will engineers never learn that they need not invert full matrices!

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37 [3.25].—G. GOOS, J. HARTMANIS & G. I. MARCHUK, Editors, *Optimization Techniques,* IFIP Technical Conference, Lecture Notes in Comput. Sci., Springer-Verlag, Berlin, Heidelberg, New York, 1975, viii + 507 pp., 24 cm. Price $16.80.

This volume contains papers presented at the IFIP Technical Conference on Optimization Techniques held at Novosibirsk, July 1–7, 1974. There are 17 papers on system modeling and identification, 15 papers on optimal control, 26 papers on mathematical programming and numerical algorithms and 12 papers on the theory of games.

J. B.

38 [5].—BERT HUBBARD, Editor, *Numerical Solutions of Partial Differential Equations,* Academic Press, New York, 1976, ix + 499 pp., 24 cm. Price £ 13.00, $25.00.

This is the proceedings of the Symposium on the Numerical Solution of Partial Differential Equations. III. The following is taken from the preface:

The Symposium on the Numerical Solution of Partial Differential Equations, SYNSPADE 1975, was the third in a series on this topic held on the campus of the University of Maryland, College Park, at 5-year intervals. During the week of 19–24 May 1975, researchers gathered at the Adult Education Center to listen to invited lectures and contributed papers and to discuss with each other the most recent developments in this field. This volume contains the invited addresses in full and a list of the contributed papers.

The emphasis of this symposium was on those difficult problems in partial differential equations exhibiting some type of singular behavior. This is a very broad topic that includes singular behavior of solutions induced by the geometry such as corners or the nature of the differential equation itself. Talks were given on the effects of nonlinearities, such as bifurcation, which occur in problems of nonlinear mechanics. Also discussed were equations of changing type and those with rapidly oscillating coefficients. The point of view of the symposium itself was to give equal weight to discussions of the mathematical models and their relation to experiment, behavior of solutions of the partial differential equations involved, and effective computational methods for their numerical solution.

J. B.

39 [5.10, 5.20, 13.05, 13.15].—J. R. OCKENDON & W. R. HODGKINS, Editors, *Moving Boundary Problems in Heat Flow and Diffusion,* Clarendon Press, Oxford, 1975, x + 300 pp., 24 cm. Price £ 6.00, $19.25.

This volume contains papers and discussions presented at a conference at the University of Oxford, England, on March 25–27, 1974.

The aim of the conference can be stated with the following summary of parts of the preface:

Since moving boundary problems (generalized Stefan problems) occur in many diverse industrial and other situations, and since results in one field were not readily available to researchers in a different field, it was decided to bring together research workers from as many different fields as possible, along with applied mathematicians and numerical analysts.

The organizers have succeeded in fulfilling their aims and have produced an interesting conference report; the papers range from industrial applications to theoretical investigations of analytical and numerical methods. At least for some years into the future this

volume should stand as a most comprehensive survey of various aspects of Stefan problems.

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40 [5.10, 5.20, 13.20].—ROBERT D. RICHTMYER, Editor, *Proceedings of the Fourth International Conference on Numerical Methods in Fluid Dynamics,* Lecture Notes in Physics, Vol. 35, Springer-Verlag, Berlin, Heidelberg, New York, 1975, v + 457 pp., 24 cm. Price $16.00.

This volume contains papers presented at the Fourth International Conference on Numerical Methods in Fluid Dynamics, at the University of Colorado, USA, on June 24–28, 1974. There are 64 papers ranging from general theory for numerical methods to applications in specific problems.

LARS B. WAHLBIN

41 [5.10.1].— A. CARASSO & A. P. STONE, Editors, *Improperly Posed Boundary Value Problems,* Pitman, London, 1975, iv + 157 pp., 22 cm. Price £ 5.60, $12.90.

This volume, which is dedicated to Fritz John, represents a substantial portion of the proceedings of a five day regional conference on "Improperly posed problems in partial differential equations" held at the University of New Mexico in May, 1974. The lectures of the reviewer have been published separately as Volume 22 in the Regional Conference Series in Applied Mathematics (S.I.A.M.). The contents of this volume under review are as follows:

    1. H. Brezis and J. A. Goldstein: *Liouville theorems for some improperly posed problems.*

    2. J. R. Cannon: *A class of inverse problems: The determination of second order elliptic partial differential operators from over-specified boundary data.*

    3. J. R. Cannon and R. E. Ewing: *The location of strengths of point sources.*

    4. A. Carasso: *The backward beam equation and the numerical computation of dissipative equations backward in time.*

    5. J. A. Donaldson: *A uniqueness class for two improperly posed problems arising in mathematical physics.*

    6. M. Ghil: *The initialization problem in numerical weather prediction.*

    7. H. A. Levine: *Nonexistence of global weak solutions to nonlinear wave equations.*

    8. H. D. Meyer: *Half-plane representations and harmonic continuation.*

    9. K. Miller: *Efficient numerical methods for backward solution of parabolic problems with variable coefficients.*

    10. R. E. Showalter: *Quasi-reversibility of first and second order parabolic evolution equations.*

    11. S. Steinberg: *Some unusual ill posed Cauchy problems and their applications.*

    12. H. F. Walker: *Well-posedness of certain elliptic problems in unbounded domains.*

The general area of improperly posed problems in partial differential equations is a very active area of research at the present time. This volume should prove quite useful to the applied mathematician or engineer who must cope with such problems, to the novice who wishes to get some idea of what is currently being done in the field and to researchers who are active in certain sub-areas of the broad subject, but wish to know more about other areas of application.

L. P.