Elastodynamic Diffraction Problems


REVIEWED BY J. D. ACHENBACH

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.

Introduction to Materials Science


REVIEWED BY A. PHILLIPS

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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Electromagnetic waves and the electromagnetic spectrum. Polarization of light, linear and circular. Diffraction and constructive and destructive interference. This is the currently selected item. Wave interference. Young's double slit introduction. Young's double slit equation. Young's double slit problem solving. Diffraction grating. Single slit interference. Based on the theory of elastic dynamics, multiple scattering of elastic waves and dynamic stress concentrations in fiber-reinforced composite were studied. The analytical expressions of elastic waves in different region were presented and an analytic method to solve this problem was established. The mode coefficients of elastic waves were determined in accordance with the continuous conditions of displacement and stress on the boundary of the multi-interfaces. By making use of the addition theorem of Hankel functions, the formulations of scattered wave fields in different local coordinates were. A stress concentration (also called a stress raiser or a stress riser) is a location in an object where the stress is significantly greater than the surrounding region. Stress concentrations occur when there are irregularities in the geometry or material of a structural component that cause an interruption to the flow of stress. This arises from such details as holes, grooves, notches and fillets. Stress concentrations may also occur from accidental damage such as nicks and scratches. 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. Then the analytic solutions of elastic wave fields and magnetic fields are presented by using the wave function expansion method. By satisfying the boundary conditions of the aperture, the mode coefficients, and the analytic solutions of dynamic stress intensity factors are determined. The numerical examples of the dynamic stress intensity factor near the aperture are presented. The numerical results indicate that the incident wave number, the piezomagnetic properties, and the nonhomogeneous parameter of materials highly influence the dynamic stress around the aperture. Magnetoelastic Coupled Wave Diffraction and Dynamic Stress Intensity Factor in Graded Piezomagnetic Composites with a Cylindrical Aperture. by. Yinhuan Jiang.