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Boundary value problems for elliptic equations and systems. (English) Zbl 0711.35038

Pitman Monographs and Surveys in Pure and Applied Mathematics, 46. Harlow: Longman Scientific & Technical; New York: John Wiley & Sons, Inc. xii, 411 p. £45.00 (1990).

Very general theorems have been proved about boundary value problems (: BVP) of elliptic partial differential equations and systems but, there has ever been a strong need for special methods to work with specific equations and systems. One of the lines of development has been the use of complex notations and complex methods to deal with a wide class of elliptic equations and systems. Both the authors have worked within this field for many years and published long series' of papers about the subject. This volume is in some respect a representation of the authors' results but it is more, it is a comprehensive representation of complex methods in BVP for elliptic equations and systems. This means the restriction to plane problems, for higher dimensions in a similar spirit I may refer to the books by *W. Tutschke* [Partielle komplexe Differentialgleichungen in einer und in mehreren komplexen Variablen (Berlin 1977; Zbl 0361.35002)] and by *K. Guerlebeck* and *W. Sproessig* [Quaternionic analysis and elliptic boundary value problems (1989; Zbl 0699.35007)]. For the literature in two-dimensional problems one may look into the book under review.

It is nearly impossible to describe the rich content of the book in the necessary few lines: Chapter I: BVP for simple complex equations (Definition and solution of several BVP for analytic and harmonic functions and related equations). Chapter II: BVP for elliptic complex equations of first order (Normal form for linear, quasilinear, and nonlinear equations; properties of solutions; Haseman, Riemann-Hilbert, and compound BVP). Chapter III: BVP for elliptic equations of second order (Reduction to normal form; extremum, representation, and compactness theorems; regular and irregular oblique derivative, Poincaré problems). Chapter IV: BVP with piecewise continuous coefficients for elliptic equations and systems (Widening the scope of the first three chapters). Chapter V: BVP for elliptic systems of two second order equations (Normal forms, also nonlinear; Dirichlet, Neumann, oblique derivative, Riemann-Hilbert problems). Chapter VI: BVP for elliptic systems of several equations (Reduction to normal forms; Riemann-Hilbert and oblique derivative problems).

The book is very clearly and exactly written, I found only few typing errors. But it is not a book to read, one has to work with it. It will be of interest to anyone who wants to know something about twodimensional BVP of elliptic type, convenient parts of the book may be used for seminars. But the work will be an indispensable tool for everyone who works in this field or wants to start that. I recommend the book.

Reviewer: [K.Habetha](#)

MSC:

- [35J25](#) Boundary value problems for second-order elliptic equations
- [35J55](#) Systems of elliptic equations, boundary value problems (MSC2000)
- [35-02](#) Research exposition (monographs, survey articles) pertaining to partial differential equations
- [35J65](#) Nonlinear boundary value problems for linear elliptic equations
- [30E25](#) Boundary value problems in the complex plane
- [35Q15](#) Riemann-Hilbert problems in context of PDEs
- [35Bxx](#) Qualitative properties of solutions to partial differential equations

Cited in **2** Reviews
Cited in **20** Documents

Keywords:

[complex methods](#); [oblique derivative](#); [Poincaré problems](#)