Static And Dynamic Buckling Of Thin Walled Plate Structures

Analyses were performed for static and dynamic buckling of a continuous fiber embedded in a matrix in order to determine the effects of interfacial debonding and fiber breakage on the critical buckling load and the domain of instability. A beam on elastic foundation model was used for the study. The study showed that a local interfacial debonding between a fiber and a surrounding matrix resulted in an increase of the wavelength of the buckling mode. An increase of the wave length yielded a decrease of the static buckling load and lowered the dynamic instability domain. In general, the effect of a partial or complete interfacial debonding was more significant on the domain of dynamic instability than on the effects of static buckling load. For dynamic buckling of a fiber, a local debonding of size 10 to 20 percent of the fiber length had the most important influence on the domains of dynamic instability regardless of the location of debonding and the boundary conditions of the fiber. For static buckling, the location of a local debonding was critical to a free-simply supported fiber but not to a fiber with both ends simply supported. Fiber breakage also lowered the critical buckling load significantly. Buckling of composites.

Dynamic Stability of Structures covers the proceedings of an International Conference on Dynamic Stability of Structures, held in Northwestern University, Evanston, Illinois on October 18-20, 1965, jointly sponsored by the Air Force of Scientific Research and Northwestern University. The conference aims to delineate the various categories of dynamic stability phenomena. This book is organized into six sections encompassing 20 chapters that tackle general topics such as mathematical methods of analysis, physical phenomena, design applications in engineering, and reports of field research. The first two sections deal with the fundamentals, principles, and concept of dynamic stability, as well as an introduction to the use of computing machines as an aid in studying the motions of complicated dynamical systems. The succeeding two sections highlight the statistical aspects in the structural stability theory and certain problems of structural dynamic. These sections also look into the dynamic buckling of elastic structures and the buckling of long slender ships due to wave-induced whipping. The last two sections explore the stability and vibration problems of mechanical systems under harmonic excitation and the dynamic buckling under step loading. These sections also include discussions on the nonlinear dynamic response of shell-type structures and of a column under random loading, as well as Italian research in the field. Structural and mechanical engineers will find this book invaluable.

This proceedings book includes a selection of refereed papers presented at the International Conference on Modern Mechanics and Applications (ICOMMA) 2020, which took place in Ho Chi Minh City, Vietnam, on December 2–4, 2020. The contributions highlight recent trends and applications in modern mechanics. Subjects covered include biological systems; damage, fracture, and failure; flow problems; multiscale multi-physics problems; composites and hybrid structures; optimization and inverse problems; lightweight structures; mechatronics; dynamics; numerical methods and intelligent computing; additive manufacturing; natural hazards modeling. The book is intended for academics, including graduate students and experienced researchers interested in recent trends in modern mechanics and application.

Stability and Vibrations of Thin-Walled Composite Structures presents engineering and academic knowledge on the stability (buckling and post buckling) and vibrations of thin walled composite structures like columns, plates, and stringer stiffened plates and shells, which form the basic structures of the aeronautical and space sectors. Currently, this knowledge is dispersed in several books and manuscripts, covering all aspects of composite materials. The book enables both engineers and academics to locate valuable, up-to-date knowledge on buckling and vibrations, be it analytical or experimental, and use it for calculations or comparisons. The book is also useful as a textbook for advanced-level graduate courses. Presents a unified, systematic, detailed and comprehensive overview of the topic Contains contributions from leading experts in the field Includes a dedicated section on testing and experimental results

This book - comprised of three separate volumes - presents the recent developments and research discoveries in structural and solid mechanics; it is dedicated to Professor Isaac Elishakoff. This first volume is devoted to the statics and stability of solid and structural members. Modern Trends in Structural and Solid Mechanics 1 has broad scope, covering topics such as: buckling of discrete systems (elastic chains, lattices with short and long range interactions, and discrete arches), buckling of continuous structural elements including beams, arches and plates, static investigation of composite plates, exact solutions of plate problems, elastic and inelastic buckling, dynamic buckling under impulsive loading, buckling and post-buckling investigations, buckling of conservative and non-conservative systems and buckling of micro and macro-systems. This book is intended for graduate students and researchers in the field of theoretical and applied mechanics.

Dynamic instability or dynamic buckling as applied to structures is a term that has been used to describe many classes of problems and many physical phenomena. It is not surprising, then, that the term finds several uses and interpretations among structural mechanicians. Problems of parametric resonance, follower-force, whirling of rotating shafts, fluid-solid interaction, general response of structures to dynamic loads, and several others are all classified under dynamic instability. Many analytical and experimental studies of such problems can be found in several books as either specialized topics or the main theme. Two such classes, parametric resonance and stability of nonconservative systems under static loads (follower-force problems), form the main theme of two books by V. V. Bolotin, which have been translated from Russian. Moreover, treatment of aero elastic instabilities can be found in several textbooks. Finally, analytical and experimental studies of structural elements and systems subjected to intense loads (of very short duration) are the focus of the recent monograph by Lindberg and Florence. The first chapter attempts to classify the various "dynamic instability" phenomena by taking into consideration the nature of the cause, the character of the response, and the history of the problem. Moreover, the various concepts and methodologies as developed and used by the various investigators for estimating critical conditions for suddenly loaded elastic systems are fully described. Chapter 2 demonstrates the concepts and criteria for dynamic stability through simple mechanical models with one and two degrees of freedom.

This volume contains the written texts of the papers presented at a Symposium on Buckling of Structures held at Harvard University in June 1974. This symposium, one of several on various topics sponsored annually by the International Union of Theoretical and Applied Me chanics (IUTAM), was organized by a Scientific Committee consisting of B. Budiansky (Chairman), A. H. Chilver, W. T. Koiter, and A. S. Vol' mir. Participation was by invitation of the Scientific Committee, and specific lecturers were invited to speak in the areas of experimental research, buckling and post-buckling calculations, post-buckling mode interaction, plasticity and creep effects, dynamic buckling, stochastic problems, and design. A total of 29 lectures were delivered, including a general opening lecture by Professor Koiter, and there were 93 reg istered participants from 16 different countries. Financial

support for the symposium was provided by IUTAM, in the form of partial travel support for a number of participants, and also by the National Science Foundation, the National Aeronautics and Space Administration, and the Air Force Office of Scientific Re search, for additional travel support and administrative expenses. Meeting facilities and services were efficiently provided by the Science Center of Harvard University, and administrative support was gen erously provided by the Division of Engineering and Applied Physics of Harvard University. The scientific chairman enjoyed the invaluable assistance of his colleagues Professors J. W. Hutchinson and J. L.

This book provides an in-depth treatment of the study of the stability of engineering structures. Contributions from internationally recognized leaders in the field ensure a wide coverage of engineering disciplines in which structural stability is of importance, in particular the experimental, analytical and numerical modelling of structural stability applied to aeronautical, civil and marine structures. This second volume in buckling and postbuckling structures builds on the first, and reports on the development of fast semi-analytical methods for the rapid characterization of postbuckling structures; optimization approaches for the design of stiffened composite panels, and a discourse on imperfection sensitivity. This book will be a particularly useful reference to professional engineers, graduate students and researchers interested in structural stability.

This thesis is focused on the investigation of the changes in the buckling behaviour of various composite shells due to dynamic, rapid loading. Currently, the structural design procedures of lightweight structures incorporate assumption of the loads as quasistatic, while maintaining reliability by applying conservative safety coefficients. Different investigations show that in various cases of dynamic loading the buckling loads can be both higher and lower than the static buckling load. Therefore, correct consideration of the load dynamics in the design procedure would lead to safer and more efficient structures. A reliable, experimentally validated analysis approach is required in order to benefit from the weight-saving potential of dynamically loaded composite structures, while maintaining the reliability. However, only few experimental investigations on dynamic buckling of composite structures have been performed because of the complexity of such experiments. In present thesis, the dynamic buckling of composite shells has been investigated experimentally and numerically, and an appropriate experimentally validated modelling approach has been proposed.

This book introduces the underlying concepts of column dynamics and buckling, based on the latest state-of-the-art research on this innovative topic. It begins with a summary of the basic concepts behind column dynamics and buckling, before moving on to the models for studying dynamic buckling inside oil wells. Four models with increasing complexity are presented: columns without friction; columns with friction; columns inside slant wells; and columns inside offshore wells. Each model is divided into two cases, depending on whether the column is being tripped in or out. A case study is used to demonstrate these models and is further developed as each model is presented and explained. The results include comparisons between the models themselves, thus showing the implications of the adopted hypotheses of each. This book enables academic, industrial, and graduate student readers to fully understand the fundamentals of dynamic buckling and to further develop the presented models for their own research.

This book presents the latest research results in the area of applied nonlinear dynamics and chaos theory. Papers by three academic generations address new applications of nonlinear dynamics to mechanics, including fluid-structure interaction, machining and mechanics of solids, and many other applications.

A digital computer program for the geometrically nonlinear analysis of totally arbitrarily loaded shells of revolution (SATANS-2) was modified to more accurately account for the conditions at the pole of the shell. This program was used to determine the buckling load of shallow spherical shells of various sizes when subjected to static axisymmetric, dynamic axisymmetric, and dynamic nearly axisymmetric step-pressure loads of infinite duration. A comparison was made between the new buckling results and previous results obtained without the new pole routine. The comparison revealed a significant change in the buckling pressures, due solely to the change in the pole routine. The new static axisymmetric, dynamic axisymmetric, and even the dynamic asymmetric critical buckling pressure loads appear to be fairly reliable results for perfect, shallow shells.

Integrating macroscopic properties with observations at lower levels, this book details advances in multiscale modelling and analysis pertaining to classes of composites which either have a wider range of relevant microstructural scales, such as metals, or do not have a very well-defined microstructure, e.g. cementitious or ceramic composites. The IUTAM symposia proceedings provide a platform for extensive further discussion and research.

Safety of Sea Transportation is the second of two Conference Proceedings of TransNav 2017, June 21-23 in Gdynia, Poland. Safety of Sea Transportation will focus on the following themes: Sustainability, intermodal and multimodal transportation Safety and hydrodynamic study of hydrotechnical structures Bunkering and fuel consumption Gases emission, water pollution and environmental protection Occupational accidents Supply chain of blocks and spare parts Electrotechnical problems Ships stability and loading strength Cargo loading and port operations Maritime Education and Training (MET) Human factor, crew manning and seafarers problems Economic analysis Mathematical models, methods and algorithms Fishery Legal aspects Aviation

Dynamic buckling loads are obtained for axisymmetric spherical caps with initial imperfections. Two types of loading are considered, namely, step loading of infinite duration and right triangular pulse. Results show that initial imperfections do indeed have the effect of reducing the buckling capacity for both dynamic and static responses. Solutions also indicate that pulse duration has a very significant impact on the magnitude of the dynamic buckling load, and that the step loading of infinite duration is the limiting case of a triangular pulse and provides the most severe loading situation for dynamic analysis. (Author).

Shells are basic structural elements of modern technology and everyday life. Examples are automobile bodies, water and oil tanks, pipelines, aircraft fuselages, nanotubes, graphene sheets or beer cans. Also nature is full of living shells such as leaves of trees, blooming flowers, seashells, cell membranes, the double helix of DNA or wings of insects. In the human body arteries, the shell of the eye, the diaphragm, the skin or the pericardium are all shells as well. Shell Structures: Theory and Applications, Volume 3 contains 137 contributions presented at the 10th Conference “Shell Structures: Theory and Applications” held October 16-18, 2013 in Gdansk, Poland. The papers cover a wide spectrum of scientific and engineering problems which are divided into seven broad groups: general lectures, theoretical modelling, stability, dynamics, bioshells, numerical analyses, and engineering design. The volume will be of interest to researchers and designers dealing with modelling and analyses of shell structures and thin-walled structural elements.

This book originally appeared as a text prepared for the Defense Nuclear Agency to summarize research on dynamic

pulse buckling, by the authors and their colleagues at SRI International, during the period from 1960 to 1980. The original printing of 300 copies by the DNA Press was followed shortly by a small second printing to meet the demand by readers who heard of the book from the primary recipients. This supply was also quickly exhausted, to researchers and practicing engineers outside the DNA community and to academics who wanted to include the material in courses on elastic and plastic stability of structures. Commercial publication by Martinus Nijhoff Publishers was therefore undertaken to meet the needs of this broader community. The objective of the book was to gather into a cohesive whole material that had been published in reports and the open literature during the two decade period. In the process of knitting this material together, a substantial amount of new work was done. The book therefore contains many new results never published in the open literature.

* Edited by Josef Singer, the world's foremost authority on structural buckling. * Time-saving and cost-effective design data for all structural, mechanical, and aerospace engineering researchers.

This volume contains the papers presented at the Fourth International Conference of Thin-Walled Structures (ICTWS4), and contains 110 papers which, collectively, provide a comprehensive state-of-the-art review of the progress made in research, development and manufacture in recent years in thin-walled structures.The presentations at the conference had representation form 35 different countries and their topical areas of interest included aeroelastic response, structural-acoustic coupling, aerospace structures, analysis, design, manufacture, cold-formed structures, cyclic loading, dynamic loading, crushing, energy absorption, fatigue, fracture, damage tolerance, plates, stiffened panels, plated structures, polymer matrix composite members, sandwich structures, shell structures, thin-walled beams, columns and vibrational response. The range of applications of thin-walled structures has become increasingly diverse with a considerable deployment of thin-walled structural elements and systems being found in a wide range of areas within Aeronautical, Automotive, Civil, Mechanical, Chemical and Offshore Engineering fields. This volume is an extremely useful reference volume for researchers and designers working within a wide range of engineering disciplines towards the design, development and manufacture of efficient thin-walled structural systems.

Manual of numerical methods in concrete aims to present a unified approach for the available mathematical models of concrete, linking them to finite element analysis and to computer programs in which special provisions are made for concrete plasticity, cracking and crushing with and without concrete aggregate interlocking. Creep, temperature, and shrinkage formulations are included and geared to various concrete constitutive models.

This book discusses the application of independent continuous mapping method in predicting and the optimization of the mechanical performance of buckling with displacement, stress and static constrains. Each model is explained by mathematical theories and followed by simulation with frequently-used softwares. With abundant project data, the book is an essential reference for mechanical engineers, structural engineers and industrial designers.

Thin-walled metal shell structures are highly efficient in their use of material, but they are particularly sensitive to failure by buckiling. Many different forms of buckling can occur for different geometries and different loading conditions. Because this field of knowledge is both complex and industrially important, it is of great interest and c

This monograph deals with buckling and postbuckling behavior of thin plates and thin-walled structures with flat wall subjected to static and dynamic load. The investigations are carried out in elastic range. The basic assumption here is the thin plate theory. This method is used to determination the buckling load and postbuckling analysis of thin-walled structures subjected to static and dynamic load. The book introduces two methods for static and dynamic buckling investigation which allow for a wider understanding of the phenomenon. Two different methods also can allow uncoupling of the phenomena occurring at the same time and attempt to estimate their impact on the final result. A general mathematical model, adopted in proposed analytical-numerical method, enables the consideration of all types of stability loss i.e.local, global and interactive forms of buckling. The applied numerical-numerical method includes adjacent of walls, shear-lag phenomenon and a deplanation of cross-sections.

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