Preface

This book develops a presentation of viscoelasticity theory oriented toward numerical applications. It is our hope that it will be useful both as a textbook for graduate courses and as a reference volume for engineers and researchers.The book is structured in twelve chapters. The first eight chapters introduce basic concepts and theoretical ideas about the viscoelastic response of solids. They cover constitutive relations in integral and differential form, influence of temperature, age and finite strain. These topics were selected aiming to make the access to the computational viscoelastic formulations easier. It is assumed that the reader has a background in mathematics and mechanics at the undergraduate level. In the last five chapters a more advanced experience may be needed.

The remaining chapters address the numerical formulation of viscoelastic problems using finite element, boundary element and finite volume methods. Chapter 9 presents viscoelastic finite element procedures formulated on a total Lagrangian description for large displacements and rotations with small strains. Two alternative boundary element procedures for the solution of problems in linear viscoelasticity are reviewed in Chap. 10: the solution in the Laplace transformed domain and the use of a general inelastic formulation. Chapter 11 presents a two-dimensional approach for linear viscoelastic solids using a finite volume framework. Together with the theoretical formulations, worked examples are presented throughout the text. Finally, in Chap. 12, further examples, to be solved with the software Abaqus, are proposed and developed. The book concludes with three Appendices which contain auxiliary expressions in mathematics and mechanics.

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