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Elastodynamic Diffraction Problems

Diffraction of Elastic Waves and Dynamic Stress Concentrations. By Y.-H. Pao and C.-C. Mow. Crane, Russak & Co. Inc., New York, 1973. 693 Pages.

REVIEWED BY J. D. ACHENBACH[1]

Elastodynamic stress concentrations near cavities and inclusions can be quite different in magnitude from the corresponding elastostatic stress concentrations. This interesting and typically dynamic effect, which is often due to the diffraction of elastic waves, has generated a good many analytical and experimental studies, including several important ones by Pao and Mow. These authors have now written a monograph in which they have collected the most useful methods of analysis for elastodynamic diffraction problems, together with extensive numerical information on the accompanying stress concentrations.

The book opens with an informative history of studies of elastic wave diffraction. The first chapter also contains sections summarizing the theory of elasticity and a brief discussion of pertinent aspects of wave propagation in elastic solids. In Chapter 2, an analysis of scattering of plane harmonic SH-waves by a cylindrical obstacle serves to introduce methods of analysis. The four remaining chapters present analytical and numerical results for both steady-state and transient diffraction by cylindrical and spherical obstacles. Chapter 3 focuses on a thorough presentation of circular cylinder problems, such as diffraction of longitudinal and transverse waves by cavities and rigid and elastic inclusions. The scattering of flexural waves by a circular inclusion in a plate is also discussed, as is the transient interaction of a circular shell with a surrounding elastic medium. Elliptic cylinder problems and parabolic cylinder problems are discussed in Chapters 4 and 5, respectively. Chapter 5 includes an analysis of the important problem of stress singularities generated by elastodynamic diffraction at the edge of a semi-infinite crack. The last chapter is concerned with the spherical inclusion problem.

This book packs a lot of information which until now was only partially available, and then dispersed in the technical literature. It will be valuable to anyone who is, or should be, interested in elastodynamic effects.

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Introduction to Materials Science

Materials Science. By A. L. Ruoff. Prentice-Hall, Englewood Cliffs, N. J., 1973. vii-928. $18.95 Cloth.

REVIEWED BY A. PHILLIPS[2]

This is an excellent introductory book on material science. It covers a large number of topics making it suitable for any engineer who wishes to be introduced to those aspects of the science of materials which are important for his work. Suitable references at the end of each chapter provide guidance for further study. The book covers material properties and behavior, electrons and atoms, micro and macrostructure, chemical equilibria, kinetics, mechanical properties, electrical properties, optical, and magnetic properties.

It is very well written and it includes a large number of examples and problems. It is a good text for teaching at the undergraduate level.

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SV elastic wave scattering from a nanoinclusion Inhomogeneous interphase Gurtin-Murdoch model of surface elasticity Dynamis stress concentration factors (DSCF). Type. Research Article.Â 14. Ru, Y., Wang, G. F. and Wang, T. J., â€œDiffractions of elastic waves and stress concentration near a cylindrical nano-inclusion incorporating surface effect,â€ Journal of Vibration and Acoustics, 131, pp. 061011-1 - 061011-7 (2009).CrossRef Google Scholar. 15. Fang, X. Q., Wang, X. H. and Zhang, L. L., â€œInterface effect on the dynamic stress around an elliptical nano-inhomogeneity subjected to anti-plane shear waves,â€ Computers, Materials, & Continua, 16, pp. 229â€“246 (2010).Google Scholar. I. INTRODUCTION A. Elastic Wave Diffraction and Dynamic Stresses. It has been known at least since the nineteenth century that an intensification of stress occurs in the vicinity of discontinuities such as holes, cracks, and solid impurities in otherwise homogeneous materials. The theory of elasticity had been well developed by the turn of the nineteenth century beginning with the work of Robert Hooke in the last quarter of the seventeenth century.Â waves and the inclusion was either fixed in space or free to translate with the plate. Pao and Mow showed that the magnitude of the stress concentration factors depended upon the incident wave length, Poisson' ratio for the plate, and the density of the inclusion. Diffraction of antiplane shear waves and stress concentration in a cracked couple stress elastic material with micro inertia. Article. Full-text available.Â We investigate diffraction of reduced traction shear waves applied at the faces of a stationary crack in an elastic solid with microstructure, under antiplane deformation. The material behaviour is described by the indeterminate theory of couple stress elasticity and the crack is rectilinear and semi-infinite. The full-field solution of the crack problem is obtained through integral transforms and the Wienerâ€“Hopf technique.