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Nota di contenuto	Part I: Green’s functions in singularly perturbed domains: Uniform asymptotic formulae for Green’s functions for the Laplacian in domains with small perforations -- Mixed and Neumann boundary conditions for domains with small holes and inclusions. Uniform asymptotics of Green’s kernels -- Green’s function for the Dirichlet boundary value problem in a domain with several inclusions -- Numerical simulations based on the asymptotic approximations -- Other examples of asymptotic approximations of Green’s functions in singularly perturbed domains -- Part II: Green’s tensors for vector elasticity in bodies with small defects: Green’s tensor for the Dirichlet boundary value problem in a domain with a single inclusion -- Green’s tensor in bodies with multiple rigid inclusions -- Green’s tensor for the mixed boundary value problem in a domain with a small hole -- Part III Meso-scale approximations. Asymptotic treatment of perforated domains without homogenization: Meso-scale approximations for solutions of Dirichlet problems -- Mixed boundary value problems in multiply-perforated domains.
Sommario/riassunto	There are a wide range of applications in physics and structural mechanics involving domains with singular perturbations of the

boundary. Examples include perforated domains and bodies with defects of different types. The accurate direct numerical treatment of such problems remains a challenge. Asymptotic approximations offer an alternative, efficient solution. Green's function is considered here as the main object of study rather than a tool for generating solutions of specific boundary value problems. The uniformity of the asymptotic approximations is the principal point of attention. We also show substantial links between Green's functions and solutions of boundary value problems for meso-scale structures. Such systems involve a large number of small inclusions, so that a small parameter, the relative size of an inclusion, may compete with a large parameter, represented as an overall number of inclusions. The main focus of the present text is on two topics: (a) asymptotics of Green's kernels in domains with singularly perturbed boundaries and (b) meso-scale asymptotic approximations of physical fields in non-periodic domains with many inclusions. The novel feature of these asymptotic approximations is their uniformity with respect to the independent variables. This book addresses the needs of mathematicians, physicists and engineers, as well as research students interested in asymptotic analysis and numerical computations for solutions to partial differential equations.