

Preface

The collection of problems contained in this book has a common origin: it has been selected from written examinations, given over the years to students of the course entitled "Theoretical Physics", at the University of Pisa. These problems are presented here together with worked-out solutions.

The Appendices establish standard notation and provide some commonly used formulae in relativistic kinematics, group theory, theory of scattering and decay, relativistic wave equations, γ -matrix algebra.

Approximately one half of the problems cover aspects of Elementary Particle Physics, while the rest range over Atomic Physics, Potential Theory, Field Theory and Physics of Nuclei. Some necessary instruments for the solutions are theory of scattering and decay, relativistic quantum mechanics, second quantization and elementary perturbative field theory.

Each examination comprises three problems, of which the candidate must solve one. Statistically, one student out of ten answers correctly all questions, seven answer two questions (from a total of three or four), and the rest turn in insufficient solutions.

The course attaches great importance to recitation sessions, where thorough problem solving becomes a true test of mastery over theoretical background.

Theoretical Physics has been taught for approximately 20 years by one of the authors (A. Di Giacomo). Recitations were held in the past by G. Paffuti and P. Rossi, and more recently by Haris Panagopoulos, for several years.

This book is translated from the original Italian edition *Problemi di Fisica Teorica*, A. Di Giacomo, G. Paffuti, P. Rossi, E.T.S. Pisa 1992. The authors are grateful to H. Panagopoulos for his collaboration in preparing the English version.