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2.7 Circulation and Rotationality in Flows; 2.8 Irrotational Flows and Velocity Potential; 2.9 Stream Function and Vector Potential; 2.10 Governing Equation for Irrotational Flows; 2.11 Kelvin's Theorem and Irrotationality; 2.12 Bernoulli's Equation: Relation of Pressure and Velocity; 2.13 Applications of Bernoulli's Equation: Air Speed Indicator; 2.13.1 Aircraft Speed Measurement
2.13.2 The Pressure Coefficient2.13.3 Compressibility Correction for Air Speed Indicator; 2.14 Viscous Effects and Boundary Layers; 2.15 Thermodynamics and Reynolds Transport Theorem; 2.16 Reynolds Transport Theorem; 2.17 The Energy Equation; 2.17.1 The Steady Flow Energy Equation; 2.18 Energy Conservation Equation; 2.19 Alternate Forms of Energy Equation; 2.20 The Energy Equation in Conservation Form; 2.21 Strong Conservation and Weak Conservation Forms; 2.22 Second Law of Thermodynamics and Entropy; 2.23 Propagation of Sound and Mach Number; 2.24 One-Dimensional Steady Flow
2.25 Normal Shock Relation for Steady Flow2.26 Rankine--Hugoniot Relation; 2.27 Prandtl or Meyer Relation; 2.28 Oblique ShockWaves; 2.29 Weak Oblique Shock; 2.30 Expansion of Supersonic Flows; Bibliography; 3 Theoretical Aerodynamics of Potential Flows; 3.1 Introduction; 3.2 Preliminaries of Complex Analysis for 2D Irrotational Flows: Cauchy--Riemann Relations; 3.2.1 Cauchy's Residue Theorem; 3.2.2 Complex Potential and Complex Velocity; 3.3 Elementary Singularities in Fluid Flows; 3.3.1 Superposing Solutions of Irrotational Flows; 3.4 Blasius' Theorem: Forces and Moment for Potential Flows
3.4.1 Force Acting on a Vortex in a Uniform Flow

Sommario/riassunto

Theoretical and Computational Aerodynamics is acomprehensive textbook covering classical aerodynamic theories and recent applications made possible by computational aerodynamics. Logically ordered for use in courses, the first seven chapters deal with classical methods of analysis up to the panel method and boundary layer solutions. The rest of the book is devoted to aspects of flow past aerodynamic surfaces from computational aspects to natural laminar flow (NLF) airfoils; transonic flows; flow control by active and passive devices. There is also a chapter devoted to low Reynolds number ae