# Analysis Of Rotating Disk In Abaqus

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**Discontinuity and Complexity in Nonlinear Physical Systems**

Analysis of a Rotating Disk System with Axial Cooling AirAnalysis of the free vibration of the rotating diskDirect Method of Design and Stress Analysis of Rotating Disks with Temperature GradientSimplifications are also presented for determination of elastic- and plastic-stress distributions for disks of given design as

described in NACA Reports 871 and 906.Analysis of Laminar Flow Between Stationary and Rotating Disks with InflowThe laminar flow between a rotating and a stationary disk with inflow was analyzed. Solutions to the dimensionless governing equations are sought by expanding each of the velocity components in powers of inverse radius. The equations to leading order are those for the configuration with no inflow. The subsequent orders yield sets of linear ordinary differential equations. Solutions are obtained for the first two of these subsequent orders. The solutions indicate that inflow tends to increase the magnitude of the azimuthal velocity in the flow between the two disks and to decrease the torque on the rotating disk. For Prandtl number one, an energy integral is obtained which relates the temperature distribution to the velocity distribution for all Reynolds numbers and therefore eliminates the needs for separate solution of the energy equation.ASME 65-WA/GTP-8A Computer Subroutine for Stress Analysis of Rotating Disks. II.This report corrects errors in a previous report on the same subject and presents a listing of a revised and improved digital computer program for finding stress distribution in a thin rotating disk with nonuniform heating. (Author).Analysis

of the Transient Response of a Flat Rotating Disk by Generalized TransformsA Computer Subroutine for Stress Analysis of Rotating, Heated DisksThis report gives listing and instructions for using a digital computer subroutine for finding stress distribution in a thin rotating disk with nonuniform heating; the problem is axisymmetric. An iterative method is used. Theoretical background is given. (Author).Analysis and Development of a Rotating Disk OxygenatorDisplacement and Stress Analysis of a Functionally Graded Fiber-reinforced Rotating Disk with Non-uniform Thickness and Angular VelocitySymmetric Planar Vibrations of a Rotating DiskThe complete problem of coupled symmetric radial and torsional vibrations of a thin rotating circular disk has been solved using undeformed coordinates. The formulation of the problem used yields several interesting and previously unreported results for the static problem. Two types of instabilities occur, static resonances and classical instabilities, for which radial and torsional displacements everywhere in the disk can become unboundedly large. These resonances were explained physically. The solutions of the frequency equation and the mode shapes are obtained. The effect of rotation is to lower the natural frequencies of the disk. When deformed

coordinates are used, as is the case in the classical analysis of a rotating disk, the instabilities are concealed and are not nearly as obvious. (Author).

Deformation and Life Analysis of Composite Flywheel Disk and Multi-Disk Systems

The complete problem of coupled symmetric radial and torsional vibrations of a thin rotating circular disk has been solved using undeformed coordinates. The formulation of the problem used yields several interesting and previously unreported results for the static problem. Two types of instabilities occur, static resonances and classical instabilities, for which radial and torsional displacements everywhere in the disk can become unboundedly large. These resonances were explained physically. The solutions of the frequency equation and the mode shapes are obtained. The effect of rotation is to lower the natural frequencies of the disk. When deformed coordinates are used, as is the case in the classical analysis of a rotating disk, the instabilities are concealed and are not nearly as obvious. (Author).

*A Numerical Analysis of Jet Impingement Cooling of a Rotating Disk*

Springer Science & Business Media

The book deals with novel aspects and perspectives in functionally graded materials (FGMs), which are advanced engineering materials designed for a specific performance or

function with spatial gradation in structure and/or composition. The contributions mainly focus on numerical simulations of mechanical properties and the behavior of FGMs and FGM structures. Several advancements in numerical simulations that are particularly useful for investigations on FGMs have been proposed and demonstrated in this Special Issue. Such proposed approaches provide incisive methods to explore and predict the mechanical and structural characteristics of FGMs subjected to thermoelectromechanical loadings under various boundary and environmental conditions. The contributions have resulted in enhanced activity regarding the prediction of FGM properties and global structural responses, which are of great importance when considering the potential applications of FGM structures. Furthermore, the presented scientific scope is, in some way, an answer to the continuous demand for FGM structures, and opens new perspectives for their practical use.

**The Rotating Disc Electrode Springer**

**Analysis of a Rotating Disk System with Axial Cooling AirAnalysis of the free vibration of the rotating diskDirect Method of Design and Stress Analysis of Rotating Disks with Temperature Gradient**

**Stress Analysis and Design Optimization of Rotating Disks of Non-uniform Thickness** Createspace Independent Publishing Platform This Brief describes systematically results of research studies on a series of convective heat transfer phenomena from rotating disks in air crossflow. Phenomena described in this volume were investigated experimentally using

an electrically heated disk placed in the test section of a wind tunnel. The authors describe findings in which transitions between different heat transfer regimes can occur in dependency on the involved Reynolds numbers and the angle of incidence, and that these transitions could be related to phenomenological Landau and Landau-de Gennes models. The concise volume closes a substantial gap in the scientific literature with respect to flow and heat transfer in rotating disk systems and provides a comprehensive presentation of new and recent results not previously published in book form.

*Cyclic Voltammetry at a Rotating Disk, Electroreduction of Nitrate in Acidic Nickel Solutions, and Fr equency-response Analysis of Porous Electrodes*

Springer Science & Business Media

The present work reports on the application of image derotated holographic interferometry to study the resonant response of a rotating steel disk at speeds up to 8000 RPM. The rotational motion of the disk is optically removed by passing the image of the rotating disk through a prism that is traveling at half the rotational speed of the disk. Off-axis double-pulsed laser holography is then used to record the disk resonant vibratory response. The first five diametrical modes and one of disk imbalance, misalignment of optical and mechanical axes of rotation and system-excited

modes of vibration are also addressed. Selected experimental results are compared to those obtained using finite element analysis. (Author).

**Rotating Flow**

MDPI

This report corrects errors in a previous report on the same subject and presents a listing of a revised and improved digital computer program for finding stress distribution in a thin rotating disk with nonuniform heating. (Author).

Elsevier

Discontinuity in Nonlinear Physical Systems explores recent developments in experimental research in this broad field, organized in four distinct sections. Part I introduces the reader to the fractional dynamics and Lie group analysis for nonlinear partial differential equations. Part II covers chaos and complexity in nonlinear Hamiltonian systems, important to understand the resonance interactions in nonlinear dynamical systems, such as Tsunami waves and wildfire propagations; as well as Lev flights in chaotic trajectories, dynamical system synchronization and DNA information complexity analysis. Part III examines chaos and periodic motions in discontinuous dynamical systems, extensively present in a range of systems, including piecewise linear systems, vibro-impact systems and drilling systems in engineering. And in Part IV, engineering and financial nonlinearity are discussed. The mechanism of shock wave with saddle-node bifurcation and rotating disk stability will be presented, and the financial nonlinear models will be discussed.

*Convective Heat and Mass*

*Transfer in Rotating Disk Systems* Springer Science & Business Media
This report gives listing and instructions for using a digital computer subroutine for finding stress distribution in a thin rotating disk with nonuniform heating; the problem is axisymmetric. An iterative method is used. Theoretical background is given. (Author).

**Displacement and Stress Analysis of a Functionally Graded Fiber-reinforced Rotating Disk with Non-uniform Thickness and Angular Velocity** Elsevier
The book is devoted to investigation of a series of problems of convective heat and mass transfer in rotating-disk systems. Such systems are widespread in scienti?c and engineering applications. As examples from the practical area, one can mention gas turbine and computer engineering, disk brakes of automobiles, rotating-disk air cleaners, systems of microclimate, extractors, dispensers of liquids, evaporators, c-cular saws, medical equipment, food process engineering, etc. Among the scienti?c applications, it is necessary to point out rotating-disk electrodes used for experim- tal determination of the diffusion coef?cient in electrolytes. The system consisting of a ?xed disk and a rotating cone that touches the disk by its vertex is widely used for measurement of the viscosity coef?cient of liquids. For time being, large

volume of experimental and computational data on par- eters of ?uid ?ow, heat and mass transfer in different types of rotating-disk systems have been accumulated, and different theoretical approaches to their simulation have been developed. This obviously causes a need of systematization and generalization of these data in a book form.

**Vibration of a Rotating Cantilever Beam with an Independently Rotating Disk on the Free End**

Often, disks rotating at high speeds are fabricated from high-strength, filament-wound composites. The carbon and glass fiber bundles, or tows that makeup a filament, are often similar in different disk designs, and steady-state stress analyses are usually reported. Typically, little information is reported about the dynamic deformation and vibrations of the disk, which are important for understanding instabilities at high rotational speeds. First, experimental and FEM modal analyses are performed for a non-rotating disk to verify the FEM model. The disk is made from composite rings which are press-fit or urethane bonded onto a hub. Then, the FEM model is used to analyze the effect of prestressing and stress stiffening due to rotation at various speeds.

*The Spectral Method Applied to Flows Driven by Rotating Disk*

"The governing

equations of the transverse vibration of a spinning disk of varying thickness are derived and solved using numerical integration techniques. A clamped-free rotating annular disk driven at the outer edge with sinusoidally varying force is considered for analysis. Representative graphs showing the stress distribution and the frequency dependence of the force transmissibility of the disk are presented. Results obtained in this paper are compared as applicable to results of previous i nvestigations."--Abs tract.

Analysis and Development of a Rotating Disk Oxygenator

This book provides the latest information and methodologies of rotating disk electrode and rotating ring-disk electrode (RDE/RRDE) and oxygen reduction reaction (ORR). It is an ideal reference for undergraduate and graduate students, scientists, and engineers who work in the areas of energy, electrochemistry science and technology, fuel cells, and other electrochemical systems. Presents a comprehensive description, from fundamentals to applications, of catalyzed oxygen reduction reaction and its mechanisms Portrays a complete description of the RDE (Rotating Disc Electrode)/RRDE (Rotating Ring-Disc Electrode) techniques and their use in evaluating ORR (Oxygen Reduction Reaction) catalysts Provides working examples along with figures, tables, photos and a comprehensive list of references to help understanding of the principles involved

ASME 65-WA/GTP-8

L'anàlisi del comportament dinàmic de components rotatius en turbomàquines és de gran interès per a evitar danys o problemes de fatiga en aquestes parts.

Per determinar el comportament dinàmic d'una part d'una estructura és necessari dur a terme una anàlisi de la vibració lliure d'aquesta part i un estudi de la característica d'excitació. L'anàlisi de les vibracions lliures (anàlisi modal) determina les freqüències i modes propis de l'estructura. Amb l'anàlisi de l'excitació s'obté el contingut freqüencial i el mode de la excitació. Els rodets hidràulics són estructures molt complexes que es troben submergides i confinades dins d'una carcassa. Particularment els rodets de màquines turbina-bomba es comporten com a estructures en forma de disc en els seus primers modes de vibració i estan excitats amb la coneguda interacció rotor-estator (RSI) quan estan en funcionament. Per tal d'estudiar l'efecte de la rotació, el confinament i l'excitació en el comportament dinàmic de l'estructura d'una manera sistemàtica i clara, es necessita un model simplificat. Per això, en aquesta tesi el comportament dinàmic d'un disc giratori submergit en aigua i confinat dins d'una carcassa s'ha analitzat analíticament, experimentalment i contrastat amb simulació. En primer lloc, es presenta un model analític per a l'anàlisi del comportament dinàmic. Les freqüències i modes propis d'un disc giratori considerant el flux que l'envolta es determinen analíticament amb un model simplificat. També s'analitza la resposta del disc amb diferents patrons d'excitació que simulen la excitació RSI. Finalment es discuteix la transmissió del sistema rotatiu al sistema estacionari. Per a l'anàlisi experimental s'ha desenvolupat un banc de proves que consisteix d'un disc giratori submergit i confinat dins d'una carcassa. El disc ha estat excitat des del sistema rotatiu amb excitadors

piezoelèctrics (PZT) i amb un dispositiu d'impacte especialment dissenyat. La resposta del disc s'ha mesurat simultàniament des del sistema rotatiu i des del sistema estacionari. Les primeres freqüències i modes propis del disc quan gira en aire i en aigua s'han obtingut des del sistema rotatiu amb acceleròmetres miniatura cargolats en el disc i s'han contrastat amb les obtingudes amb el model analític presentat i amb una simulació numèrica d'elements finits (FEM). Només els modes diametrals del disc, que són els més rellevants i similars als dels rodets hidràulics, s'han considerat en aquest estudi. El disc ha estat excitat amb diversos patrons d'excitació que simulen el veritable RSI. El comportament dinàmic del disc a causa d'aquests patrons d'excitació ha estat determinat experimentalment i contrastat amb el model analític. Finalment, s'ha realitzat l'anàlisi de la transmissió des del sistema rotatiu al sistema estacionari. Les freqüències i modes propis del disc s'han detectat amb diversos tipus de sensors col·locats al sistema estacionari.

**Analysis of a Rotating Disk System with Axial Cooling Air**

"This thesis provides a vibration analysis of a rotating cantilever beam with an independently rotating thin circular disk on the free end. The exact differential equations of the system as defined by classical Bernoulli-Euler beam theory are written using the methods of the calculus of variations. The exact equations are not solved, but two different approximations are found by assuming a cubic polynomial deflection curve and applying the equation of Lagrange. The

solutions are restricted to small deflections of the beam and a shaft stiffness which permits a deflection in only a single plane. Nonlinear differential equations result in the second approximation and are solved by a digital analog simulation. The nonlinear equations are then linearized using only the dominant terms. Using the linearized equations, the first two natural frequencies and their respective amplitude ratios are solved for in a general computer program that can be applied to many different free vibration beam problems. The results show that the fundamental mode frequency decreases with increasing tip mass and increasing beam rotational speed which results in instability at high speeds. The relative spin of the disk with respect to the beam has no effect at zero beam rotation, but the effect of the relative spin of the disk increases as the beam rotation increases. The results obtained follow the trend reported in other works for limiting cases of this probl em"--Abstract, pages ii-iii.

A Computer Subroutine for Stress Analysis of Rotating, Heated Disks

The laminar flow between a rotating and a stationary disk with inflow was analyzed. Solutions to the dimensionless governing equations are sought by expanding each of the velocity components in powers of inverse radius. The equations to leading order are those for the configuration with no inflow. The subsequent orders yield sets

of linear ordinary differential equations. Solutions are obtained for the first two of these subsequent orders. The solutions indicate that inflow tends to increase the magnitude of the azimuthal velocity in the flow between the two disks and to decrease the torque on the rotating disk. For Prandtl number one, an energy integral is obtained which relates the temperature distribution to the velocity distribution for all Reynolds numbers and therefore eliminates the needs for separate solution of the energy equation.

*An Analysis of Atomization by the Rotating Disk for Controlled Droplet Size*

Even if the subject is a long-standing one, this is the first monograph on this field. On the one hand, this book is intended to give a rather wide review on this field, both in a historical and pedagogical perspective; on the other hand, it aims at critically re-examining and discussing the most controversial issues. For instance, according to some authors the celebrated Sagnac effect is a disproval of the theory of relativity applied to rotating frames; according to others, it is an astonishing experimental evidence of the relativistic theory. In order to give the reader a deeper insight into this research field, the contributing authors discuss their opinions on the main

subjects in an enthralling virtual round table: in this way, the reader can get a direct comparison of the various viewpoints on the most controversial and interesting topics. This is particularly expedient, since the differences in the various approaches are often based upon subtleties that can be understood only by a direct comparison of the underlying hypotheses.

*Production Engineering and Marketing Analysis of the Rotating Disk Evaporator*

In this study an attempt is made to put into perspective the problem of a rotating disk, be it a single disk or a number of concentric disks forming a unit. An analytical model capable of performing an elastic stress analysis for single/multiple, annular/solid, anisotropic/isotropic disk systems, subjected to both pressure surface tractions, body forces (in the form of temperature-changes and rotation fields) and interfacial misfits is derived and discussed. Results of an extensive parametric study are presented to clearly define the key design variables and their associated influence. In general the important parameters were identified as misfit, mean radius, thickness, material property and/or load gradation, and speed; all of which must be simultaneously optimized to achieve the "best" and most reliable design. Also, the important issue of defining proper performance/merit indices (based on the specific stored energy), in the presence of multiaxiality and material anisotropy is addressed. These merit indices are then utilized to discuss the

difference between flywheels made from PMC and TMC materials with either an annular or solid geometry. Finally two major aspects of failure analysis, that is the static and cyclic limit (burst) speeds are addressed. In the case of static limit loads, upper, lower, and out-of-plane bounds for disks with constant thickness are presented for both the case of internal pressure loading (as one would see in a hydroburst test) and pure rotation (as in the case of a free spinning disk). The results (interaction diagrams) are displayed graphically in designer friendly format. For the case of fatigue, a representative fatigue/life master curve is illustrated in which the normalized limit speed versus number of applied cycles is given for a cladded TMC disk application.Arnold, S. M. and Saleeb, A. F. and AlZoubi, N. R.Glenn Research CenterDESIGN ANALYSIS; FAILURE ANALYSIS; MATHEMATICAL MODELS; ROTATING DISKS; STRESS ANALYSIS; F

Wave Number Analysis and Resonance of Stationary and Travelling Cross Flow Modes on a Rotating Disk

Important advances in a subject are as often promoted by a new technique as by new concepts and theories. In the study of electrode reactions which involve diffusion in a primary or a secondary step, the development and use of techniques involving rotating disc electrodes and derived instrumentation based on ring-disc and split-ring systems has enabled advances of great importance to be made in the quantitative examination of diffusion processes at electrodes and their role in electrode processes generally. The technique allows precisely defined mass-transport conditions to be set up which can be

subjected to exact mathe matical analysis so that quantitative treatment of hydrodynamic and diffusion behavior can be made. Of special interest for elec trochemists is the opportunity which the rotating ring-disc system offers for studying solution-soluble intermediates in sequential electrode processes and the kinetics of their reactions in solution. In this book by Pleskov and Filinovskii, both the experimental techniques and the mathematical analysis for the treatments of results for various conditions and types of reaction are described in detail. We believe that presentation of work that has been car ried out by means of rotating electrode techniques, to a large extent by Russian workers, in the form of a concise book will be of great value both to electrochemists and kineticists, and those interested in the physics of fluid motion.

*Rotating Electrode Methods and Oxygen Reduction Electrocatalysts*

Rotating flow is critically important across a wide range of scientific, engineering and product applications, providing design and modeling capability for diverse products such as jet engines, pumps and vacuum cleaners, as well as geophysical flows. Developed over the course of 20 years' research into rotating fluids and associated heat transfer at the University of Sussex Thermo-Fluid Mechanics Research Centre (TFMRC), Rotating Flow is an indispensable reference and resource for all those working within the gas turbine and rotating machinery industries. Traditional fluid and flow dynamics

titles offer the essential background but generally include very sparse coverage of rotating flows—which is where this book comes in. Beginning with an accessible introduction to rotating flow, recognized expert Peter Childs takes you through fundamental equations, vorticity and vortices, rotating disc flow, flow around rotating cylinders and flow in rotating cavities, with an introduction to atmospheric and oceanic circulations included to help deepen understanding. Whilst competing resources are weighed down with complex mathematics, this book focuses on the essential equations and provides full workings to take readers step-by-step through the theory so they can concentrate on the practical applications. A detailed yet accessible introduction to rotating flows, illustrating the differences between flows where rotation is significant and highlighting the non-intuitive nature of rotating flow fields Written by world-leading authority on rotating flow, Peter Childs, making this a unique and authoritative work Covers the essential theory behind engineering applications such as rotating discs, cylinders, and cavities, with natural phenomena such as atmospheric and oceanic flows used to explain underlying principles Provides a rigorous, fully worked mathematical account of rotating flows whilst also including

numerous practical examples in daily life to highlight the relevance and prevalence of different flow types Concise summaries of the results of important research and lists of references included to direct readers to significant further resources

heating. (Author).

**Viscoelastic Film Flow on a Rotating Disk**

This report corrects errors in a previous report on the same subject and presents a listing of a revised and improved digital computer program for finding stress distribution in a thin rotating disk with nonuniform