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Nota di contenuto	QUANTUM FIELD THEORY; Contents; Preface; Acknowledgment; 1. Introducing Quantum Fields; 1.1. The Classical String; 1.2. The Quantum String; 1.3. Second Quantization; 1.4. Creation and Annihilation Operators; 1.5. Bose and Fermi Statistics; Problems; References; 2. Scalar Fields; 2.1. Klein-Gordon Equation; 2.2. Real Scalar Field; 2.3. Energy and Momentum; 2.4. Particle Spectrum; 2.5. Continuum Normalization; 2.6. Complex Scalar Field; 2.7. Charge and Antiparticle; 2.8. Microcausality; 2.9. The Feynman Propagator; 2.10. The Wave Functional; 2.11. Functional Operations 2.12. Vacuum Wave Functional2.13. The 4 Theory; Problems; 3. Relativistic Fields; 3.1. Lorentz Transformations; 3.2. Minimal Representation: SL(2C); 3.3. The Poincare Group; 3.4. Scalar, Vector, and Spinor Fields; 3.5. Relativistic Quantum Fields; 3.6. One-Particle States; Problems; Reference; 4. Canonical Formalism; 4.1. Principle of Stationary Action; 4.2. Noether's Theorem; 4.3. Translational Invariance; 4.4. Lorentz Invariance; 4.5. Symmetrized Energy-Momentum Tensor; 4.6. Gauge Invariance; Problems; Reference; 5. Electromagnetic Field; 5.1. Maxwell's Equations

5.2. Covariance of the Classical Theory; 5.3. Canonical Formalism; 5.4. Quantization in Coulomb Gauge; 5.5. Spin Angular Momentum; 5.6. Intrinsic Parity; 5.7. Transverse Propagator; 5.8. Vacuum Fluctuations; 5.9. The Casimir Effect; 5.10. The Gauge Principle; Problems; References; 6. Dirac Equation; 6.1. Dirac Algebra; 6.2. Wave Functions and Current Density; 6.3. Plane Waves; 6.4. Lorentz Transformations; 6.5. Interpretation of Dirac Matrices; 6.6. External Electromagnetic Field; 6.7. Nonrelativistic Limit; 6.8. Thomas Precession; 6.9. Hole Theory; 6.10. Charge Conjugation; 6.11. Massless Particles; Problems; References; 7. The Dirac Field; 7.1. Quantization of the Dirac Field; 7.2. Feynman Propagator; 7.3. Normal Ordering; 7.4. Electromagnetic Interactions; 7.5. Isospin; 7.6. Parity; 7.7. Charge Conjugation; 7.8. Time Reversal; Problems; Reference; 8. Dynamics of Interacting Fields; 8.1. Time Evolution; 8.2. Interaction Picture; 8.3. Adiabatic Switching; 8.4. Correlation Functions in the Interaction Picture; 8.5. S Matrix and Scattering; 8.6. Scattering Cross Section; 8.7. Potential Scattering; 8.8. Adiabatic Theorem; Problems; References.; 9. Feynman Graphs; 9.1. Perturbation Theory; 9.2. Time-Ordered and Normal Products; 9.3. Wick's Theorem; 9.4. Feynman Rules for Scalar Theory; 9.5. Types of Feynman Graphs; 9.5.1. Vacuum Graph; 9.5.2. Self-Energy Graph; 9.5.3. Connected Graph; 9.6. Wick Rotation; 9.7. Regularization Schemes; 9.8. Linked-Cluster Theorem; 9.9. Vacuum Graphs; Problems; Reference.; 10. Vacuum Correlation Functions; 10.1. Feynman Rules; 10.2. Reduction Formula; 10.3. The Generating Functional; 10.4. Connected Correlation Functions; 10.5. Lehmann Representation; 10.6. Dyson-Schwinger Equations; 10.7. Bound States; 10.8. Bethe-Salpeter Equation

Sommario/riassunto

A unique approach to quantum field theory, with emphasis on the principles of renormalization Quantum field theory is frequently approached from the perspective of particle physics. This book adopts a more general point of view and includes applications of condensed matter physics. Written by a highly respected writer and researcher, it first develops traditional concepts, including Feynman graphs, before moving on to key topics such as functional integrals, statistical mechanics, and Wilson's renormalization group. The connection between the latter and conventional perturbative renormalization