

Preface

This book is the first to focus on the development of the 3D linearized stability loss theory for investigation of internal stability loss in a structure of elastic and viscoelastic composite materials and of stability loss of elements of construction made from these materials within the scope of the initial imperfection approach (criterion). Under the initial imperfection approach we mean that the structure of the composite material or structural element has an initial imperfection and an evolution of this imperfection is studied by employing the 3D geometrically nonlinear field equations of the theory of elasticity and viscoelasticity for anisotropic bodies.

During the last 15 years, my students and I have investigated problems related to the 3D stability loss of cylinders, plates, buckling delamination of plates containing cracks, internal and near-surface stability loss of layered and fibrous elastic and viscoelastic composites, etc. These investigations allowed me to determine how the approximate stability loss theories of beams, plates, and shells can influence the accuracy of the results related to critical time. Moreover, these investigations allowed me to determine the rules of buckling delamination around cracks contained by plates.

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 and viscoelasticity for anisotropic bodies, with partial differential equations and integral transformations, and also with the Finite Element Method.

I have designed the book for graduate researchers; for mechanical engineers designing composite materials for automobiles, trucks, flywheels, etc.; for civil engineers contemplating the use of composites in infrastructure; for aerospace engineers studying advanced airframe design; and for biomedical engineers developing lightweight composites for bone replacement and repair.

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

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