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References3 Thermal Bending; 3.1 Limits on the Analysis; 3.2 Stress Relationships; 3.3 Displacement Relations; 3.4 General Thermal Bending Relations; 3.5 Shear Stresses; 3.6 Beam Bending Examples; 3.7 Thermal Bowing of Pipes; 3.8 Historical Note; Problems; References; 4 Thermal Stresses in Trusses and Frames; 4.1 Elastic Energy Method; 4.2 Unit-Load Method; 4.3 Trusses with External Constraints; 4.4 Trusses with Internal Constraints; 4.5 The Finite Element Method; 4.6 Elastic Energy in Bending; 4.7 Pipe Thermal Expansion Loops; 4.8 Pipe Bends; 4.9 Elastic Energy in Torsion
4.10 Historical NoteProblems; References; 5.1 Introduction; 5.2 Strain Relationships; 5.3 Stress Relationships; 5.4 Stress-Strain Relations; 5.5 Temperature Field Equation; 5.6 Reduction of the Governing Equations; 5.7 Historical Note; Problems; References; 6 Plane Stress; 6.1 Introduction; 6.2 Stress Resultants; 6.3 Circular Plate with a Hot Spot; 6.4 Two-Dimensional Problems; 6.5 Plate with a Circular Hole; 6.6 Historical Note; Problems; References; 7 Bending Thermal Stresses in Plates; 7.1 Introduction; 7.2 Governing Relations for Bending of Rectangular Plates
7.3 Boundary Conditions for Plate Bending7.4 Bending of Simply-Supported Rectangular Plates; 7.5 Rectangular Plates with Two-Dimensional Temperature Distributions; 7.6 Axisymmetric Bending of Circular Plates; 7.7 Axisymmetric Thermal Bending Examples; 7.8 Circular Plates with a Two-Dimensional Temperature Distribution; 7.9 Historical Note; Problems; References; 8 Thermal Stresses in Shells; 8.1 Introduction; 8.2 Cylindrical Shells with Axisymmetric Loading; 8.3 Cooldown of Ring-Stiffened Cylindrical Vessels; 8.4 Cylindrical Vessels with Axial Temperature Variation; 8.5 Short Cylinders
8.6 Axisymmetric Loading of Spherical Shells8.7 Approximate Analysis of Spherical Shells under Axisymmetric Loading; 8.8 Historical Note; Problems; References; 9 Thick-Walled Cylinders and Spheres; 9.1 Introduction; 9.2 Governing Equations for Plane Strain; 9.3 Hollow Cylinder with Steady-State Heat Transfer; 9.4 Solid Cylinder; 9.5 Thick-Walled Spherical Vessels; 9.6 Solid Spheres; 9.7 Historical Note; Problems; References; 10 Thermoelastic Stability; 10.1 Introduction; 10.2 Thermal Buckling of Columns; 10.3 General Formulation for Beam Columns; 10.4 Postbuckling Behavior of Columns
10.5 Lateral Thermal Buckling of Beams

Sommario/riassunto

The tools engineers need for effective thermal stress design Thermal stress concerns arise in many engineering situations, from aerospace structures to nuclear fuel rods to concrete highway slabs on a hot summer day. Having the tools to understand and alleviate these potential stresses is key for engineers in effectively executing a wide range of modern design tasks. Design for Thermal Stresses provides an accessible and balanced resource geared towards real-world applications. Presenting both the analysis and synthesis needed for accurate design, the book emphasizes key principles,