

- Preface p. xi
- Symbols p. xv
- Greek Alphabet p. xviii
- 1 Tension, Compression, and Shear p. 1
 - 1.1 Introduction to Mechanics of Materials p. 1
 - 1.2 Normal Stress and Strain p. 3
 - 1.3 Mechanical Properties of Materials p. 10
 - 1.4 Elasticity, Plasticity, and Creep p. 20
 - 1.5 Linear Elasticity, Hooke's Law, and Poisson's Ratio p. 23
 - 1.6 Shear Stress and Strain p. 28
 - 1.7 Allowable Stresses and Allowable Loads p. 39
 - 1.8 Design for Axial Loads and Direct Shear p. 44
 - Problems p. 49
- 2 Axially Loaded Members p. 67
 - 2.1 Introduction p. 67
 - 2.2 Changes in Lengths of Axially Loaded Members p. 68
 - 2.3 Changes in Lengths of Nonuniform Bars p. 77
 - 2.4 Statically Indeterminate Structures p. 84
 - 2.5 Thermal Effects, Misfits, and Prestrains p. 93
 - 2.6 Stresses on Inclined Sections p. 105
 - 2.7 Strain Energy p. 116
 - 2.8 Impact Loading p. 128
 - 2.9 Repeated Loading and Fatigue p. 137
 - 2.10 Stress Concentrations p. 139
 - 2.11 Nonlinear Behavior p. 145
 - 2.12 Elastoplastic Analysis p. 150
 - Problems p. 156
- 3 Torsion p. 187
 - 3.1 Introduction p. 187
 - 3.2 Torsional Deformations of a Circular Bar p. 188
 - 3.3 Circular Bars of Linearly Elastic Materials p. 191
 - 3.4 Nonuniform Torsion p. 204
 - 3.5 Stresses and Strains in Pure Shear p. 212
 - 3.6 Relationship Between Moduli of Elasticity E and G p. 220
 - 3.7 Transmission of Power by Circular Shafts p. 221
 - 3.8 Statically Indeterminate Torsional Members p. 228
 - 3.9 Strain Energy in Torsion and Pure Shear p. 232
 - 3.10 Thin-Walled Tubes p. 240
 - 3.11 Stress Concentrations in Torsion p. 249
 - Problems p. 251
- 4 Shear Forces and Bending Moments p. 271
 - 4.1 Introduction p. 271
 - 4.2 Types of Beams, Loads, and Reactions p. 271
 - 4.3 Shear Forces and Bending Moments p. 276
 - 4.4 Relationships Between Loads, Shear Forces, and Bending Moments p. 284
 - 4.5 Shear-Force and Bending-Moment Diagrams p. 288

- Problems p. 302
- 5 Stresses in Beams (Basic Topics) p. 311
- 5.1 Introduction p. 311
- 5.2 Pure Bending and Nonuniform Bending p. 312
- 5.3 Curvature of a Beam p. 313
- 5.4 Longitudinal Strains in Beams p. 314
- 5.5 Normal Stresses in Beams (Linearly Elastic Materials) p. 320
- 5.6 Design of Beams for Bending Stresses p. 332
- 5.7 Nonprismatic Beams p. 341
- 5.8 Shear Stresses in Beams of Rectangular Cross Section p. 345
- 5.9 Shear Stresses in Beams of Circular Cross Section p. 354
- 5.10 Shear Stresses in the Webs of Beams with Flanges p. 358
- 5.11 Built-Up Beams and Shear Flow p. 366
- 5.12 Beams with Axial Loads p. 370
- 5.13 Stress Concentrations in Bending p. 376
- Problems p. 378
- 6 Stresses in Beams (Advanced Topics) p. 407
- 6.1 Introduction p. 407
- 6.2 Composite Beams p. 407
- 6.3 Transformed-Section Method p. 417
- 6.4 Doubly Symmetric Beams with Inclined Loads p. 423
- 6.5 Bending of Unsymmetric Beams p. 430
- 6.6 The Shear-Center Concept p. 435
- 6.7 Shear Stresses in Beams of Thin-Walled Open Cross Sections p. 438
- 6.8 Shear Stresses in Wide-Flange Beams p. 441
- 6.9 Shear Centers of Thin-Walled Open Sections p. 445
- 6.10 Elastoplastic Bending p. 454
- Problems p. 464
- 7 Analysis of Stress and Strain p. 479
- 7.1 Introduction p. 479
- 7.2 Plane Stress p. 480
- 7.3 Principal Stresses and Maximum Shear Stresses p. 489
- 7.4 Mohr's Circle for Plane Stress p. 498
- 7.5 Hooke's Law for Plane Stress p. 514
- 7.6 Triaxial Stress p. 519
- 7.7 Plane Strain p. 524
- Problems p. 539
- 8 Applications of Plane Stress (Pressure Vessels, Beams, and Combined Loadings) p. 557
- 8.1 Introduction p. 557
- 8.2 Spherical Pressure Vessels p. 557
- 8.3 Cylindrical Pressure Vessels p. 564
- 8.4 Maximum Stresses in Beams p. 572
- 8.5 Combined Loadings p. 582
- Problems p. 598
- 9 Deflections of Beams p. 609

- 9.1 Introduction p. 609
- 9.2 Differential Equations of the Deflection Curve p. 609
- 9.3 Deflections by Integration of the Bending-Moment Equation p. 615
- 9.4 Deflections by Integration of the Shear-Force and Load Equations p. 626
- 9.5 Method of Superposition p. 632
- 9.6 Moment-Area Method p. 641
- 9.7 Nonprismatic Beams p. 651
- 9.8 Strain Energy of Bending p. 656
- 9.9 Castigliano's Theorem p. 662
- 9.10 Deflections Produced by Impact p. 674
- 9.11 Temperature Effects p. 676
- Problems p. 678
- 10 Statically Indeterminate Beams p. 697
- 10.1 Introduction p. 697
- 10.2 Types of Statically Indeterminate Beams p. 698
- 10.3 Analysis by the Differential Equations of the Deflection Curve p. 701
- 10.4 Method of Superposition p. 708
- 10.5 Temperature Effects p. 721
- 10.6 Longitudinal Displacements at the Ends of a Beam p. 724
- Problems p. 728
- 11 Columns p. 739
- 11.1 Introduction p. 739
- 11.2 Buckling and Stability p. 740
- 11.3 Columns with Pinned Ends p. 743
- 11.4 Columns with Other Support Conditions p. 755
- 11.5 Columns with Eccentric Axial Loads p. 766
- 11.6 The Secant Formula for Columns p. 771
- 11.7 Elastic and Inelastic Column Behavior p. 777
- 11.8 Inelastic Buckling p. 779
- 11.9 Design Formulas for Columns p. 785
- Problems p. 798
- 12 Review of Centroids and Moments of Inertia p. 815
- 12.1 Introduction p. 815
- 12.2 Centroids of Plane Areas p. 816
- 12.3 Centroids of Composite Areas p. 819
- 12.4 Moments of Inertia of Plane Areas p. 822
- 12.5 Parallel-Axis Theorem for Moments of Inertia p. 825
- 12.6 Polar Moments of Inertia p. 828
- 12.7 Products of Inertia p. 830
- 12.8 Rotation of Axes p. 833
- 12.9 Principal Axes and Principal Moments of Inertia p. 835
- Problems p. 839
- References and Historical Notes p. 845
- Appendix A Systems of Units and Conversion Factors p. 853
- A.1 Systems of Units p. 853
- A.2 SI Units p. 854

- A.3 U.S. Customary Units p. 861
- A.4 Temperature Units p. 863
- A.5 Conversions Between Units p. 864
- Appendix B Problem Solving p. 867
- B.1 Types of Problems p. 867
- B.2 Steps in Solving Problems p. 868
- B.3 Dimensional Homogeneity p. 869
- B.4 Significant Digits p. 870
- B.5 Rounding of Numbers p. 872
- Appendix C Mathematical Formulas p. 873
- Appendix D Properties of Plane Areas p. 877
- Appendix E Properties of Structural-Steel Shapes p. 883
- Appendix F Properties of Structural Lumber p. 889
- Appendix G Deflections and Slopes of Beams p. 891
- Appendix H Properties of Materials p. 897
- Answers to Problems p. 903
- Name Index p. 919
- Subject Index p. 921