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Nota di contenuto	1. Historical survey -- 1.1. Development from 1817 to 1926 -- 1.2. Development after 1926 -- 2. Description of the phase-integral method -- 2.1. Form of the wave function and the q-equation -- 2.2. Phase-integral approximation generated from an unspecified base function -- 2.3. F-matrix method -- 2.4. F-matrix connecting points on opposite sides of a well-isolated turning point, and expressions for the wave function in these regions -- 2.5. Phase-integral connection formulas for a real, smooth, single-hump potential barrier -- 3. Problems with solutions -- 3.1. Base function for the radial Schrodinger equation when the physical potential has at the most a Coulomb singularity at the origin -- 3.2. Base function and wave function close to the origin when the physical potential is repulsive and strongly singular at the origin -- 3.3. Reflectionless potential -- 3.4. Stokes and

3.29. Displacement of the energy levels due to compression of an atom (simple treatment) -- 3.30. Displacement of the energy levels due to compression of an atom (alternative treatment) -- 3.31. Quantization condition for a particle in a smooth potential well, limited on one side by an impenetrable wall and on the other side by a smooth, infinitely thick potential barrier, and in particular for a particle in a uniform gravitational field limited from below by an impenetrable plane surface -- 3.32. Energy spectrum of a non-relativistic particle in a potential proportional to cot[superscript 2]([chi]/a[subscript 0]), where 0 < [chi]/a[subscript 0] < [pi] and a[subscript 0] is a quantity with the dimension of length, e.g. the Bohr radius -- 3.33. Determination of a one-dimensional, smooth, single-well potential from the energy spectrum of the bound states -- 3.34. Determination of a radical, smooth, single-well potential from the energy spectrum of the bound states -- 3.35. Determination of the radial, single-well potential, when the energy eigenvalues are -mZ[superscript 2]e[superscript 4]/[2[actual symbol not reproducible][superscript 2]([iota]+s+1)[superscript 2]], where [iota] is the angular momentum quantum number, and s is the radial quantum number -- 3.36. Exact formula for the normalization integral for the wave function pertaining to a bound state of a particle in a radial potential -- 3.37. Phase-integral formula for the normalized radial wave function pertaining to a bound state of a particle in a radial single-well potential -- 3.38. Radial wave function [psi](z) for as s-electron in a classically allowed region containing the origin, when the potential near the origin is dominated by a strong, attractive Coulomb singularity, and the normalization factor is chosen such that, when the radial variable z is dimensionless, [psi](z)/z tends to unity as z tends to zero -- 3.39. Quantization condition, and value of the normalized wave function at the origin expressed in terms of the level density, for as s-electron in a single-well potential with a strong attractive Coulomb singularity at the origin -- 3.40. Expectation value of an unspecified function f(z) for a non-relativistic particle in a bound state -- 3.41. Some cases in which the phase-integral expectation value formula yields the expectation value exactly in the first-order approximation -- 3.42. Expectation value of the kinetic energy of a non-relativistic particle in a bound state. Verification of the virial theorem -- 3.43. Phase-integral calculation of quantal matrix elements -- 3.44. Connection formula for a complex potential barrier -- 3.45. Connection formula for a real, single-hump potential barrier -- 3.46. Energy levels of a particle in a smooth double-well potential, when no symmetry requirement is imposed -- 3.47. Energy levels of a particle in a smooth, symmetric, double-well potential -- 3.48. Determination of the quasi-stationary energy levels of a particle in a radial potential with a thick single-hump barrier -- 3.49.
Transmission coefficient for a particle penetrating a real single-hump potential barrier -- 3.50. Transmission coefficient for a particle penetrating a real, symmetric, superdense double-hump potential barrier.

Sommario/riassunto

This book provides a thorough introduction to one of the most efficient approximation methods for the analysis and solution of problems in theoretical physics and applied mathematics. It is written with practical needs in mind and contains a discussion of 50 problems with solutions, of varying degrees of difficulty. The problems are taken from quantum mechanics, but the method has important applications in any field of science involving second order ordinary differential equations. The power of the asymptotic solution of second order differential equations is demonstrated, and in each case the authors clearly indicate which concepts and results of the general theory are needed to solve a

particular problem. This book will be ideal as a manual for users of the phase-integral method, as well as a valuable reference text for experienced research workers and graduate students.