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Path Integrals and Quantum Mechanics; 2.1 Basis States; 2.2 Operator Ordering; 2.3 The Classical Limit; 2.4 Equivalence with the Schrodinger Equation; 2.5 Free Particle; 2.6 References; 3. Harmonic Oscillator; 3.1 Path Integral for the Harmonic Oscillator; 3.2 Method of Fourier Transform; 3.3 Matrix Method; 3.4 The Classical Action; 3.5 References; 4. Generating Functional
4.1 Euclidean Rotation4.2 Time Ordered Correlation Functions; 4.3 Correlation Functions in Definite States; 4.4 Vacuum Functional; 4.5 Anharmonic Oscillator; 4.6 References; 5. Path Integrals for Fermions; 5.1 Fermionic Oscillator; 5.2 Grassmann Variables; 5.3 Generating Functional; 5.4 Feynman Propagator; 5.5 The Fermion Determinant; 5.6 References; 6. Supersymmetry; 6.1 Supersymmetric Oscillator; 6.2 Supersymmetric Quantum Mechanics; 6.3 Shape Invariance; 6.4 Example; 6.5 Supersymmetry and Singular Potentials; 6.6 References; 7. Semi-Classical Methods; 7.1 WKB Approximation
7.2 Saddle Point Method7.3 Semi-Classical Methods in Path Integrals; 7.4 Double Well Potential; 7.5 References; 8. Path Integral for the Double Well; 8.1 Instantons; 8.2 Zero Modes; 8.3 The Instanton Integral; 8.4 Evaluating the Determinant; 8.5 Multi-Instanton Contributions; 8.6 References; 9. Path Integral for Relativistic Theories; 9.1 Systems with Many Degrees of Freedom; 9.2 Relativistic Scalar Field Theory; 9.3 Feynman Rules; 9.4 Connected Diagrams; 9.5 References; 10. Effective Action; 10.1 The Classical Field; 10.2 Effective Action; 10.3 Loop Expansion
10.4 Effective Potential at One Loop10.5 References; 11. Invariances and Their Consequences; 11.1 Symmetries of the Action; 11.2 Noether's Theorem; 11.3 Complex Scalar Field; 11.4 Ward Identities; 11.5 Spontaneous Symmetry Breaking; 11.6 Goldstone Theorem; 11.7 References; 12. Gauge Theories; 12.1 Maxwell Theory; 12.2 Non-Abelian Gauge Theory; 12.3 Path Integral for Gauge Theories; 12.4 BRST Invariance; 12.5 Ward Identities; 12.6 References; 13. Anomalies; 13.1 Anomalous Ward Identity; 13.2 Schwinger Model; 13.3 References; 14. Systems at Finite Temperature; 14.1 Statistical Mechanics
14.2 Critical Exponents14.3 Harmonic Oscillator; 14.4 Fermionic Oscillator; 14.5 References; 15. Ising Model; 15.1 One Dimensional Ising Model; 15.2 The Partition Function; 15.3 Two Dimensional Ising Model; 15.4 Duality; 15.5 High and Low Temperature Expansions; 15.6 Quantum Mechanical Model; 15.7 Duality in the Quantum System; 15.8 References; Index

Sommario/riassunto

This unique book describes quantum field theory completely within the context of path integrals. With its utility in a variety of fields in physics, the subject matter is primarily developed within the context of quantum mechanics before going into specialized areas.Adding new material keenly requested by readers, this second edition is an important expansion of the popular first edition. Two extra chapters cover path integral quantization of gauge theories and anomalies, and a new section extends the supersymmetry chapter, where singular potentials in supersymmetric systems are described.