

1. Record Nr.	UNINA9910453231303321
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Titolo	Diagrammatics [[electronic resource]] : lectures on selected problems in condensed matter theory // Michael V. Sadovskii
Pubbl/distr/stampa	Singapore ; ; Hackensack, NJ, : World Scientific, c2006
ISBN	1-281-91942-X 9786611919429 981-277-436-X
Descrizione fisica	1 online resource (359 p.)
Disciplina	530.4/1
Soggetti	Condensed matter Quantum field theory Feynman diagrams Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Preface; Contents; 1 Introduction; 1.1 Quasiparticles and Green's functions; 1.2 Diagram technique. Dyson equation; 1.3 Green's functions at finite temperatures; 2 Electron-Electron Interaction; 2.1 Diagram rules; 2.2 Electron gas with Coulomb interaction; 2.3 Polarization operator of free electron gas at $T = 0$; 2.4 Dielectric function of an electron gas; 2.5 Electron self-energy effective mass and damping of quasiparticles; 2.6 RKKY-oscillations; 2.7 Linear response; 2.8 Microscopic foundations of Landau-Silin theory of Fermi-liquids; 2.9 Interaction of quasiparticles in Fermi-liquid 2.10 Non-Fermi-liquid behavior 3 Electron-Phonon Interaction; 3.1 Diagram rules; 3.2 Electron self-energy; 3.3 Migdal theorem; 3.4 Self-energy and spectrum of phonons; 3.5 Plasma model; 3.6 Phonons and fluctuations; 4 Electrons in Disordered Systems; 4.1 Diagram technique for "impurity" scattering; 4.2 Single-electron Green's function; 4.3 Keldysh model; 4.4 Conductivity and two-particle Green's function; 4.5 Bethe-Salpeter equation "diffuson" and "Cooperon"; 4.6 Quantum corrections self-consistent theory of localization and Anderson transition; 4.6.1 Quantum corrections to conductivity

4.6.1.1 Technical details 4.6.1.2 "Poor man" interpretation of quantum corrections; 4.6.2 Self-Consistent Theory of Localization; 4.6.2.1 Metallic phase; 4.6.2.2 Anderson insulator; 4.6.2.3 Frequency dispersion of the generalized diffusion coefficient; 4.7 "Triangular" vertex; 4.8 The role of electron-electron interaction; 5 Superconductivity; 5.1 Cooper instability; 5.2 Gorkov equations; 5.3 Superconductivity in disordered metals; 5.4 Ginzburg-Landau expansion; 5.5 Superconductors in electromagnetic field; 6 Electronic Instabilities and Phase Transitions; 6.1 Phonon spectrum instability 6.2 Peierls dielectric 6.3 Peierls dielectric with impurities; 6.4 Ginzburg-Landau expansion for Peierls transition; 6.5 Charge and spin density waves in multi-dimensional systems. Excitonic insulator; 6.6 Pseudogap; 6.6.1 Fluctuations of Peierls short-range order; 6.6.2 Electron in a random field of fluctuations; 6.6.3 Electromagnetic response; 6.7 Tomonaga-Luttinger model and non Fermi-liquid behavior; Appendix A Fermi Surface as Topological Object; Appendix B Electron in a Random Field and Feynman Path Integrals; Bibliography

Sommario/riassunto

The introduction of quantum field theory methods has led to a kind of "revolution" in condensed matter theory. This resulted in the increased importance of Feynman diagrams or diagram technique. It has now become imperative for professionals in condensed matter theory to have a thorough knowledge of this method. There are many good books that cover the general aspects of diagrammatic methods. At the same time, there has been a rising need for books that describe calculations and methodical "know how" of specific problems for beginners in graduate and postgraduate courses. This unique collection
