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.

1 Professor, Department of Civil Engineering, The Technological Institute, Northwestern University, Evanston, Ill.

2 Professor, Yale University, Department of Engineering and Applied Science, New Haven, Conn. Fellow ASME.
SV elastic wave scattering from a nanoinclusion.

Inhomogeneous interphase Gurtin-Murdoch model of surface elasticity.

Dynamic stress concentration factors (DSCF).

Type: Research Article.


5. Lee V W, Cao H. (1989). Through programming calculations, the dynamic stress concentration factor (DSCF) of circular tunnels in the two types of composite strata, hard-over-soft and soft-over-hard, is analyzed when SH waves propagate, and certain conclusions on the scattering of SH waves that are distinguished from the case of single homogeneous layers are reached. The research in this article reveals some phenomena.

Â Rock vibration is propagated in the form of elastic waves through the particles of the rock. The destructive consequences of earthquakes are directly or indirectly related to seismic waves. That is why the study of seismic waves has become the basic work of studying and predicting earthquakes. The report shows clearly that the scattering of elastic (stress) waves is no different from the scattering of sound or electromagnetic waves, and much of the analysis is based on wave propagation methods.Â Ironically, the elastic solid theory used was originally developed to explain the diffraction of light â€“ and was abandoned after the electromagnetic wave and quantum theories of light appeared. When Rand began studying survivability of hardened military systems in 1960, there were few solutions and few numerical results for dynamic stress concentration factors. A decade later, there were many; this volume summarizes an extensive literature.