BOOK REVIEWS

McDonough, T. P. and Mavron, V. C. (editors), *Combinatorics* (London Mathematical Society Lecture Note Series No. 13, Cambridge University Press, 1974), v+204 pp., £3·20.

This volume contains the Proceedings of the British Combinatorial Conference held in the University College of Wales, Aberystwyth, from 2nd to 6th July 1973. There are 28 papers and a Problem Section. The papers cover a wide range of topics: graphs in many different aspects; enumerative problems; combinatorial designs of various kinds, such as Room squares and Latin rectangles; partition relations for ordered sets; and so on. Thus for its size the book gives, at postgraduate level, a very good impression of modern combinatorics. Clearly such conferences are of great benefit, but perhaps the reviewer may be permitted to wonder whether in this field a little too much is now being published in special volumes of this kind, rather than in the regular periodical literature.

D. MONK

Kallaher, M. J. and Ostrom, T. G. (editors), *Proceedings of the International Conference on Projective Planes* (Washington State University Press, 1973), vii+287 pp., \$8.00.

The conference referred to in the title took place from 25th to 28th April 1973. The volume, which is reproduced from typescript, contains 21 papers presented at the conference. It is dedicated to the memory of Peter Dembowski (1928-1971), whose early death was a tragic loss to Mathematics, and to this speciality in particular. The memorial note contains a bibliography of 30 items; there is also an index of work quoted in his fine treatise *Finite Geometries.* Inevitably this collection of papers will appeal mainly to experts in the field.

D. MONK

Chambers, Ll. G., *Integral Equations: A Short Course* (International Textbook Company Limited, 1976), 198 pp., £7·00.

One could say that books on integral equations cover a continuous spectrum ranging from the completely classical to the ultra-abstract, in which case this book would lie in the infra-red. Those seeking phrases such as "Hilbert space", "spectral theory" or "compact operator" must look elsewhere instead, the author opts for a presentation more suited to an honours course in mathematical methods. The student will have to be familiar with such topics as uniform convergence, mean convergence (in L^2), special functions and complex integration. The author's intention is to use such tools to develop and illustrate the elementary theory of integral equations.

Chapter 1 shows how integral equations can arise in practice and introduces Volterra equations and Fredholm equations of the first and second kind. Chapter 2 gives an account of the classical theory of Fredholm equations proceeding via degenerate kernels to Hilbert-Schmidt operators. Symmetric and Hermitian kernels receive special attention and analogies are drawn with matrix algebra. Chapter 3 treats Volterra equations with particular mention of kernels of convolution type and equations related to Abel's equation. Chapter 4 deals with the use of classical integral transformations in solving integral equations. Sections are devoted to applications of the Fourier, Laplace,

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Hilbert and finite Hilbert transforms in turn. Chapter 5 discusses a selection of approximate methods. Iterative methods for non-linear equations are followed by various methods for linear equations including the approximation of kernels and free terms, collocation, Galerkin's method and least squares approximation. Finally there are methods for obtaining approximations to eigenvalues and eigenfunctions. The book concludes with several appendices containing a collection of odds and ends required at various places in the main part of the text.

To illustrate the theory the author has included almost 80 worked examples and a similar number of exercises for the reader and these provide what is perhaps the outstanding feature of the book.

The author's overall philosophy is sound and the book might have been warmly recommended were it not for the fact that the entire text contains a plethora of mistakes. Indeed, the reviewer spotted almost 200 errors, some mathematical, others typographical. It might be said that missing integral signs, wrong dummy variables in summations and sign slips in the algebra will be obvious to most students; but even the most patient student will become exasperated when there are as many as six mistakes in almost as many lines (e.g. on p. 76 or p. 112). Furthermore, there are some more serious errors whose correction is perhaps not so easy for the reader. Thus the proof on p. 17 using (1.69) is wrong in detail. Again, (2.11) looks plausible but (2.12) (which is prefaced by "it is clear that") certainly does not follow from it; the reader has to work out what (2.11) should have been and, if lucky, might find his guess proved right when he gets to (2.23). One or two proofs seem incomplete such as that on p. 144 which appears to establish uniqueness only on a restricted interval, as it stands. In fact, in the theoretical sections, the logic is sometimes far from clear. Thus, on p. 23, the second paragraph doesn't make sense because of a misprint. Again, it is not always immediately clear what assumptions are being made about the kernels of an equation. Also, some new paragraphs begin in odd places, thereby disrupting the logical flow (and, surely, even a mathematical sentence should end with a full stop!). Some of these criticisms may sound childish. Yet it must be said that almost all of these faults could easily have been eradicated if more care had been taken; the impression is given of things being done in too much of a hurry, which is a pity.

In spite of these shortcomings, the book could still serve as a useful adjunct to a methods course. A student on such a course might perhaps have wished for additional physical applications or an explanation of where some of the kernels arise (for instance, the Poisson-type kernel which appears in Example 2.14 and elsewhere). Nevertheless he should find the exercises valuable and may well succeed in solving them, provided that he adds to his mathematical talents some of the qualities of a detective and a mind-reader.

ADAM C. MACBRIDE

CAIANIELLO, E. R., *Combinatorics and Renormalisation in Quantum Field Theory* (*Benjamin, 1974*), xv+121 pp., \$16.00 (cloth), \$9.50 (paper).

This book is another in the Benjamin Frontiers in Physics series. As such it is pitched at the level of a postgraduate course in mathematical physics. Appropriately enough, the exposition is informal and complete proofs of mathematical results are not always given. Its main virtue is that it gives in a single volume a comprehensive account of the important work of E. R. Caianiello and his collaborators, carried out over a period of almost twenty years, on the renormalisation problems of quantum field theory. The mathematical state of the art of renormalisation is not yet sufficiently advanced for field theories in three-space dimensions to give a rigorous treatment of this problem. Nevertheless, combinatorial theory can be used to good advantage in dispensing with

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