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Applications Of Complex Variables In Engineering

KASANA, H.S.



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Applications of Vector Analysis and Complex Variables in Engineering Otto D. L. Strack, 2020-04-18 This textbook presents the application of mathematical methods and theorems to solve engineering problems rather than focusing on mathematical proofs. Applications of Vector Analysis and Complex Variables in Engineering explains the mathematical principles in a manner suitable for engineering students who generally think quite differently than students of mathematics. The objective is to emphasize mathematical methods and applications rather than emphasizing general theorems and principles for which the reader is referred to the literature. Vector analysis plays an important role in engineering and is presented in terms of indicial notation making use of the Einstein summation convention. This text differs from most texts in that symbolic vector notation is completely avoided as suggested in the textbooks on tensor algebra and analysis written in German by Duschek and Hochreiner in the 1960s. The defining properties of vector fields, the divergence and curl, are introduced in terms of fluid mechanics. The integral theorems of Gauss, the divergence theorem, Stokes, and Green are introduced also in the context of fluid mechanics. The final application of vector analysis consists of the introduction of non-Cartesian coordinate systems with straight axes, the formal definition of vectors and tensors. The stress and strain tensors are defined as an application. Partial differential equations of the first and second order are discussed. Two-dimensional linear partial differential equations of the second order are covered, emphasizing the three types of equation: hyperbolic, parabolic, and elliptic. The hyperbolic partial differential equations have two real characteristic directions, and writing the equations along these directions simplifies the solution process. The parabolic partial differential equations have two coinciding characteristics; this gives useful information regarding the character of the equation but does not help in solving problems. The elliptic partial differential equations do not have real characteristics. In contrast to most texts, rather than abandoning the idea of using characteristics, here the complex characteristics are determined, and the differential equations are written along these characteristics. This leads to a generalized complex variable system introduced by Wirtinger. The vector field is written in terms of a complex velocity, and the divergence and the curl of the vector field is written in complex form, reducing both equations to a single one. Complex variable methods are applied to elliptical problems in fluid mechanics and linear elasticity. The techniques presented for solving parabolic problems are the Laplace transform and separation of variables, illustrated for problems of heat flow and soil mechanics. Hyperbolic problems of vibrating strings and bars governed by the wave equation are solved by the method of characteristics as well as by Laplace transform. The method of characteristics for quasi-linear hyperbolic partial differential equations is illustrated for the case of a failing granular material such as sand underneath a strip footing. The Navier-Stokes equations are derived and discussed in the final chapter as an illustration of a highly non-linear set of partial differential equations, and the solutions are interpreted by illustrating the role of rotation, curl, in energy transfer of a fluid.

Complex Variables with Applications A. David Wunsch, 1995-06 Complex Variables and Their

Applications Anthony D. Osborne, 1999 An understanding of functions of a complex variable together with the importance of their applications form an essential part of the study of mathematics Complex Variables and their Applications assumes as little background knowledge of the reader as is practically possible a sound knowledge of calculus and basic real analysis being the only essential pre requisites With an emphasis on clear and careful explanation the book covers all the essential topics covered in a first course on Complex Variables such as differentiation integration and applications Laurent series residue theory and applications and elementary conformal mappings The reader is also introduced to the Schwarz Christoffel transformation Dirchlet problems harmonic functions analytic continuation infinite products asymptotic series and elliptic functions Applications of complex variable theory to linear ordinary differential equations and integral transforms are also included Complex Variables and their Applications is an ideal textbook and resource for second and final year students of mathematics engineering and physics Applied Complex Variables for Scientists and Engineers Yue Kuen

Kwok, 2002-02-07 This is an introduction to complex variable methods for scientists and engineers It begins by carefully defining complex numbers and analytic functions and proceeds to give accounts of complex integration Taylor series singularities residues and mappings Both algebraic and geometric tools are employed to provide the greatest understanding with many diagrams illustrating the concepts introduced The emphasis is laid on understanding the use of methods rather than on rigorous proofs One feature that will appeal to scientists is the high proportion of the book devoted to applications of the material to physical problems These include detailed treatments of potential theory hydrodynamics electrostatics gravitation and the uses of the Laplace transform for partial differential equations The text contains some 300 stimulating exercises of high quality with solutions given to many of them It will be highly suitable for students wishing to learn the elements of complex analysis in an applied context *Fundamentals of Complex Analysis with Applications to Engineering and Science (Classic Version)* Edward Saff, Arthur Snider, 2017-02-13 This title is part of the Pearson Modern Classics series

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Steven G. Krantz, 2007-09-19 From the algebraic properties of a complete number field to the analytic properties imposed by the Cauchy integral formula to the geometric qualities originating from conformality Complex Variables A Physical Approach with Applications and MATLAB explores all facets of this subject with particular emphasis on using theory in practice The first five chapters encompass the core material of the book These chapters cover fundamental concepts holomorphic and

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Mathematical Methods for Physics and Engineering K. F.

Riley, M. P. Hobson, S. J. Bence, 2006-03-13 The third edition of this highly acclaimed undergraduate textbook is suitable for teaching all the mathematics for an undergraduate course in any of the physical sciences As well as lucid descriptions of all the topics and many worked examples it contains over 800 exercises New stand alone chapters give a systematic account of the special functions of physical science cover an extended range of practical applications of complex variables and give an introduction to quantum operators Further tabulations of relevance in statistics and numerical integration have been added In this edition half of the exercises are provided with hints and answers and in a separate manual available to both students and their teachers complete worked solutions The remaining exercises have no hints answers or worked solutions and can be used for unaided homework full solutions are available to instructors on a password protected web site www.cambridge.org 9780521679718 *Functions of a Complex Variable* George F. Carrier, Max Krook, Carl E. Pearson, 2005-07-01 This book

makes available to readers a comprehensive range of analytical techniques based upon complex variable theory **Complex Variables and Applications** Ruel V. Churchill, James Ward Brown, 1990 **Fundamentals of Complex Analysis with Applications to Engineering, Science, and Mathematics** Edward B. Saff, Arthur David Snider, 2013-08-29 This is the best seller in this market It provides a comprehensive introduction to complex variable theory and its applications to current engineering problems It is designed to make the fundamentals of the subject more easily accessible to students who have little inclination to wade through the rigors of the axiomatic approach Modeled after standard calculus books both in level of exposition and layout it incorporates physical applications throughout the presentation so that the mathematical methodology appears less sterile to engineering students The full text downloaded to your computer With eBooks you can search for key concepts words and phrases make highlights and notes as you study share your notes with friends eBooks are downloaded to your computer and accessible either offline through the Bookshelf available as a free download available online and also via the iPad and Android apps Upon purchase you ll gain instant access to this eBook Time limit The eBooks products do not have an expiry date You will continue to access your digital ebook products whilst you have your Bookshelf installed

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