

Applications Of Double Laplace Transform To Boundary Value

The Double Laplace Transform and Its Application to Partial Differential EquationsDouble Laplace Transform and Application to Wave, Heat and Laplace's EquationDouble Laplace Transformation in Mixed Boundary-initial Value Problems and Its Application to Multi-component Plasmas

This book offers engineering students an introduction to the theory of partial differential equations and then guiding them through the modern problems in this subject. Divided into two parts, in the first part readers already well-acquainted with problems from the theory of differential and integral equations gain insights into the classical notions and problems, including differential operators, characteristic surfaces, Levi functions, Green's function, and Green's formulas. Readers are also instructed in the extended potential theory in its three forms: the volume potential, the surface single-layer potential and the surface double-layer potential. Furthermore, the book presents the main initial boundary value problems associated with elliptic, parabolic and hyperbolic equations. The second part of the book, which is addressed first and foremost to those who are already acquainted with the notions and the results from the first part, introduces readers to modern aspects of the theory of partial differential equations.

Version 6.0. An introductory course on differential equations aimed at engineers. The book covers first order ODEs, higher order linear ODEs, systems of ODEs, Fourier series and PDEs, eigenvalue problems, the Laplace transform, and power series methods. It has a detailed appendix on linear algebra. The book was developed and used to teach Math 286/285 at the University of Illinois at Urbana-Champaign, and in the decade since, it has been used in many classrooms, ranging from small community colleges to large public research universities. See https://www.jirka.org/diffyqs/ for more information, updates, errata, and a list of classroom adoptors

Concise treatment of fundamental theory explores two-dimensional Laplace transform and basic definitions, theorems, applications of operational calculus in two variables. Includes tables of formulae for various categories of functions. 1962 edition.

Theory and Application of Multiple Laplace Transforms to the Solution of Problems in Electric Circuit Analysis and Electromagnetic Theory

Markov and Semi-Markov Theory and Computational Implementation

Integral Transforms and their Applications

Essentials of Partial Differential Equations

Probabilistic Applications of Tauberian Theorems

Classic graduate-level exposition covers theory and applications to ordinary and partial differential equations. Includes derivation of Laplace transforms of various functions, Laplace transform for a finite interval, and more. 1948 edition.

Integral Transforms and Their Applications, Third Edition covers advanced mathematical methods for many applications in science and engineering. The book is suitable as a textbook for senior undergraduate and first-year graduate students and as a reference for professionals in mathematics, engineering, and applied sciences. It presents a systematic development of the underlying theory as well as a modern approach to Fourier, Laplace, Hankel, Mellin, Radon, Gabor, wavelet, and Z transforms and their applications. New to the Third Edition New material on the historical development of classical and modern integral transforms New sections on Fourier transforms of generalized functions, the Poisson summation formula, the Gibbs phenomenon, and the Heisenberg uncertainty principle Revised material on Laplace transforms and double Laplace transforms and their applications New examples of applications in mechanical vibrations, electrical networks, quantum mechanics, integral and functional equations, fluid mechanics, mathematical statistics, special functions, and more New figures that facilitate a clear understanding of physical explanations Updated exercises with solutions, tables of integral transforms, and bibliography Through numerous examples and end-of-chapter exercises, this book develops readers' analytical and computational skills in the theory and applications of transform methods. It provides accessible working knowledge of the analytical methods and proofs required in pure and applied mathematics, physics, and engineering, preparing readers for subsequent advanced courses and research in these areas.

Applied Engineering Analysis Tai-Ran Hsu, San Jose State University, USA A resource book applying mathematics to solve engineering problems Applied Engineering Analysis is a concise textbookwhich demonstrates how toapply mathematics to solve engineering problems. It begins with an overview of engineering analysis and an introduction to mathematical modeling, followed by vector calculus, matrices and linear algebra, and applications of first and second order differential equations. Fourier series and Laplace transform are also covered, along with partial differential equations, numerical solutions to nonlinear and differential equations and an introduction to finite element analysis. The book also covers statistics with applications to design and statistical process controls. Drawing on the author's extensive industry and teaching experience, spanning 40 years, the book takes a pedagogical approach and includes examples, case studies and end of chapter problems. It is also accompanied by a website hosting a solutions manual and PowerPoint slides for instructors. Key features: Strong emphasis on deriving equations, not just solving given equations, for the solution of engineering problems. Examples and problems of a practical nature with illustrations to enhance students' self-learning. Numerical methods and techniques, including finite element analysis. Includes coverage of statistical methods for probabilistic design analysis of structures and statistical process control (SPC). Applied Engineering Analysis is a resource book for engineering students and professionals to learn how to apply the mathematics experience and skills that they have already acquired to their engineering profession for innovation, problem solving, and decision making.

This guide book to mathematics contains in handbook form the fundamental working knowledge of mathematics which is needed as an everyday guide for working scientists and engineers, as well as for students. Easy to understand, and convenient to use, this guide book gives concisely the information necessary to evaluate most problems which occur in concrete applications. In the newer editions emphasis was laid on those fields of mathematics that became more important for the formulation and modeling of technical and natural processes, namely Numerical Mathematics, Probability Theory and Statistics, as well as Information Processing. Besides many enhancements and new paragraphs, new sections on Geometric and Coordinate Transformations, Quaternions and Applications, and Lie Groups and Lie Algebras were added for the sixth edition.

An Introduction to Laplace Transforms and Fourier Series

Dependability for Systems with a Partitioned State Space

Integral Methods in Science and Engineering, Volume 1

Laplace Transforms and Their Applications in Differential Equations

Proceedings of the Second International Conference, MMCTRE 2021

This book presents new knowledge and recent developments in all aspects of computational techniques, mathematical modeling, energy systems, and applications of fuzzy sets and intelligent computing. The book is a collection of best selected research papers presented at the Second International Conference on “Mathematical Modeling, Computational Intelligence Techniques and Renewable Energy (MMCTRE 2021),” organized by the Department of Mathematics, Pandit Deendrayal Petroleum University, in association with Forum for Interdisciplinary Mathematics. The book provides innovative works of researchers, academicians, and students in the area of interdisciplinary mathematics, statistics, computational intelligence, and renewable energy.

This volume is an introductory level textbook for partial differential equations (PDE's) and suitable for a one-semester undergraduate level or two-semester graduate level course in PDE's or applied mathematics. Chapters One to Five are organized according to the equations and the basic PDE's are introduced in an easy to understand manner. They include the first-order equations and the three fundamental second-order equations, i.e. the heat, wave and Laplace equations. Through these equations we learn the types of problems, how we pose the problems, and the methods of solutions such as the separation of variables and the method of characteristics. The modeling aspects are explained as well. The methods introduced in earlier chapters are developed further in Chapters Six to Twelve. They include the Fourier series, the Fourier and the Laplace transforms, and the Green's functions. The equations in higher dimensions are also discussed in detail. This volume is application-oriented and rich in examples. Going through these examples, the reader is able to easily grasp the basics of PDE's.

This reference text describes the basic elements of the integral, finite, and discrete transforms – emphasizing their use for solving boundary and initial value problems as well as facilitating the representations of signals and systems. Proceeding to the final solution in the same setting of Fourier analysis without interruption, Integral and Discrete Transforms with Applications and Error Analysis: presents the background of the FFT and explains how to choose the appropriate transform for solving a boundary value problem; discusses modelling of the basic partial differential equations, as well as the solutions in terms of the main special functions; considers the Laplace, Fourier, and Hankel transforms and their variations, offering a more logical continuation of the operational methods; covers integral, discrete, and finite transforms and trigonometric Fourier and general orthogonal series expansion, providing an application to signal analysis and boundary-value problems; and examines the practical approximation of computing the resulting Fourier series or integral representation of the final solution and treats the errors incurred. Containing many detailed examples and numerous end-of-chapter exercises of varying difficulty for each section with answers, Integral and Discrete Transforms with Applications and Error Analysis is a thorough reference for analysts; industrial and applied mathematicians; electrical, electronics, and other engineers; and physicists and an informative text for upper-level undergraduate and graduate students in these disciplines.

To date, the theoretical development of q-calculus has rested on a non-uniform basis. Generally, the bulky Gasper-Rahman notation was used, but the published works on q-calculus looked different depending on where and by whom they were written. This confusion of tongues not only complicated the theoretical development but also contributed to q-calculus remaining a neglected mathematical field. This book overcomes these problems by introducing a new and interesting notation for q-calculus based on logarithms. For instance, q-hypergeometric functions are now visually clear and easy to trace back to their hypergeometric parents. With this new notation it is also easy to see the connection between q-hypergeometric functions and the q-gamma function, something that until now has been overlooked. The book covers many topics on q-calculus, including special functions, combinatorics, and q-difference equations. Apart from a thorough review of the historical development of q-calculus, this book also presents the domains of modern physics for which q-calculus is applicable, such as particle physics and supersymmetry, to name just a few.?

Nuclear Science Abstracts

Fractional Differential Equations, Inclusions and Inequalities with Applications

Theoretical Developments and Numerical Examples

The Double Laplace Transform and Its Application to Partial Differential Equations

Applied Laplace Transforms and z-Transforms for Scientists and Engineers

The articles of this book are written by leading experts in partial differential equations and their applications, who present overviews here of recent advances in this broad area of mathematics. The formation of shocks in fluids, modern numerical computation of turbulence, the breaking of the Einstein equations in a vacuum, the dynamics of defects in crystals, effects due to entropy in hyperbolic conservation laws, the Navier–Stokes and other limits of the Boltzmann equation, occupancy times for Brownian motion in a two dimensional wedge, and new methods of analyzing and solving integrable systems are some of this volume's subjects. The reader will find an exposition of important advances without a lot of technicalities and with an emphasis on the basic ideas of this field.

This is a revised edition of the chapter on Laplace Transforms, which was published few years ago in Part II of My Personal Study Notes in advanced mathematics. In this edition, I typed the cursive scripts of the personal notes, edited the typographic errors, but most of all reproduced all the calculations and graphics in a modern style of representation. The book is organized into six chapters equally distributed to address: (1) The theory of Laplace transformations and inverse transformations of elementary functions, supported by solved examples and exercises with given answers; (2) Transformation of more complex functions from elementary transformation; (3) Practical applications of Laplace transformation to equations of motion of material bodies and deflection, stress, and strain of elastic beams; (4) Solving equations of state of motion of bodies under inertial and gravitational forces; (5) Solving heat flow equations through various geometrical bodies; and (6) Solving partial differential equations by the operational algebraic properties of transforming and inverse transforming of partial differential equations. During the editing process, I added plenty of comments of the underlying meaning of the arcane equations such that the reader could discern the practical weight of each mathematical formula. In a way, I attempted to convey a personal sense and feeling on the significance and philosophy of devising a mathematical equation that transcends into real-life emulation. The reader will find this edition dense with graphic illustrations that should spare the reader the trouble of searching other references in order to infer any missing steps. In my view, detailed graphic illustrations could soothe the harshness of arcane mathematical jargon, as well as expose the merits of the assumption contemplated in the formulation. In lieu of offering a dense textbook on Laplace Transforms, I opted to stick to my personal notes that give the memorable zest of a subject that could easily remembered when not frequently used. Brief Outline of Contents: CHAPTER 1. THE LAPLACE TRANSFORMATION AND INVERSE TRANSFORMATION 1.1. Integral transforms 1.2. Some elementary Laplace transforms 1.3. The Laplace transformation of the sum of two functions 1.4. Sectionally or piecewise continuous functions 1.5. Functions of exponential order 1.7. Null functions 1.8. Inverse Laplace transforms 1.10. Laplace transforms of derivatives 1.11. Laplace transforms of integrals 1.12. The first shift theorem of multiplying the object function by eat 1.15. Determination of the inverse Laplace transforms by the aid of partial fractions 1.16. Laplace's solution of linear differential equations with constant coefficients CHAPTER 2. GENERAL THEOREMS ON THE LAPLACE TRANSFORMATION 2.1. The unit step function 2.2. The second translation or shifting property 2.4. The unit impulse function 2.5. The unit doublet 2.7. Initial value theorem 2.8. Final value theorem 2.9. Differentiation of transforms 2.11. Integration of transforms 2.12. Transforms of periodic functions 2.13. The product theorem- Convolution 2.15. Power series method for the determination of transforms and inverse transforms 2.16. The error function or probability integral 2.22. The inversion integral CHAPTER 3. ELECTRICAL APPLICATIONS OF THE LAPLACE TRANSFORMATION CHAPTER 4. DYNAMICAL APPLICATIONS OF LAPLACE TRANSFORMS CHAPTER 5. STRUCTURAL APPLICATIONS 5.1. Deflection of beams CHAPTER 6. USING LAPLACE TRANSFORMATION TO SOLVE LINEAR PARTIAL DIFFERENTIAL EQUATIONS 6.1. Transverse vibrations of a stretched string under gravity 6.2. Longitudinal vibrations of bars 6.3. Partial differential equations of transmission lines 6.4. Conduction of heat 6.5. Exercise on using Laplace Transformation in solving Linear Partial Differential Equations

This introduction to Laplace transforms and Fourier series is aimed at second-year students in applied mathematics. It is unusual in treating Laplace transforms at a relatively simple level with many examples. Mathematics students do not usually meet this material until later in their degree course but applied mathematicians and engineers need an early introduction. Suitable as a course text, it will also be of interest to physicists and engineers as supplementary material. The application of the double Laplace transform (Laplace transformation in both space and time) to the solution of systems of linear, homogenous, hyperbolic, partial differential equations with real, constant coefficients is treated. The purpose of this treatment is to discuss comprehensively a method whereby the mixed boundary-initial value problem for these equations can be solved. The treatment is limited to one-dimensional systems. Certain features of the double Laplace transform method which appear in the solution of equations of the type described are examined in detail. Two of these features are the important role played by the characteristics of the partial differential equations and the restrictions among the boundary and initial conditions which are necessary for a well-defined solution. The method is applied to the moment equations for a multi-component plasma, and the connection between the general solution and the usual 'normal mode' solution is discussed. The case of a monoenergetic beam injected into a cold, semi-infinite plasma is treated in detail. The effect of the collisions of the plasma particles with the background is included. A solution for the growth of an initial thermal disturbance in the plasma is obtained. This treatment yields the first picture of the relationship between the temporal and spatial growth in a finite, unstable plasma. (Author).

Recent Advances in Nonlinear Partial Differential Equations and Applications

The Laplace Transform

Scientific and Technical Aerospace Reports

Solution of Boundary-value Problems in Arbitrary Sectors by Use of the Double Laplace Transform

Mathematical Modeling, Computational Intelligence Techniques and Renewable Energy

The series is devoted to the publication of high-level monographs and surveys which cover the whole spectrum of probability and statistics. The books of the series are addressed to both experts and advanced students.

This book is devoted to one of the most critical areas of applied mathematics, namely the Laplace transform technique for linear time invariance systems arising from the fields of electrical and mechanical engineering. It focuses on introducing Laplace transformation and its operating properties, finding inverse Laplace transformation through different methods, and describing transfer function applications for mechanical and electrical networks to develop input and output relationships. It also discusses solutions of initial value problems, the state-variables approach, and the solution of boundary value problems connected with partial differential equations.

Issues in Structural and Materials Engineering: 2011 Edition is a ScholarlyEditions® eBook that delivers timely, authoritative, and comprehensive information about Structural and Materials Engineering. The editors have built Issues in Structural and Materials Engineering: 2011 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Structural and Materials Engineering in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Structural and Materials Engineering: 2011 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions® and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Transform methods provide a bridge between the commonly used method of separation of variables and numerical techniques for solving linear partial differential equations. While in some ways similar to separation of variables, transform methods can be effective for a wider class of problems. Even when the inverse of the transform cannot be found ana

Laplace Transforms

Double Laplace Transformation in Mixed Boundary-initial Value Problems and Its Application to Multi-component Plasmas

The Analytical Theory of Heat

Applied Engineering Analysis

Operational Calculus in Two Variables and Its Applications

This contributed volume contains a collection of articles on the most recent advances in integral methods. The first of two volumes, this work focuses on the construction of theoretical integral methods. Written by internationally recognized researchers, the chapters in this book are based on talks given at the Fourteenth International Conference on Integral Methods in Science and Engineering, held July 25–29, 2016, in Padova, Italy. A broad range of topics is addressed, such as: • Integral equations • Homogenization • Duality methods • Optimal design • Conformal techniques This collection will be of interest to researchers in applied mathematics, physics, and mechanical and electrical engineering, as well as graduate students in these disciplines, and to other professionals who use integration as an essential tool in their work.

This research monograph provides an introduction to tractable multidimensional diffusion models, where transition densities, Laplace transforms, Fourier transforms, fundamental solutions or functionals can be obtained in explicit form. The book also provides an introduction to the use of Lie symmetry group methods for diffusions, which allows to compute a wide range of functionals. Besides the well-known methodology on affine diffusions it presents a novel approach to affine processes with applications in finance. Numerical methods, including Monte Carlo and quadrature methods, are discussed together with supporting material on stochastic processes. Applications in finance, for instance, on credit risk and credit valuation adjustment are included in the book. The functionals of multidimensional diffusions analyzed in this book are significant for many areas of application beyond finance. The book is aimed at a wide readership, and develops an intuitive and rigorous understanding of the mathematics underlying the derivation of explicit formulas for functionals of multidimensional diffusions.

The theory of Laplace transformation is an important part of the mathematical background required for engineers, physicists and mathematicians. Laplace transformation methods provide easy and effective techniques for solving many problems arising in various fields of science and engineering, especially for solving differential equations. What the Laplace transformation does in the field of differential equations, the z-transformation achieves for difference equations. The two theories are parallel and have many analogies. Laplace and z transformations are also referred to as operational calculus, but this notion is also used in a more restricted sense to denote the operational calculus of Mikusinski. This book does not use the operational calculus of Mikusinski, whose approach is based on abstract algebra and is not readily accessible to engineers and scientists. The symbolic computation capability of Mathematica can now be used in favor of the Laplace and z-transformations. The first version of the Mathematica Package LaplaceAndzTransforms developed by the author appeared ten years ago. The Package computes not only Laplace and z-transforms but also includes many routines from various domains of applications. Upon loading the Package, about one hundred and fifty new commands are added to the built-in commands of Mathematica. The code is placed in front of the already built-in code of Laplace and z-transformations of Mathematica so that built-in functions not covered by the Package remain available. The Package substantially enhances the Laplace and z-transformation facilities of Mathematica. The book is mainly designed for readers working in the field of applications.

During the last decade, there has been an increased interest in fractional differential equations, inclusions, and inequalities, as they play a fundamental role in the modeling of numerous phenomena, in particular, in physics, biomathematics, blood flow phenomena, ecology, environmental issues, viscoelasticity, aerodynamics, electrodynamics of complex medium, electrical circuits, electron-analytical chemistry, control theory, etc. This book presents collective works published in the recent Special Issue (SI) entitled "Fractional Differential Equation, Inclusions and Inequalities with Applications" of the Journal Mathematics. This Special Issue presents recent developments in the theory of fractional differential equations and inequalities. Topics include but are not limited to the existence and uniqueness results for boundary value problems for different types of fractional differential equations, a variety of fractional inequalities, impulsive fractional differential equations, and applications in sciences and engineering.

Handbook of Mathematics

Notes on Diffy Qs

Issues in Structural and Materials Engineering: 2011 Edition

Fractional Differential Equations

Theory, Methods and Applications

This is a substantially updated, extended and reorganized third edition of an introductory text on the use of integral transforms. Chapter 1 is largely new, covering introductory aspects of complex variable theory. Emphasis is on the development of techniques and the connection between properties of transforms and the kind of problems for which they provide tools. Around 400 problems are accompanied in the text. It will be useful for graduate students and researchers working in mathematics and physics.

Significant revision of classic reference in special functions.

Fractional calculus provides the possibility of introducing integrals and derivatives of an arbitrary order in the mathematical modelling of physical processes, and it has become a relevant subject with applications to various fields, such as anomalous diffusion, propagation in different media, and propogation in relation to materials with different properties. However, many aspects from theoretical and practical points of view have still to be developed in relation to models based on fractional operators. This Special Issue is related to new developments on different aspects of fractional differential equations, both from a theoretical point of view and in terms of applications in different fields such as physics, chemistry, or control theory, for instance. The topics of the Issue include fractional calculus, the mathematical analysis of the properties of the solutions to fractional equations, the extension of classical approaches, or applications of fractional equations to several fields.

In preparing this second edition I have restricted myself to making small corrections and changes to the first edition. Two chapters have had extensive changes made. First, the material of Sections 14.1 and 14.2 has been rewritten to make explicit reference to the book of Bleistein and Handelsman, which appeared after the original Chapter 14 had been written. Second, Chapter 21, on numerical methods, has been rewritten to take account of comparative work which was done by the author and Brian Martin, and published as a review paper. The material for all of these chapters was in fact, prepared for a translation of the book. Considerable thought has been given to a much more comprehensive revision and expansion of the book. In particular, there have been spectacular advances in the solution of some non-linear problems using isospectra1 methods, which may be regarded as a generalization of the Fourier transform. However, the subject is a large one, and even a modest introduction would have added substantially to the book. Moreover, the recent book by Dodd et al. is at a similar level to the present volume. Similarly, I have refrained from expanding the chapter on numerical methods into a complete new part of the book, since a specialized monograph on numerical methods is in preparation in collaboration with a colleague.

With Applications

Engineering Applications of the Laplace Transform

Conference in Honor of Peter D. Lax and Louis Nirenberg on Their 80th Birthdays, June 7-10, 2006, Universidad de Castilla-La Mancha at Palacio Lorenzana, Toledo, Spain

Basics Hypergeometric Series

Demonstrates the application of DSM to solve a broad range of operator equations The dynamical systems method (DSM) is a powerful computational method for solving operator equations. With this book as their guide, readers will master the application of DSM to solve a variety of linear and nonlinear problems as well as ill-posed and well-posed problems. The authors offer a clear, step-by-step, systematic development of DSM that enables readers to grasp the method's underlying logic and its numerous applications. Dynamical Systems Method and Applications begins with a general introduction and then sets forth the scope of DSM in Part One. Part Two introduces the discrepancy principle, and Part Three offers examples of numerical applications of DSM to solve a broad range of problems in science and engineering. Additional featured topics include: General nonlinear operator equations Operators satisfying a spectral assumption Newton-type methods without inversion of the derivative Numerical problems arising in applications Stable numerical differentiation Stable solution to ill-conditioned linear algebraic systems Throughout the chapters, the authors employ the use of figures and tables to help readers grasp and apply new concepts. Numerical examples offer original theoretical results based on the solution of practical problems involving ill-conditioned linear algebraic systems, and stable differentiation of noisy data. Written by internationally recognized authorities on the topic, Dynamical Systems Method and Applications is an excellent book for courses on numerical analysis, dynamical systems, operator theory, and applied mathematics at the graduate level. The book also serves as a valuable resource for professionals in the fields of mathematics, physics, and engineering.

Acclaimed text on engineering math for graduate students covers theory of complex variables, Cauchy-Riemann equations, Fourier and Laplace transform theory, Z-transform, and much more. Many excellent problems.

Probabilistic models of technical systems are studied here whose finite state space is partitioned into two or more subsets. The systems considered are such that each of those subsets of the state space will correspond to a certain performance level of the system. The crudest approach differentiates between 'working' and 'failed' system states only. Another, more sophisticated, approach will differentiate between the various levels of redundancy provided by the system. The dependability characteristics examined here are random variables associated with the state space's partitioned structure; some typical ones are as follows • The sequence of the lengths of the system's working periods; • The sequences of the times spent by the system at the various performance levels;

• The cumulative time spent by the system in the set of working states during the first m working periods; • The total cumulative 'up' time of the system until final breakdown; • The number of repair events during a finite time interval; • The number of repair events until final system breakdown; • Any combination of the above. These dependability characteristics will be discussed within the Markov and semi-Markov frameworks.

Complex Variables and the Laplace Transform for Engineers

Theoretical Techniques

Functionals of Multidimensional Diffusions with Applications to Finance

A Computational Approach using a Mathematica Package

Integral and Discrete Transforms with Applications and Error Analysis