

Preface

This book is the first to focus on the study of the dynamics of pre-strained (or initially strained) bi-material systems by utilizing the three-dimensional linearized theory of elastic waves in initially stressed bodies (TDLTEWISB). Under investigation are systems consisting of half-space and covering layers, bi-layered slabs resting on a rigid foundation, sandwich plates, compound solid and hollow cylinders, etc. The problems considered relate to the study of the time-harmonic dynamic stress field under acting, moving, and oscillating moving loads on the foregoing systems, as well as to the study of the normal, near-surface, torsional, longitudinal axisymmetric, and flexural waves' dispersion in the aforementioned systems. The problems can be classified with respect to the magnitude of the initial strains (finite initial strains and small initial strains), to the material properties (elastic, viscoelastic, piezoelectric, isotropic, orthotropic, etc.), as well as to the character of the contact (complete and incomplete) conditions between the constituents of the system.

A lot of numerical results are presented and discussed. These results were obtained by my students and me during the last 14 years and have significance not only within the scope of the TDLTEWISB but also within the scope of the classical linear theory of elastodynamics.

This book deals with systematic consideration and analysis of the aforementioned, plus related investigations. I assume that the reader is familiar with the theory of elasticity, piezoelectricity, and viscoelasticity for anisotropic bodies with partial differential equations and integral transformations and also with the numerical calculation algorithms for PC programming.

I have designed this book for graduate researchers; mechanical engineers designing bi-material systems such as those mentioned above for automobiles; civil engineers designing roads or landing strips for aircraft; engineers dealing with the armor of objects from external dynamic actions; aerospace engineers studying advanced airframe design and safety with respect to external dynamic impacts; engineers dealing with the control of wave dispersion or waveguides with the use of a covering layer and initial stretching and compressing or dealing with nondestructive analysis of the residual stresses, geometrical characteristics, defects, and

degree of debonding of the imperfection between the constituents of the bi-material systems; and biomedical engineers developing bi-material lightweight sandwich systems for bone replacement and repair.

At the end of each chapter a corresponding reference list is provided.

Surkay D. Akbarov

Dynamics of Pre-Strained Bi-Material Elastic Systems

Linearized Three-Dimensional Approach

Akbarov, S.

2015, XXI, 1004 p. 477 illus., Hardcover

ISBN: 978-3-319-14459-7