooden wheels of carts. Thermal stresses, the study of the effect of thermal expansion on the stresses of an elastic body, was perhaps the topic to be first explored extensively in this area. With the rapid unfolding of computing power in recent years, progressively more challenging problems are being addressed. Thermoelastic analysis of shells in transonic flow environments encountered in aerospace engineering is one such quite complex problem. The complexity emerges not only due to the difficulty in dealing with the shell geometry, but also due to thermomechanical coupling effects, time-varying thermal loads, non-linearity, and "multiphysics" nature of the problem such as the fluid–structure-thermal interaction. This book provides a comprehensive mathematical treatment and the state-of-the-art modelling techniques useful to address such problems.

The authors begin Chapter 2 by studying the dynamics of shallow elastic shells under transonic flow conditions including the thermoelastic coupling effects. Chapters 3 and 4 are dedicated for the error estimate of Bubnov–Galerkin methods. Chapters 5–7 centre around modelling various non-linearities and studying their effects. The discussion of spatial–temporal chaos, and the concept of *modal portrait* and its uses in the study of spatial chaos in Chapter 7 is quite insightful. Chapter 8 concentrates on the elasto-plastic material non-linearity and its effect on vibration and stability.

The book covers a wide range of interesting topics including not only the solution techniques to dynamic analysis of shallow elastic shells under transonic flow, but also its dynamic stability under shockwave-induced vibration and thermal shock, solitary waves induced by parametric vibrations, non-symmetric vibrations, and periodic variation of material properties during vibration.

A unique feature of this book is the nice blend of engineering vividness and mathematical rigour. Typically, the authors concentrate on specific problem statement and solution approaches first, and then generalize the observations by abstract mathematical versions. A detailed account of computational aspects of the numerical methods described and an insightful discussion of copious numerical results are presented in a way to capture and sustain the interest of the reader.

A comprehensive review of previous research work interleaved with the authors' critical observations and remarks, presented in the Introduction, must prove very useful to young researchers in this area. In addition to this general review, ample citations of more specific nature are provided in the individual chapters. Furthermore, the last chapter gives a useful collection of formerly unsolved problems.

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The outlook of the book is quite inviting, and with 222 vivid illustrations and a lucid language style of the text, the book is able to absorb and engage the reader quite well.

The authors are to be congratulated for their valuable contribution to the literature in the area of theoretical thermoelasticity and vibration of plates.

K.M. Liew
School of Mechanical and Production Engineering,
Nanyang Technological University,
Nanyang Avenue, Singapore 639798, Republic of Singapore
E-mail address: mkmliew@ntu.edu.sg