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Book Review

Solution of Crack Problems: The Distributed Dislocation Technique, by D. A. Hills, P. A. Kelly, D. N. Dai, and A. M. Korsunsky. Kluwer Academic Publishers, Dordrecht, The Netherlands, 1996.

REVIEWED BY L. M. KEER[1]

Fracture mechanics applications using dislocation theory have now been in the literature for a number of years. Many such solutions have appeared and been catalogued in the seminal book by Mura (*Micromechanics of Defects in Solids,* Martinus Nijhoff, 1982). There, the application of dislocation theory towards the solution of significant problems in materials science has been demonstrated by two and three-dimensional examples.

The book by Hills et al., using the distributed dislocation method, formulates problems appropriate to two-dimensional and three-dimensional elasticity. Solutions given in this volume are in the context of linear, isotropic elasticity, and except for a brief mention of crack-tip plasticity, there is no attempt to include nonlinear fracture mechanics into the scope of this book.

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The list of two-dimensional topics chosen by the authors include cracks in monolithic plane bodies that can be arbitrary in shape, interfacial cracks and cracks that have a kinking geometry. These solutions represent important applications to areas of engineering interest, such as tribology (fretting, contact fatigue, inclusions), composite materials (interfacial cracking), and others. Recently, considerable interest has been given to planar three-dimensional cracks. The theory associated with such problems is developed cleanly in three chapters, the last revealing the mathematical foundations behind the hypersingular integrals that appear in such three-dimensional formulations. The reader is given a sound introduction to this subject, and with the framework given here, will obtain the insight to carry through more difficult research examples.

Finally, the reader is provided with several useful appendices containing tables of exact analytical results that provide influence functions for dislocation systems of particular geometries, recipes for solution of singular integral equations of the first kind, and results for plane and ring dipole influence functions.

The book would be suitable as a graduate level text for students who have already taken an elasticity course and who understand some of the mathematical and physical concepts concerned with integral equations.

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