test and development of elements); 3. Solution techniques; 4. Trends in element formulation (the authors predict a bright future for the hybrid and SEMILOOF type elements); 5. Trends in solution techniques; 6. Speculations (miscellaneous non-structural applications and the patch test are discussed); 7. Theoretical details (numerical integration, matrices, differential geometry).

Fracture mechanics and the computational problems associated with applications of the finite element method in fracture mechanics receive little attention. This is surprising especially because the authors make the point that they are looking to the future, which undoubtedly will bring ever increasing reliance on fracture mechanics at the expense of the traditional approach based on maximum stress design.

An interesting and unique aspect of the book is its informal style. It is replete with irrelevant and often irreverent comments, which provide welcome diversions in the otherwise demanding pursuit of the idiosyncratic processes of bright engineering minds wrestling with the finer points of finite element analysis.

BARNA A. SZABO

Greensfelder Professor of Civil Engineering
Washington University
St. Louis, Missouri 63130

19[3.35].—ALAN GEORGE & JOSEPH W. LIU, *Computer Solution of Large Sparse Positive Definite Systems*, Prentice-Hall, Englewood Cliffs, N. J., 1981, xii + 324 pp., $23\frac{1}{2}$ cm. Price $24.95.

This book is about efficient implementation of the Cholesky factorization method for the solution of sparse positive definite systems. The two main concerns of the book are the development of the various reordering schemes and the corresponding efficient algorithms. The basic tools for direct sparse matrix solution are described which include the fundamentals of Cholesky factorization and solution as well as graph theoretic ideas for reordering algorithms. Algorithmic efficiency is achieved by careful consideration of operation counts and storage requirements. Fortran programs implementing the algorithms are included and discussed in great detail.

The authors discuss a collection of methods which from their experience they prefer for solving sparse matrix problems. Band and envelope methods are described and the Reverse Cuthill-McKee Algorithm is proposed for the reordering problem. The minimal degree algorithm is considered for low fill reordering for general sparse matrices. Quotient tree methods for finite element and finite difference problems are also studied. The last of the methods studied are one-way and nested dissection methods for finite element problems.

This book should be of interest to numerical analysts, engineers, and anyone involved in the solution of positive definite sparse matrix systems. As a text, the book could be used along with a good text on iterative matrix techniques for a one semester course on sparse matrix solution. Exercises dealing with program modification as well as more theoretical considerations are included at the end of the chapters. The book also provides an in depth documentation of the authors sparse matrix package "SPARSPAK". The detailed study of the coding of these methods provides an example of good Fortran programming style.

JOSEPH E. PASCIAK

Applied Mathematics Department
Brookhaven National Laboratory
Upton, New York 11973

20[10.05].—V. K. B. KOTA, *Table of Reduction of U(10) Partitions into SU(3) Irreducible Components*, 112 pages of computer printout, deposited in the UMT file.

The irreducible representations (IR) of the unitary group $U(10)$ corresponding to any integer N, are denoted [1] by the Young partitions $[f]$, where

$$[f] = [f_1 f_2 \cdots f_{10}]$$

with $f_i \geqslant f_{i+1} \geqslant 0$, and $\Sigma_{i=1}^{10} f_i = N$ while the IR of $SU(3)$ (the unitary unimodular group in three dimensions) are denoted [2] by the pair of numbers $(\lambda\, \mu)$. The tabulations are for the reduction of the IR of $U(10)$ to IR of $SU(3)$ with the constraint that the partition [1] of $U(10)$ correspond to the IR $(3\,0)$ of $SU(3)$. Essentially the problem is to obtain the $SU(3)$ content of the "plethysms" $\{3\} \otimes \{f\}$. All possible $U(10)$ partitions having a maximum of four columns (i.e., all partitions of the type $[4^a 3^b 2^c 1^d]$ are considered and their reductions to $SU(3)$ contents are tabulated. A method to obtain these reductions is given in [3] and a computer code is constructed for the IBM 360/44 machine which follows this procedure step by step. The reductions for $N \leqslant 6$ are given previously by Ibrahim [4]. The tabulations give the reductions up to $N = 20$, and for the remaining partitions the reductions can be obtained using the relationship

$$[4^{10-a-b-c-d} 3^d 2^c 1^b] = \sum_\gamma A_\gamma(\mu_\gamma \lambda_\gamma),$$

if

$$[4^a 3^b 2^c 1^d] = \sum_\gamma A_\gamma(\lambda_\gamma \mu_\gamma),$$

where A_γ gives the number of occurrences of $(\lambda_\gamma \mu_\gamma)$ in the reduction of the partition $[4^a 3^b 2^c 1^d]$. The stringent dimensionality check is performed for each partition and the tabulations display all types of symmetry checks.

In the tables, the $U(10)$ partition was printed out as $f_1 f_2 f_3 \cdots f_{10}$ and below this the IR of $SU(3)$ contained in the partition are all listed as $A_1(\lambda_1 \mu_1) A_2(\lambda_2 \mu_2) \ldots$.

AUTHOR'S SUMMARY

Physical Research Laboratory
Navarangpura
Ahmedabad 380 009, India