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CONTENTS

Vol. LV, No. 3 September 1997

F. BALDONI AND K. R. RAJAGOPAL, Conditions of compatibility for the solid-liquid interface .................................................. 401

A. NOURI, F. POUPAUD, AND Y. DEMAY, An existence theorem for the multi-fluid Stokes problem ........................................... 421

WILLIAM H. PAULSEN, Eigenfrequencies of the non-collinearly coupled Euler-Bernoulli beam system with dissipative joints .................................................. 437

CHI-WANG SHU AND YANNI ZENG, High-order essentially non-oscillatory scheme for viscoelasticity with fading memory .................................................. 459

RUSTUM CHOKSI, The singular limit of a hyperbolic system and the incompressible limit of solutions with shocks and singularities in nonlinear elasticity ...... 485

MARK T. HANSON AND IGUSTI W. PUJA, The evaluation of certain infinite integrals involving products of Bessel functions: A correlation of formula .. 505

JAMES Q. FENG, Electrically charged conducting drops revisited ........... 525

KURT N. JOHNSON, Circularly symmetric deformation of shallow elastic membrane caps .................................................. 537

ZHUANGYI LIU AND SONGMU ZHENG, Exponential stability of the Kirchhoff plate with thermal or viscoelastic damping .................................................. 551

W. A. DAY, A note on the propagation of temperature disturbances ........ 565

S. A. KHURI AND C. Y. WANG, Stokes flow around a bend ...................... 573

NEW BOOKS .......................................................... 436, 458

This is the first paperback edition of volume 11 in the series Cambridge Studies in Mathematical Biology, first published in 1991. It develops an approach to the study of the dynamic behaviour exhibited by many species of plants, insects and other animals which unifies two approaches: that by theoreticians who model purely in terms of sophisticated mathematical equations, and biologists who develop simple deterministic models, reluctant to accept stochastic ideas. The authors show that both deterministic and stochastic models have important roles to play and should therefore be considered together; and they construct simple model-based computer simulation procedures which provide insight into the underlying generating mechanism, highlight hitherto unforeseen features of a process and thereby suggest further profitable lines of biological investigation. They advocate the view that the environment has a spatial dimension, since individual population members rarely mix homogeneously over the territory available to them but develop instead within separate sub-regions. Chapter headings: 1. Introductory remarks; 2. Simple birth-death process; 3. General birth-death process; 4. Time-lag models of population growth; 5. Competition processes; 6. Predator-prey processes; 7. Spatial predator-prey systems; 8. Fluctuating environments; 9. Spatial population dynamics; 10. Epidemic processes; 11. Linear and branching architectures.


This book is designed to be a comprehensive review of some of the more recently developed strategies implementing heuristic techniques. All these techniques have been inspired to some sense by the realization that attempting to imitate natural processes can bring valuable insights to the problem of combinatorial optimization. The articles are by John Beasley, Kathryn Dowsland, Fred Glover, Manual Laguna, Carsten Peterson, Colin Reeves, Bo Soderberg, and their headings are, respectively, Introduction, simulated annealing, Tabu search, genetic algorithms, artificial neural networks, Lagrangean relaxation, evaluation of heuristic performance.

Nonlinear Parabolic and Elliptic Equations. By C. V. Pao, Plenum Press, 1992, xv+777 pp., $125.00

This book is intended to give a systematic treatment of the basic mathematical theory and constructive methods for a class of nonlinear parabolic and elliptic differential equations as well as their applications to various reaction-diffusion problems. The mathematical problems under consideration include scalar boundary-value problems of parabolic and elliptic equations, integroparabolic and integroelliptic boundary-value problems, and coupled systems of parabolic and elliptic equations. The boundary conditions for these equations may be linear or nonlinear, including nonlinear boundary conditions of integral type. The fundamental approach to all of these problems is the method of upper and lower solutions and the associated monotone iterations. This approach leads not only to the basic results of existence, uniqueness, and multiplicity of solutions, but also to various qualitative properties of the solution through suitable construction of upper and lower solutions. This method is also adaptable to constructing numerical solutions of the corresponding discrete systems. Extensive discussion is also given to the stability analysis and the asymptotic behaviour of time-dependent solutions, and attention is given to models arising in ecology, biochemistry, enzyme kinetics, combustion theory, and chemical and nuclear engineering. A special topic is the finite-time blow-up problem for parabolic equations. The book consists of twelve chapters; the first seven chapters treat the scalar parabolic and elliptic boundary-value problems and the remaining five chapters are concerned with coupled systems of parabolic and elliptic equations.
Nonlinear Dynamics, Chaos and Econometrics. Edited by M. Hashem Pesarian and Simon M. Potter, John Wiley and Sons, 1993, xiii+244 pp., $55.00


Chaotic Dynamics — Theory and Practice. Edited by T. Bounti, Plenum Press, 1992, xii+418 pp., $110.00

This is volume 298 in the NATO Advanced Science Institutes Series B: Physics. It contains the proceedings of a NATO Advanced Research Workshop held July 11–20, 1991, in Patras, Greece, which brought together scientists representing many of the different aspects of chaotic dynamics. There are 37 papers, divided into two parts, those on theory and those on practice. Within the theoretical papers, there are four general areas with 3–5 papers in each: (i) complexity, control and data representation; (ii) fractals, multifractals and analyticity of normal forms; (iii) integrability, Painlevé property and singularity analysis; (iv) statistical physics, celestial mechanics and cosmology. The “practical” papers are divided into four groups with 5–7 papers in each: (i) controlling dynamical systems; (ii) semiconductors, superconductors, lasers and electronic circuits; (iii) biology, chemistry, atmospheric and magnetospheric dynamics; (iv) Hamiltonian dynamics, dissipative dynamics and normal forms.

Measure Theory. By J. L. Doob, Springer-Verlag, 1994, xii+210 pp., $49.00

This is volume 143 in the series Graduate Texts in Mathematics. In this very personal monograph, written with verve and a perspective gained from the vantage point of great original achievement, the author stresses the following points: (i) the application of pseudometric, rather than metric, spaces, which obviates the artificial replacement of functions by equivalence classes, a replacement that makes the use of “almost everywhere” either improper or artificial. (ii) Probability concepts are introduced in their appropriate place, not consigned to a “ghetto”, since mathematical probability is an important part of measure theory and offers a wide range of measure theoretic examples and applications both in and outside pure mathematics. (iii) Convergence of sequences of measures is treated both in the general Vitali-Hahn-Saks setting and in the mathematical setting of Borel measures on the metric spaces of classical analysis. Chapter headings: 0. Conventions and notation; 1. Operations on sets; 2. Classes of subsets of a space; 3. Set functions; 4. Measure spaces; 5. Measurable functions; 6. Integration; 7. Hilbert space; 8. Convergence of measure sequences; 9. Signed measures; 10. Measures and functions of bounded variation on $\mathbb{R}$; 11. Conditional expectations, martingale theory.