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Nota di contenuto	Electrical Conduction in Graphene and Nanotubes; Contents; Preface; Physical Constants, Units, Mathematical Signs and Symbols; 1 Introduction; 1.1 Carbon Nanotubes; 1.2 Theoretical Background; 1.2.1 Metals and Conduction Electrons; 1.2.2 Quantum Mechanics; 1.2.3 Heisenberg Uncertainty Principle; 1.2.4 Bosons and Fermions; 1.2.5 Fermi and Bose Distribution Functions; 1.2.6 Composite Particles; 1.2.7 Quasifree Electron Model; 1.2.8 "Electrons" and "Holes"; 1.2.9 The Gate Field Effect; 1.3 Book Layout; 1.4 Suggestions for Readers; 1.4.1 Second Quantization 1.4.2 Semi-classical Theory of Electron Dynamics 1.4.3 Fermi Surface; References; 2 Kinetic Theory and the Boltzmann Equation; 2.1 Diffusion and Thermal Conduction; 2.2 Collision Rate: Mean Free Path; 2.3 Electrical Conductivity and Matthiessen's Rule; 2.4 The Hall Effect: "Electrons" and "Holes"; 2.5 The Boltzmann Equation; 2.6 The Current Relaxation Rate; References; 3 Bloch Electron Dynamics; 3.1 Bloch Theorem in One Dimension; 3.2 The Kronig-Penney Model; 3.3 Bloch Theorem in Three Dimensions; 3.4 Fermi Liquid Model; 3.5 The Fermi Surface; 3.6 Heat Capacity and Density of States 3.7 The Density of State in the Momentum Space 3.8 Equations of

Motion for a Bloch Electron; References; 4 Phonons and Electron-Phonon Interaction; 4.1 Phonons and Lattice Dynamics; 4.2 Van Hove Singularities; 4.2.1 Particles on a Stretched String (Coupled Harmonic Oscillators); 4.2.2 Low-Frequency Phonons; 4.2.3 Discussion; 4.3 Electron-Phonon Interaction; 4.4 Phonon-Exchange Attraction; References; 5 Electrical Conductivity of Multiwalled Nanotubes; 5.1 Introduction; 5.2 Graphene; 5.3 Lattice Stability and Reflection Symmetry; 5.4 Single-Wall Nanotubes; 5.5 Multiwalled Nanotubes
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7.8.8 Blurred Fermi Surface

Sommario/riassunto

Written in a self-contained manner, this textbook allows both advanced students and practicing applied physicists and engineers to learn the relevant aspects from the bottom up. All logical steps are laid out without omitting steps.The book covers electrical transport properties in carbon based materials by dealing with statistical mechanics of carbon nanotubes and graphene presenting many fresh and sometimes provoking views. Both second quantization and superconductivity are covered and discussed thoroughly. An extensive list of references is given in the end of each chapter, while