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Nota di contenuto	Cover; Title Page; Contents; Preface; PART 1. MATHEMATICAL PRELIMINARIES, DEFINITIONS AND PROPERTIES OF FRACTIONAL INTEGRALS AND DERIVATIVES; Chapter 1. Mathematical Preliminaries; 1.1. Notation and definitions; 1.2. Laplace transform of a function; 1.3. Spaces of distributions; 1.4. Fundamental solution; 1.5. Some special functions; Chapter 2. Basic Definitions and Properties of Fractional Integrals and Derivatives; 2.1. Definitions of fractional integrals and derivatives; 2.1.1. Riemann-Liouville fractional integrals and derivatives 2.1.1.1. Laplace transform of Riemann-Liouville fractional integrals and derivatives2.1.2. Riemann-Liouville fractional integrals and derivatives on the real half-axis; 2.1.3. Caputo fractional derivatives; 2.1.4. Riesz potentials and Riesz derivatives; 2.1.5. Symmetrized Caputo derivative; 2.1.6. Other types of fractional derivatives; 2.1.6.1. Canavati fractional derivative; 2.1.6.2. Marchaud fractional derivatives; 2.1.6.3. Grunwald-Letnikov fractional derivatives; 2.2. Some additional properties of

fractional derivatives; 2.2.1. Fermat theorem for fractional derivative
 2.2.2. Taylor theorem for fractional derivatives
 2.3. Fractional derivatives in distributional setting; 2.3.1. Definition of the fractional integral and derivative; 2.3.2. Dependence of fractional derivative on order; 2.3.3. Distributed-order fractional derivative; PART 2.
 MECHANICAL SYSTEMS; Chapter 3. Waves in Viscoelastic Materials of Fractional-Order Type; 3.1. Time-fractional wave equation on unbounded domain; 3.1.1. Time-fractional Zener wave equation; 3.1.2. Time-fractional general linear wave equation; 3.1.3. Numerical examples; 3.1.3.1. Case of time-fractional Zener wave equation
 3.1.3.2. Case of time-fractional general linear wave equation
 3.2. Wave equation of the fractional Eringen-type; 3.3. Space-fractional wave equation on unbounded domain; 3.3.1. Solution to Cauchy problem for space-fractional wave equation; 3.3.1.1. Limiting case $\beta \rightarrow 1$; 3.3.1.2. Case $u_0(x) \dots$; 3.3.1.3. Case $u_0(x) \dots$; 3.3.1.4. Case $u_0(x) \dots$; 3.3.2. Solution to Cauchy problem for fractionally damped space-fractional wave equation; 3.4. Stress relaxation, creep and forced oscillations of a viscoelastic rod; 3.4.1. Formal solution to systems [3.110]-[3.112], [3.113] and either [3.114] or [3.115]
 3.4.1.1. Displacement of rod's end is prescribed by [3.120]
 3.4.1.2. Stress at rod's end is prescribed by [3.121]; 3.4.2. Case of solid-like viscoelastic body; 3.4.2.1. Determination of the displacement u in a stress relaxation test; 3.4.2.2. Case $\sigma = 0H + F$; 3.4.2.3. Determination of the stress s in a stress relaxation test; 3.4.2.4. Determination of displacement u in the case of prescribed stress; 3.4.2.5. Numerical examples; 3.4.3. Case of fluid-like viscoelastic body; 3.4.3.1. Determination of the displacement u in a stress relaxation test
 3.4.3.2. Determination of the stress s in a stress relaxation test

Sommario/riassunto

The books Fractional Calculus with Applications in Mechanics: Vibrations and Diffusion Processes and Fractional Calculus with Applications in Mechanics: Wave Propagation, Impact and Variational Principles contain various applications of fractional calculus to the fields of classical mechanics. Namely, the books study problems in fields such as viscoelasticity of fractional order, lateral vibrations of a rod of fractional order type, lateral vibrations of a rod positioned on fractional order viscoelastic foundations, diffusion-wave phenomena, heat conduction, wave propagation, forced oscillations