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ANALYSIS OF SHELLS, PLATES, AND BEAMS

A STATE OF THE ART REPORT

Springer Nature This book commemorates the 75th birthday of Prof. George Jaiani – Georgia’s leading expert on shell theory. He is also well known outside Georgia for his individual approach to shell theory research and as an organizer of meetings, conferences and schools in the field. The collection of papers presented includes articles by scientists from various countries discussing the state of the art and new trends in the theory of shells, plates, and beams. Chapter 20 is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

ANALYSIS OF SHELLS AND PLATES

Springer Science & Business Media The study ofthree-dimensional continua has been a traditional part of graduate education in solid mechanics for some time. With rational simplifications to the three-dimensional theory of elasticity, the engineering theories of medium-thin plates and of thin shells may be derived and applied to a large class of engi neering structures distinguished by a characteristically small dimension in one direction. Often, these theories are

developed somewhat independently due to their distinctive geometrical and load-resistance characteristics. On the other hand, the two systems share a common basis and might be unified under the classification of Surface Structures after the German term Fliichentragwerke. This common basis is fully exploited in this book. A substantial portion of many traditional approaches to this subject has been devoted to constructing classical and approximate solutions to the governing equations of the system in order to proceed with applications. Within the context of analytical, as opposed to numerical, approaches, the limited general ity of many such solutions has been a formidable obstacle to applications involving complex geometry, material properties, and/or loading. It is now relatively routine to obtain computer-based solutions to quite complicated situations. However, the choice of the proper problem to solve through the selection of the mathematical model remains a human rather than a machine task and requires a basis in the theory of the subject.

THEORY AND ANALYSIS OF ELASTIC PLATES AND SHELLS, SECOND EDITION

CRC Press This text presents a complete treatment of the theory and analysis of elastic plates. It provides detailed coverage of classic and shear deformation plate theories and their solutions by analytical as well as numerical methods for bending, buckling and natural vibrations. Analytical solutions are based on the Navier and Levy solution method, and numerical solutions are based on the Rayleigh-Ritz methods and finite element method. The author address a range of topics, including basic equations of elasticity, virtual work and energy principles, cylindrical bending of plates, rectangular plates and an introduction to the finite element method with applications to plates.

THEORY AND ANALYSIS OF ELASTIC PLATES AND SHELLS, SECOND EDITION

CRC Press Because plates and shells are common structural elements in aerospace, automotive, and civil engineering structures, engineers must understand the behavior of such structures through the study of theory and analysis. Compiling this information into a single volume, Theory and Analysis of Elastic Plates and Shells, Second Edition presents a complete, up-to-date, and unified treatment of classical and shear deformation plates and shells, from the basic derivation of theories to analytical and numerical solutions. Revised and updated, this second edition incorporates new information in most chapters, along with some rearrangement of topics to improve the clarity of the overall presentation. The book presents new material on the theory and analysis of shells, featuring an additional chapter devoted to the topic. The author also includes new sections that address Castigliano's theorems, axisymmetric

buckling of circular plates, the relationships between the solutions of classical and shear deformation theories, and the nonlinear finite element analysis of plates. The book provides many illustrations of theories, formulations, and solution methods, resulting in an easy-to-understand presentation of the topics. Like the previous edition, this book remains a suitable textbook for a course on plates and shells in aerospace, civil, and mechanical engineering curricula and continues to serve as a reference for industrial and academic structural engineers and scientists.

NONLINEAR MECHANICS OF SHELLS AND PLATES IN COMPOSITE, SOFT AND BIOLOGICAL MATERIALS

Cambridge University Press This book guides the reader into the modelling of shell structures in applications where advanced composite materials or complex biological materials must be described with great accuracy. A valuable resource for researchers, professionals and graduate students, it presents a variety of practical concepts, diagrams and numerical results.

SHELL THEORY

Elsevier This account of the theory of plates and shells is written primarily as a textbook for graduate students in mechanical and civil engineering. The unified treatment of shells of arbitrary shape is accomplished by tensor analysis. This useful tool is introduced in the first chapter, and no knowledge of advanced mathematical methods is required. The general theory developed in the first eight chapters is applied in the remaining part to thin elastic plates and shells with special emphasis on engineering methods and engineering applications. A number of detailed examples illustrate the theory.

NONLINEAR VIBRATIONS AND STABILITY OF SHELLS AND PLATES

Cambridge University Press This unique book explores both theoretical and experimental aspects of nonlinear vibrations and stability of shells and plates. It is ideal for researchers, professionals, students, and instructors. Expert researchers will find the most recent progresses in nonlinear vibrations and stability of shells and plates, including advanced problems of shells with fluid-structure interaction. Professionals will find many practical concepts, diagrams, and numerical results, useful for the design of shells and plates made of traditional and advanced materials. They will be able to understand complex phenomena such as dynamic instability, bifurcations, and chaos, without needing an extensive mathematical background. Graduate students will find (i) a complete text on nonlinear mechanics of shells

and plates, collecting almost all the available theories in a simple form, (ii) an introduction to nonlinear dynamics, and (iii) the state of art on the nonlinear vibrations and stability of shells and plates, including fluid-structure interaction problems.

PLATES AND SHELLS

THEORY AND ANALYSIS, FOURTH EDITION

Applied and Computational Mechanics Original edition publised under the title: Stresses in plates and shells / Ansel C. Ugural.

PLATES AND SHELLS

THEORY AND ANALYSIS, FOURTH EDITION

CRC Press Noted for its practical, accessible approach to senior and graduate-level engineering mechanics, Plates and Shells: Theory and Analysis is a long-time bestselling text on the subjects of elasticity and stress analysis. Many new examples and applications are included to review and support key foundational concepts. Advanced methods are discussed and analyzed, accompanied by illustrations. Problems are carefully arranged from the basic to the more challenging level. Computer/numerical approaches (Finite Difference, Finite Element, MATLAB) are introduced, and MATLAB code for selected illustrative problems and a case study is included.

ANISOTROPIC ELASTIC PLATES

Springer Science & Business Media As structural elements, anisotropic elastic plates find wide applications in modern technology. The plates here are considered to be subjected to not only inplane load but also transverse load. In other words, both plane and plate bending problems as well as the stretching-bending coupling problems are all explained in this book. In addition to the introduction of the theory of anisotropic elasticity, several important subjects have are discussed in this book such as interfaces, cracks, holes, inclusions, contact problems, piezoelectric materials, thermoelastic problems and boundary element analysis.

POISSON THEORY OF ELASTIC PLATES

Springer Nature This groundbreaking book resolves the main lacuna in Kirchhoff theory of bending of plates in the Poisson-Kirchhoff boundary conditions paradox through the introduction of auxiliary problem governing transverse stresses. The book highlights new primary bending problem which is formulated and analyzed by the application of developed Poisson theory. Analysis with prescribed transverse stresses along faces of the plate, neglected in most reported theories, is presented with an additional term in displacements. The book presents a systematic procedure for the analysis of unsymmetrical laminates. This volume will be a useful reference for students, practicing engineers as well as researchers in applied mechanics. .

THIN PLATES AND SHELLS

THEORY: ANALYSIS, AND APPLICATIONS

CRC Press Presenting recent principles of thin plate and shell theories, this book emphasizes novel analytical and numerical methods for solving linear and nonlinear plate and shell dilemmas, new theories for the design and analysis of thin plate-shell structures, and real-world numerical solutions, mechanics, and plate and shell models for engineering appli

THEORY OF PLATES AND SHELLS

DEVELOPMENTS AND NOVEL APPROACHES IN NONLINEAR SOLID BODY MECHANICS

Springer This book features selected manuscripts presented at ICoNSoM 2019, exploring cutting-edge methods for developing novel models in nonlinear solid mechanics. Innovative methods like additive manufacturing—for example, 3D printing— and miniaturization mean that engineers need more accurate techniques for modeling solid body mechanics. The book focuses on the formulation of continuum and discrete models for complex materials and systems, particularly the design of metamaterials.

ANALYSIS AND MODELLING OF ADVANCED STRUCTURES AND SMART SYSTEMS

Springer This book presents selected papers presented at the 8th International Conference "Design, Modeling and

Experiments of Advanced Structures and Systems" (DeMEASS VIII, held in Moscow, Russia in May 2017) and reflects the modern state of sciences in this field. The contributions contain topics like Piezoelectric, Ferroelectric, Ferroelastic and Magnetostrictive Materials, Shape Memory Alloys and Active Polymers, Functionally Graded Materials, Multi-Functional Smart Materials and Structures, Coupled Multi-Field Problems, Design and Modeling of Sensors and Actuators, Adaptive Structures.

NONLINEAR ANALYSIS OF SHELL STRUCTURES

AIAA

MESH-FREE AND FINITE ELEMENT-BASED METHODS FOR STRUCTURAL MECHANICS APPLICATIONS

MDPI The problem of solving complex engineering problems has always been a major topic in all industrial fields, such as aerospace, civil and mechanical engineering. The use of numerical methods has increased exponentially in the last few years, due to modern computers in the field of structural mechanics. Moreover, a wide range of numerical methods have been presented in the literature for solving such problems. Structural mechanics problems are dealt with using partial differential systems of equations that might be solved by following the two main classes of methods: Domain-decomposition methods or the so-called finite element methods and mesh-free methods where no decomposition is carried out. Both methodologies discretize a partial differential system into a set of algebraic equations that can be easily solved by computer implementation. The aim of the present Special Issue is to present a collection of recent works on these themes and a comparison of the novel advancements of both worlds in structural mechanics applications.

THEORY OF SHELL STRUCTURES

Cambridge University Press This book attempts to bring the essence of shell structures within the grasp of engineers. It tackles the fundamental question of how bending and stretching effects combine and interact in shell structures from a physical point of view; and shows that this approach leads to an understanding of the structural mechanics of shells in general.

THE NONLINEAR THEORY OF ELASTIC SHELLS

Cambridge University Press A clear, thorough explanation of the nonlinear behaviour of shells, for researchers and graduate students.

PLATE AND SHELL STRUCTURES

SELECTED ANALYTICAL AND FINITE ELEMENT SOLUTIONS

John Wiley & Sons Plate and Shell Structures: Selected Analytical and Finite Element Solutions Maria Radwa?ska, Anna Stankiewicz, Adam Wosatko, Jerzy Pamin Cracow University of Technology, Poland Comprehensively covers the fundamental theory and analytical and numerical solutions for different types of plate and shell structures Plate and Shell Structures: Selected Analytical and Finite Element Solutions not only provides the theoretical formulation of fundamental problems of mechanics of plates and shells, but also several examples of analytical and numerical solutions for different types of shell structures. The book contains advanced aspects related to stability analysis and a brief description of modern finite element formulations for plates and shells, including the discussion of mixed/hybrid models and locking phenomena. Key features: 52 example problems solved and illustrated by more than 200 figures, including 30 plots of finite element simulation results. Contents based on many years of research and teaching the mechanics of plates and shells to students of civil engineering and professional engineers. Provides the basis of an intermediate-level course on computational mechanics of shell structures. The book is essential reading for engineering students, university teachers, practitioners and researchers interested in the mechanics of plates and shells, as well as developers testing new simulation software.

STRUCTURAL STABILITY THEORY AND PRACTICE

BUCKLING OF COLUMNS, BEAMS, PLATES, AND SHELLS

John Wiley & Sons Discover the theory of structural stability and its applications in crucial areas in engineering Structural Stability Theory and Practice: Buckling of Columns, Beams, Plates, and Shells combines necessary information on structural stability into a single, comprehensive resource suitable for practicing engineers and students alike. Written in both US and SI units, this invaluable guide is perfect for readers within and outside of the US.

Structural Stability Theory and Practice: Buckling of Columns, Beams, Plates, and Shell offers: Detailed and patiently developed mathematical derivations and thorough explanations Energy methods that are incorporated throughout the chapters Connections between theory, design specifications and solutions The latest codes and standards from the American Institute of Steel Construction (AISC), Canadian Standards Association (CSA), Australian Standards (SAA), Structural Stability Research Council (SSRC), and Eurocode 3 Solved and unsolved practice-oriented problems in every chapter, with a solutions manual for unsolved problems included for instructors Ideal for practicing professionals in civil, mechanical, and aerospace engineering, as well as upper-level undergraduates and graduate students in structural engineering courses, Structural Stability Theory and Practice: Buckling of Columns, Beams, Plates, and Shell provides readers with detailed mathematical derivations along with thorough explanations and practical examples.

PLATES AND SHELLS FOR SMART STRUCTURES

CLASSICAL AND ADVANCED THEORIES FOR MODELING AND ANALYSIS

John Wiley & Sons Smart structures that contain embedded piezoelectric patches are loaded by both mechanical and electrical fields. Traditional plate and shell theories were developed to analyze structures subject to mechanical loads. However, these often fail when tasked with the evaluation of both electrical and mechanical fields and loads. In recent years more advanced models have been developed that overcome these limitations. Plates and Shells for Smart Structures offers a complete guide and reference to smart structures under both mechanical and electrical loads, starting with the basic principles and working right up to the most advanced models. It provides an overview of classical plate and shell theories for piezoelectric elasticity and demonstrates their limitations in static and dynamic analysis with a number of example problems. This book also provides both analytical and finite element solutions, thus enabling the reader to compare strong and weak solutions to the problems. Key features: compares a large variety of classical and modern approaches to plates and shells, such as Kirchhoff-Love , Reissner-Mindlin assumptions and higher order, layer-wise and mixed theories introduces theories able to consider electromechanical couplings as well as those that provide appropriate interface continuity conditions for both electrical and mechanical variables considers both static and dynamic analysis accompanied by a companion website hosting dedicated software MUL2 that is used to obtain the numerical solutions in the book, allowing the reader to reproduce the examples given as well as solve problems of their own The models currently used have a wide range of applications in civil, automotive, marine and aerospace engineering. Researchers of smart structures, and structural analysts in industry, will find all they need to

know in this concise reference. Graduate and postgraduate students of mechanical, civil and aerospace engineering can also use this book in their studies. www.mul2.com

BUCKLING AND POSTBUCKLING OF BEAMS, PLATES, AND SHELLS

Springer This book contains eight chapters treating the stability of all major areas of the flexural theory. It covers the stability of structures under mechanical and thermal loads and all areas of structural, loading and material types. The structural element may be assumed to be made of a homogeneous/isotropic material, or of a functionally graded material. Structures may experience the bifurcation phenomenon, or they may follow the postbuckling path. This volume explains all these aspects in detail. The book is self-contained and the necessary mathematical concepts and numerical methods are presented in such a way that the reader may easily follow the topics based on these basic tools. It is intended for people working or interested in areas of structural stability under mechanical and/or thermal loads. Some basic knowledge in classical mechanics and theory of elasticity is required.

THEORIES OF PLATES AND SHELLS

CRITICAL REVIEW AND NEW APPLICATIONS

Springer Science & Business Media Plate and shell theories experienced a renaissance in recent years. The potentials of smart materials, the challenges of adaptive structures, the demands of thin-film technologies and more on the one hand and the availability of newly developed mathematical tools, the tremendous increase in computer facilities and the improvement of commercial software packages on the other caused a reanimation of the scientific interest. In the present book the contributions of the participants of the EUROMECH Colloquium 444 "Critical Review of the Theories of Plates and Shells and New Applications" have been collected. The aim was to discuss the common roots of different plate and shell approaches, to review the current state of the art, and to develop future lines of research. Contributions were written by scientists with civil and mechanical engineering as well as mathematical and physical background.

THEORY OF STRUCTURES

FUNDAMENTALS, FRAMED STRUCTURES, PLATES AND SHELLS

John Wiley & Sons This book provides the reader with a consistent approach to theory of structures on the basis of applied mechanics. It covers framed structures as well as plates and shells using elastic and plastic theory, and emphasizes the historical background and the relationship to practical engineering activities. This is the first comprehensive treatment of the school of structures that has evolved at the Swiss Federal Institute of Technology in Zurich over the last 50 years. The many worked examples and exercises make this a textbook ideal for in-depth studies. Each chapter concludes with a summary that highlights the most important aspects in concise form. Specialist terms are defined in the appendix. There is an extensive index befitting such a work of reference. The structure of the content and highlighting in the text make the book easy to use. The notation, properties of materials and geometrical properties of sections plus brief outlines of matrix algebra, tensor calculus and calculus of variations can be found in the appendices. This publication should be regarded as a key work of reference for students, teaching staff and practising engineers. Its purpose is to show readers how to model and handle structures appropriately, to support them in designing and checking the structures within their sphere of responsibility.

LINEAR ELASTIC THEORY OF THIN SHELLS

THE COMMONWEALTH AND INTERNATIONAL LIBRARY: STRUCTURES AND SOLID BODY MECHANICS DIVISION

Elsevier Linear Elastic Theory of Thin Shells presents membrane and bending theories for open and closed cylindrical shells and shells of arbitrary shape. This book aims to develop the analysis through membrane theory to bending theory for shells and to limit the type of mathematics used. Organized into eight chapters, this book begins with an overview of the solid material enclosed between two closely spaced doubly curved surfaces. This text then examines the five stress resultants for closed cylindrical shell. Other chapters consider the theoretical stresses that are closely related to the actual stresses determined experimentally in practice. This book discusses as well the numerical analysis of more complicated shell structures. The final chapter deals with the correlation between experimental and theoretical stresses in shells. This book is intended to be suitable for final year engineering and post-graduate students. Design and consulting engineers will also find this book extremely useful.

MECHANICS OF LAMINATED COMPOSITE PLATES AND SHELLS

THEORY AND ANALYSIS, SECOND EDITION

CRC Press The second edition of this popular text provides complete, detailed coverage of the various theories, analytical solutions, and finite element models of laminated composite plates and shells. The book reflects advances in materials modeling in general and composite materials and structures in particular. It includes a chapter dedicated to the theory and analysis of laminated shells, discussions on smart structures and functionally graded materials, exercises and examples, and chapters that were reorganized from the first edition to improve the clarity of the presentation.

ADVANCES IN THE THEORY OF PLATES AND SHELLS

Elsevier Plates and shells play an important role in structural, mechanical, aerospace and manufacturing applications. The theory of plates and shells have advanced in the past two decades to handle more complicated problems that were previously beyond reach. In this book, the most recent advances in this area of research are documented. These include topics such as thick plate and shell analyses, finite rotations of shell structures, anisotropic thick plates, dynamic analysis, and laminated composite panels. The book is divided into two parts. In Part I, emphasis is placed on the theoretical aspects of the analysis of plates and shells, while Part II deals with modern applications. Numerous eminent researchers in the various areas of plate and shell analyses have contributed to this work which pays special attention to aspects of research such as theory, dynamic analysis, and composite plates and shells.

MATLAB CODES FOR FINITE ELEMENT ANALYSIS

SOLIDS AND STRUCTURES

Springer Science & Business Media This book intend to supply readers with some MATLAB codes for ?nite element analysis of solids and structures. After a short introduction to MATLAB, the book illustrates the ?nite element implementation of some problems by simple scripts and functions. The following problems are discussed: • Discrete systems, such as springs and bars • Beams and frames in bending in 2D and 3D • Plane stress problems • Plates in bending • Free vibration of Timoshenko beams and Mindlin plates, including laminated composites • Buckling of

Timoshenko beams and Mindlin plates The book does not intends to give a deep insight into the ?nite element details, just the basic equations so that the user can modify the codes. The book was prepared for undergraduate science and engineering students, although it may be useful for graduate students. TheMATLABcodesofthisbookareincludedinthedisk.Readersarewelcomed to use them freely. The author does not guarantee that the codes are error-free, although a major e?ort was taken to verify all of them. Users should use MATLAB 7.0 or greater when running these codes. Any suggestions or corrections are welcomed by an email to ferreira@fe.up.pt.

THIN SHELLS

COMPUTING AND THEORY

Elsevier Thin Shells: Computing and Theory introduces the basic concepts of elastic analysis of shells and the computer programming methods of such analyses. The book utilizes FORTRAN in presenting the programs for stress analysis in shells. The text first covers membrane and bending theories for cylindrical and spherical shells and the membrane theory for shells of arbitrary shape. Next, the book tackles the analysis of more complicated shell structures such as multi-shells. The next chapter deals with a finite element method. The 10th chapter details the correlation between theoretical stresses and actual experimental stresses, and the last chapter covers corrugated shells. The text will be of great use to students and practitioners of civil engineering.

RECENT APPROACHES IN THE THEORY OF PLATES AND PLATE-LIKE STRUCTURES

Springer This book presents the various approaches in establishment the basic equations of one- and two-dimensional structural elements. In addition, the boundaries of validity of the theories and the estimation of errors in approximate theories are given. Many contributions contain not only new theories, but also new applications, which makes the book interesting for researcher and graduate students.

THEORY AND DESIGN OF PLATE AND SHELL STRUCTURES

Springer Science & Business Media The design of many structures such as pressure vessels, aircrafts, bridge decks, dome roofs, and missiles is based on the theories of plates and shells. The degree of simplification needed to adopt the

theories to the design of various structures depends on the type of structure and the re quired accuracy of the results. Hence, a water storage tank can be satis factorily designed using the membrane shell theory, which disregards all bending moments, whereas the design of a missile casing requires a more precise analysis in order to minimize weight and materials. Similarly, the design of a nozzle-to-cylinder junction in a nuclear reactor may require a sophisticated finite element analysis to prevent fatigue failure while the same junction in an air accumulator in a gas station is designed by simple equations that satisfy equilibrium conditions. Accordingly, this book is written for engineers interested in the theories of plates and shells and their proper application to various structures. The examples given throughout the book subsequent to derivation of various theories are intended to show the engineer the level of analysis required to achieve a safe design with a given degree of accuracy. The book covers three general areas. These are: bending of plates; membrane and bending theories of shells; and buckling of plates and shells. Bending of plates is discussed in five chapters. Chapters 1 and 2 cover rectangular plates with various boundary and loading conditions.

VIBRATION OF SHELLS

The vibrational characteristics and mechanical properties of shell structures are discussed. The subjects presented are: (1) fundamental equations of thin shell theory, (2) characteristics of thin circular cylindrical shells, (3) complicating effects in circular cylindrical shells, (4) noncircular cylindrical shell properties, (5) characteristics of spherical shells, and (6) solution of three-dimensional equations of motion for cylinders.

THERMAL STRESS ANALYSIS OF COMPOSITE BEAMS, PLATES AND SHELLS

COMPUTATIONAL MODELLING AND APPLICATIONS

Academic Press Thermal Stress Analysis of Composite Beams, Plates and Shells: Computational Modelling and Applications presents classic and advanced thermal stress topics in a cutting-edge review of this critical area, tackling subjects that have little coverage in existing resources. It includes discussions of complex problems, such as multi-layered cases using modern advanced computational and vibrational methods. Authors Carrera and Fazzolari begin with a review of the fundamentals of thermoelasticity and thermal stress analysis relating to advanced structures and the basic mechanics of beams, plates, and shells, making the book a self-contained reference. More challenging topics are then addressed, including anisotropic thermal stress structures, static and dynamic responses of coupled and uncoupled thermoelastic problems, thermal buckling, and post-buckling behavior of thermally loaded structures, and

thermal effects on panel flutter phenomena, amongst others. Provides an overview of critical thermal stress theory and its relation to beams, plates, and shells, from classical concepts to the latest advanced theories Appeals to those studying thermoelasticity, thermoelastics, stress analysis, multilayered structures, computational methods, buckling, static response, and dynamic response Includes the authors' unified formulation (UF) theory, along with cutting-edge topics that receive little coverage in other references Covers metallic and composite structures, including a complete analysis and sample problems of layered structures, considering both mesh and meshless methods Presents a valuable resource for those working on thermal stress problems in mechanical, civil, and aerospace engineering settings

THE BOUNDARY ELEMENT METHOD FOR PLATE ANALYSIS

Elsevier Boundary Element Method for Plate Analysis offers one of the first systematic and detailed treatments of the application of BEM to plate analysis and design. Aiming to fill in the knowledge gaps left by contributed volumes on the topic and increase the accessibility of the extensive journal literature covering BEM applied to plates, author John T. Katsikadelis draws heavily on his pioneering work in the field to provide a complete introduction to theory and application. Beginning with a chapter of preliminary mathematical background to make the book a self-contained resource, Katsikadelis moves on to cover the application of BEM to basic thin plate problems and more advanced problems. Each chapter contains several examples described in detail and closes with problems to solve. Presenting the BEM as an efficient computational method for practical plate analysis and design, Boundary Element Method for Plate Analysis is a valuable reference for researchers, students and engineers working with BEM and plate challenges within mechanical, civil, aerospace and marine engineering. One of the first resources dedicated to boundary element analysis of plates, offering a systematic and accessible introductory to theory and application Authored by a leading figure in the field whose pioneering work has led to the development of BEM as an efficient computational method for practical plate analysis and design Includes mathematical background, examples and problems in one self-contained resource

APPLIED MECHANICS OF SOLIDS

CRC Press Modern computer simulations make stress analysis easy. As they continue to replace classical mathematical methods of analysis, these software programs require users to have a solid understanding of the fundamental principles on which they are based.Develop Intuitive Ability to Identify and Avoid Physically Meaningless

PredictionsApplied Mechanics o

ELASTICITY

THEORY, APPLICATIONS, AND NUMERICS

Elsevier Although there are several books in print dealing with elasticity, many focus on specialized topics such as mathematical foundations, anisotropic materials, two-dimensional problems, thermoelasticity, non-linear theory, etc. As such they are not appropriate candidates for a general textbook. This book provides a concise and organized presentation and development of general theory of elasticity. This text is an excellent book teaching guide. Contains exercises for student engagement as well as the integration and use of MATLAB Software Provides development of common solution methodologies and a systematic review of analytical solutions useful in applications of

MECHANICS OF FRACTURE INITIATION AND PROPAGATION

SURFACE AND VOLUME ENERGY DENSITY APPLIED AS FAILURE CRITERION

Springer Science & Business Media The assessment of crack initiation and/or propagation has been the subject of many past discussions on fracture mechanics. Depending on how the chosen failure criterion is combined with the solution of a particular theory of continuum mechanics, the outcome could vary over a wide range. Mod elling of the material damage process could be elusive if the scale level of observation is left undefined. The specification of physical dimension alone is not sufficient because time and temperature also play an intimate role. It is only when the latter two variables are fixed that failure predictions can be simplified. The sudden fracture of material with a pre-existing crack is a case in point. Barring changes in the local temperature,* the energy released to create a unit surface area of an existing crack can be obtained by considering the change in elastic energy of the system before and after crack extension. Such a quantity has been referred to as the critical energy release rate, G e, or stress intensity factor, K Ie. Other parameters, such as the crack opening displacement (COD), path-independent J-integral, etc. , have been proposed; their relation to the fracture process is also based on the energy release concept. These one-parameter approaches, however, are unable simultaneously to account for the failure process of crack initiation, propagation and onset of rapid fracture. A review on the use of G, K I, COD, J, etc. , has been made by Sih [1,2].

FINITE ELEMENT ANALYSIS OF COMPOSITE MATERIALS USING ABAQUSTM

CRC Press Developed from the author's graduate-level course on advanced mechanics of composite materials, Finite Element Analysis of Composite Materials with Abaqus shows how powerful finite element tools address practical problems in the structural analysis of composites. Unlike other texts, this one takes the theory to a hands-on level by actually solving

STABILITY OF NONLINEAR SHELLS

ON THE EXAMPLE OF SPHERICAL SHELLS

Elsevier Stability of NonLinear Shells is a compilation of the author's work on analyzing the behaviour of spherical caps and related shell structures under various (axisymmetric) load systems. Differing from other texts on shells of revolution, it is one of the first attempts to deal with effects of multi-parameter load systems. This extension leads to the discovery of some new, hitherto unknown phenomena exhibited by these structures. In addition, the book presents a novel way to characterize properties of solutions of the governing equations for spherical caps - a classification anchored in a theory called reciprocal systems. The author has introduced a deformation map, a projection of multi-dimensional solutions to two-dimensional graphs, to enable analysts to gain insight into the physical meaning of the results obtained. Numerous examples illustrate the concepts introduced. This book also comes to grips with many misconceptions existing in engineering literature about the question of the stability of solutions.