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fundamental introduction of absolute differential calculus and for those interested in applications of tensor calculus to

mathematical physics and engineering topics include spaces and tensors basic operations in riemannian space curvature of space more

examines general cartesian coordinates the cross product einstein s special theory of relativity bases in general coordinate systems maxima and minima of functions of two variables line integrals integral theorems and more 1963 edition

concise readable text ranges from definition of vectors and discussion of algebraic operations on vectors to the concept of tensor and algebraic operations on tensors worked out problems and solutions 1968 edition

this elementary introduction pays special attention to aspects of tensor calculus and relativity that students tend to find most difficult its use of relatively unsophisticated mathematics in the early chapters allows readers to develop their confidence within the framework of cartesian coordinates before undertaking the theory of tensors in curved spaces and its application to general relativity theory topics include the special principle of relativity and lorentz transformations orthogonal transformations and cartesian tensors special relativity mechanics and electrodynamics general tensor calculus and riemannian space and the general theory of relativity including a focus on black holes and gravitational waves the text concludes with a chapter offering a sound background in applying the principles of general relativity to cosmology numerous exercises advance the theoretical developments of the main text thus enhancing this volume s appeal to students of applied mathematics and physics at both undergraduate and postgraduate levels preface list of constants references bibliography

remarkably comprehensive concise and clear industrial laboratories considered as a condensed text in the classical manner the book can well be recommended nature here is a clear introduction to classic vector and tensor analysis for students of engineering and mathematical physics chapters range from elementary operations and applications of geometry to application of vectors to mechanics partial differentiation integration and tensor analysis more than 200 problems are included throughout the book

this volume offers a working knowledge of the fundamentals of matrix and tensor calculus relevant to several fields particularly aeronautical engineering the text skillfully combines mathematical statements with practical applications 1947 edition

revised and updated throughout this book presents the fundamental concepts of vector and tensor analysis with their corresponding physical and geometric applications emphasizing the development of computational skills and basic procedures and exploring highly complex and technical topics in simplified settings this text incorporates transformation of rectangular cartesian coordinate systems and the invariance of the gradient divergence and the curl into the discussion of tensors combines the test for independence of path and the path independence sections offers new examples and figures that demonstrate computational methods as well as clarify concepts introduces subtitles in each section to highlight the appearance of new topics provides definitions and theorems in boldface type for easy identification it also contains numerical exercises of varying levels of difficulty and many problems solved

this book presents tensors and tensor analysis as primary mathematical tools for engineering and engineering science students and researchers the discussion is based on the concepts of vectors and vector analysis in three dimensional euclidean space and although it takes the subject matter to an advanced level the book starts with elementary geometrical vector algebra so that it is suitable as a first introduction to tensors and tensor analysis each chapter includes a number of problems for readers to solve and solutions are provided in an appendix at the end of the text chapter 1 introduces the necessary mathematical foundations for the chapters that follow while chapter 2 presents the equations of motions for bodies of continuous material chapter 3 offers a general definition of tensors and tensor fields in three dimensional euclidean space chapter 4 discusses a new family of tensors related to the deformation of continuous material chapter 5 then addresses constitutive equations for elastic materials and viscous fluids which are presented as tensor equations relating the tensor concept of stress to the tensors describing deformation rate of deformation and rotation chapter 6 investigates general coordinate systems in three dimensional euclidean space and chapter 7 shows how the tensor equations discussed in chapters 4 and 5 are presented in general coordinates chapter 8 describes surface geometry in three dimensional euclidean space chapter 9 includes the most common integral theorems in two and three dimensional euclidean space applied in continuum mechanics and mathematical physics

tensor calculus is a generalization of vector calculus and comes near of being a universal language in physics physical laws must be independent of any particular coordinate system used in describing them this requirement leads to tensor calculus the only prerequisites for reading this book are a familiarity with calculus including vector calculus and linear algebra and some knowledge of differential equations

through several centuries there has been a lively interaction between mathematics and mechanics on the one side mechanics has used mathematics to formulate the basic laws and to apply them to a host of problems that call for the quantitative prediction of the consequences of some action on the other side the needs of mechanics have stimulated the development of mathematical concepts differential calculus grew out of the needs of newtonian dynamics vector algebra was developed as a means to describe force systems vector analysis to study velocity fields and force fields and the calculus of variations has evolved from the energy principles of mechanics in recent times the theory of tensors has attracted the attention of the mechanics people its very name indicates its origin in the theory of elasticity for a long time little use has been made of it in this area but in the last decade its usefulness in the mechanics of continuous media has been widely recognized while the undergraduate textbook literature in this country was becoming vectorized lagging almost half a century behind the development in europe books dealing with various aspects of continuum mechanics took to tensors like fish to water since many authors were not sure whether their readers were sufficiently familiar with tensors they either added a chapter on tensors or wrote a separate book on the subject

provides a brief introduction and history of tensors followed by the study of systems of different orders einstein summation convention kronecker symbol leading to the concepts of tensor algebra and tensor calculus the authors conclude with a study in riemannian geometry

the subject of tensor analysis deals with the problem of the formulation of the relation between various entities in forms which remain invariant when we pass from one system of coordinates to another the invariant form of equation is necessarily related to the possible system of coordinates with reference to which the equation remains invariant the primary purpose of this book is the study of the invariance form of equation relative to the totality of the rectangular coordinate system in the three dimensional euclidean space we start with the consideration of the way the sets representing various entities are transformed when we pass from one system of rectangular coordinates to another a tensor may be a physical entity that can be described as a tensor only with respect to the manner of its representation by means of multi sets associated with different system of axes such that the sets associated with different system of coordinate obey the transformation law for tensor we have employed s_{ij} notation for tensors of any order we could also employ single letter such as a or b to denote tensors

there is a large gap between engineering courses in tensor algebra on one hand and the treatment of linear transformations

within classical linear algebra on the other this book addresses primarily engineering students with some initial knowledge of matrix algebra thereby mathematical formalism is applied as far as it is absolutely necessary numerous exercises provided in the book are accompanied by solutions enabling autonomous study the last chapters deal with modern developments in the theory of isotropic and anisotropic tensor functions and their applications to continuum mechanics and might therefore be of high interest for phd students and scientists working in this area

illustrating the important aspects of tensor calculus and highlighting its most practical features physical components of tensors presents an authoritative and complete explanation of tensor calculus that is based on transformations of bases of vector spaces rather than on transformations of coordinates written with graduate students professors and researchers in the areas of elasticity and shell theories in mind this text focuses on the physical and nonholonomic components of tensors and applies them to the theories it establishes a theory of physical and anholonomic components of tensors and applies the theory of dimensional analysis to tensors and anholonomic connections this theory shows the relationship and compatibility among several existing definitions of physical components of tensors when referred to nonorthogonal coordinates the book assumes a basic knowledge of linear algebra and elementary calculus but revisits these subjects and introduces the mathematical backgrounds for the theory in the first three chapters in addition all field equations are also given in physical components as well comprised of five chapters this noteworthy text deals with the basic concepts of linear algebra introducing the vector spaces and the further structures imposed on them by the notions of inner products norms and metrics focuses on the main algebraic operations for vectors and tensors and also on the notions of duality tensor products and component representation of tensors presents the classical tensor calculus that functions as the advanced prerequisite for the development of subsequent chapters provides the theory of physical and anholonomic components of tensors by associating them to the spaces of linear transformations and of tensor products and advances two applications of this theory physical components of tensors contains a comprehensive account of tensor calculus and is an essential reference for graduate students or engineers concerned with solid and structural mechanics

part i rigorous presentation of tensor calculus as a development of vector analysis part ii important applications of tensor calculus concluding section field equations of general relativity theory 1962 edition

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