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Laplace Transforms

Advanced Mathematics

LAPLACE TRANSFORMS

By

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- Theory of transformation and inverse transformation
- Transformation of elementary and complex functions
- Equations of motion of material bodies, deflection, stress, and strain of elastic beams
- Electrical current flow in network circuitries of active elements;
- Applications on heat flow equations in various geometries
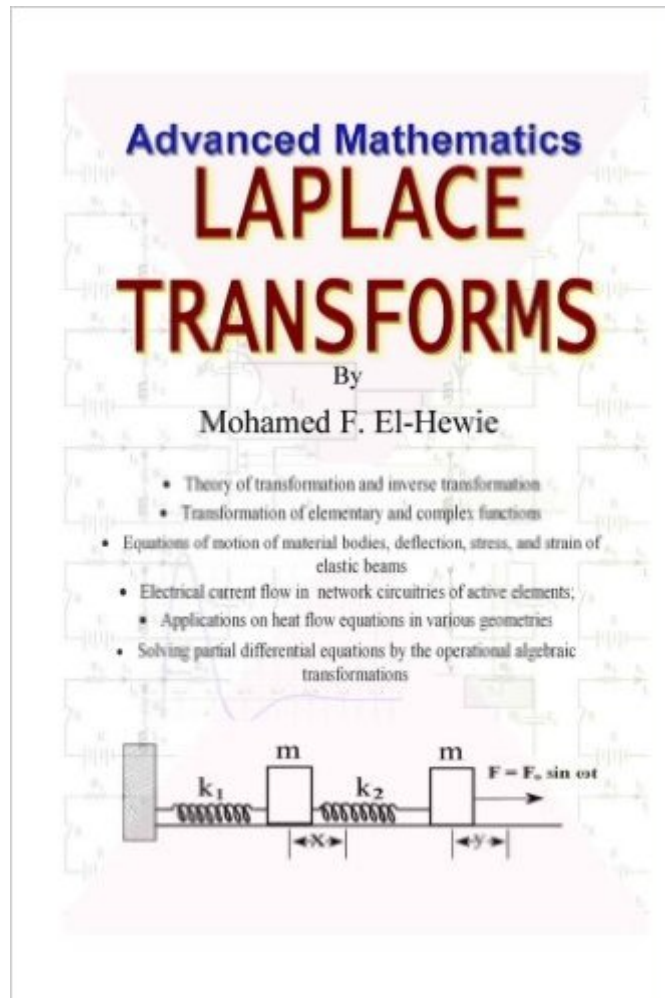- Solving partial differential equations by the operational algebraic transformations

Synopsis

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. Laplaceâ ™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 transform 2.11. Integration of transforms 2.12. Transforms of periodic

functions 2.13. The product theoremâ"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 IN SOLVING 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

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Customer Reviews

This is one of those self published little gems, but unlike so many others, has a LOT of value if you can organize it yourself. First, there is no index, so the 150 or so worked problems flow generally from the chapters, but for specifics you'll have to create your own index if you want to use it as a reference work. Second, the Chapter titles at the beginning are very general, and don't agree with the Intro (which says, for example, that 4 is about electrical current flow (meaning "topic" 4) in circuits, whereas CHAPTER 4 is actually about strings, dynamic systems, etc.The formulas and solutions are high quality, with few errors, and have plenty of diagrams. Despite the promotional reviews there are NOT really a lot of verbal descriptions, because the book moves at a very rapid place from example to example in order to pack at least one or two examples of each type of problem in 300 pages. The author does use the solution notation convention so later problems do refer back to previous exercises.In summary, these are the class notes of a very bright

mathematician, and show the sub steps for each technique quite clearly, as long as you know the symbols and understand the operations, which are not explained in detail. Not a lot of space is spent on inverses, which are really the toughest part of transform operators, but the problems selected solve quite clearly without the need for highly complex inversion manipulations. Some of the applications covered include solutions of PDE's, electrical applications, structural and dynamic applications, and of course equations of motion, waves, vibrating strings, etc.For the price, a lot of good worked examples if you can get around the lack of indexing.

Laplace Transforms Daring Greatly: How the Courage to Be Vulnerable Transforms the Way We Live, Love, Parent, and Lead What's Best Next: How the Gospel Transforms the Way You Get Things Done The Wealth of Networks: How Social Production Transforms Markets and Freedom The Secret Life of Stories: From Don Quixote to Harry Potter, How Understanding Intellectual Disability Transforms the Way We Read Why Travel Solo ?: The 12 Ways Traveling Solo Transforms Your Personality and Changes Your Life (Solo Travel Guide) (Volume 1) Furnitecture: Furniture That Transforms Space Power Pricing: How Managing Price Transforms the Bottom Line Socialnomics: How Social Media Transforms the Way We Live and Do Business Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation Blown to Bits: How the New Economics of Information Transforms Strategy Because He Loves Me: How Christ Transforms Our Daily Life