

1. Record Nr.	UNINA9910483871003321
Autore	Sitharam T. G. <1961->
Titolo	Theory of elasticity // T.G. Sitharam, L. Govindaraju
Pubbl/distr/stampa	Singapore : , : Springer, , [2021] ©2021
ISBN	981-334-650-7
Descrizione fisica	1 online resource (296 pages)
Disciplina	531.382
Soggetti	Elasticity Strains and stresses
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Foreword I -- Foreword II -- Preface -- Review -- Contents -- About the Authors -- 1 Elasticity -- 1.1 Introduction -- 1.2 The General Theory of Elasticity -- 1.3 Assumptions of Linear Elasticity -- 1.4 Applications of Linear Elasticity -- 2 Analysis of Stress -- 2.1 Introduction -- 2.2 Notation of Stress -- 2.3 Concept of Direct Stress and Shear Stress -- 2.4 Stress Tensor -- 2.5 Spherical and Deviatorial Stress Tensors -- 2.6 Indicial Notation -- 2.7 Types of Stress -- 2.8 Two-Dimensional Stress at a Point -- 2.9 Principal Stresses in Two Dimensions -- 2.10 Cauchy's Stress Principle -- 2.11 Direction Cosines -- 2.12 Stress Components on an Arbitrary Plane -- 2.13 Stress Components on Oblique Plane (Stress Transformation) -- 2.14 Principal Stress in Three Dimensions -- 2.15 Stress Invariant -- 2.16 Equilibrium of a Two-Dimensional or Plane Element Differential Element -- 2.17 Octahedral Stresses -- 2.18 Mohr's Stress Circle -- 2.19 Mohr Circles for Two-Dimensional Stress Systems -- 2.20 Construction of Mohr's Circle for Two- Dimensional Stress System -- 2.21 Equilibrium Equations in Polar Co-ordinates (Two-Dimensional State of Stress) -- 2.22 General State of Stress in Three Dimensions in Cylindrical Co-ordinate System -- 2.23 Numerical Examples -- 2.24 Exercises -- 3 Analysis of Strain -- 3.1 Deformations -- 3.2 Displacement and Strain -- 3.3 Concept of Strain -- 3.4 Components of Strain -- 3.5 Strain Tensor -- 3.6 Rotations -- 3.7 Deformation of an Infinitesimal Line

Element -- 3.8 Change in Length of a Linear Element -- 3.9 Change in Length of a Linear Element-Linear Components -- 3.10 Strain Transformation -- 3.11 Spherical and Deviatorial Strain Tensors -- 3.12 Principal Strains and Strain Invariants -- 3.13 Octahedral Strains -- 3.14 Mohr's Circle for Strain -- 3.15 Equations of Compatibility for Strains.

3.16 Measurement of Surface Strains-Strain Rosettes -- 3.16.1 Strain Rosettes -- 3.16.2 Strain Transformation Laws -- 3.16.3 Measurement of Strains Using Rosettes -- 3.17 Numerical Examples -- 3.18 Exercises -- 4 Stress-Strain Relations -- 4.1 Introduction -- 4.2 Linear Elasticity-Generalized Hooke's Law -- 4.3 Elastic Strain Energy for Uniaxial Stress -- 4.4 Strain Energy in an Elastic Body -- 4.5 Boundary Conditions -- 4.6 ST. Venant's Principle -- 4.7 Principle of Superposition -- 4.8 Existence and Uniqueness of Solution (Uniqueness Theorem) -- 4.9 Numerical Examples -- 4.10 Exercises -- 5 Two-Dimensional Problems in Cartesian Co-ordinate System -- 5.1 Introduction -- 5.1.1 Plane Stress Problems -- 5.1.2 Plane Strain Problems -- 5.2 Relationship Between Plane Stress and Plane Strain -- 5.2.1 Plane Stress Case -- 5.2.2 Plane Strain Case -- 5.3 Transformation of Compatibility Equation from Strain Components to Stress Components -- 5.3.1 Plane Stress Case -- 5.3.2 Plane Strain Case -- 5.4 Airy's Stress Function -- 5.4.1 Stress Function for Plane Stress Case -- 5.4.2 Stress Function for Plane Strain Case -- 5.5 Solution of Two-Dimensional Problems by the Use of Polynomials -- 5.6 Pure Bending of a Beam -- 5.7 Bending of a Narrow Cantilever Beam Subjected to End Load -- 5.8 Bending of a Simply Supported Beam by a Distributed Loading (Udl) -- 5.9 Numerical Examples -- 5.10 Exercises -- 6 Two-Dimensional Problems in Elasticity (in Polar Coordinate System) -- 6.1 Introduction -- 6.2 Strain-Displacement Relations -- 6.3 Strain-Compatibility Equation -- 6.4 Stress-Strain Relations -- 6.5 Airy's Stress Function -- 6.6 Biharmonic Equation -- 6.7 Axisymmetric Problems -- 6.8 Thick-Walled Cylinder Subjected to Internal and External Pressures -- 6.9 Rotating Discs of Uniform Thickness -- 6.9.1 Solid Disc -- 6.9.2 Circular Disc with a Hole. 6.10 Stress Concentration -- 6.11 The Effect of Circular Holes on Stress Distributions in Plates -- 6.12 Bars with Large Initial Curvature -- 6.13 Winkler-Bach Theory -- 6.14 Stresses in Closed Rings -- 6.15 Numerical Examples -- 6.16 Exercises -- 7 Torsion of Prismatic Bars -- 7.1 Introduction -- 7.2 General Solution of the Torsion Problem -- 7.3 Boundary Conditions -- 7.4 Stress Function Method -- 7.5 Torsion of Circular Cross-Section -- 7.6 Torsion of Elliptical Cross-Section -- 7.7 Prandtl's Membrane Analogy -- 7.8 Torsion of Thin-Walled Sections -- 7.9 Torsion of Thin-Walled Multiple-Cell Closed Sections -- 7.10 Numerical Examples -- 7.11 Exercises -- 8 Elastic Solutions in Geomechanics -- 8.1 Introduction -- 8.2 Kelvin's Problem -- 8.3 Boussinesq's Problem -- 8.4 Flamant's Problem -- 8.5 Cerrutti's Problem -- 8.6 Mindlin's Problem -- 8.7 Applications -- Bibliography.

---