Natural Frequencies And Mode Shapes Of A Nonlinear Uniform Cantilevered Beam

An algorithm has been developed to calculate mode shapes and natural frequencies of taut cables with attached masses. The transcendental equations of motion are solved by an iterative technique that allows accurate calculation of extremely high mode numbers. The algorithm has been implemented as a FORTRAN program primarily as a tool in determining drag coefficients of submerged strumming cables; however, any taut cable can be analyzed. To assess the accuracy of the program, a simple experiment was conducted to determine the natural frequencies and mode shapes of a wire with attached masses driven sinusoidally by a shaker. The algorithm shows close agreement with the experimental data. (Author).
Formulas for Natural Frequency and Mode ShapeFormulas for Natural Frequency and Mode ShapeKrieger Publishing CompanyFormulas for Natural Frequency and Mode ShapeExperimental Determination of Natural Frequencies and Mode Shapes of Beams by Sonic MethodASME 65-APMW-5An Investigation of the Natural Frequencies and Mode Shapes of Double Conical Sandwich DisksA Method for Determining the Natural Frequencies and Mode Shapes of a Flat Panel Clamped on Four EdgesAn Investigation of the Natural Frequencies and Mode Shapes of Liquids in Oblate Spheroidal TanksAn Investigation of the Natural Frequencies and Mode Shapes of Double Conical Sandwich DisksVibration and Mode Shapes Analysis of Cable Stayed Bridges Considering Different Structural ParametersGRIN Verlag
Natural Frequencies and Mode Shapes of Circular Cylindrical Shells Determined by a Modified Galerkin Procedure
Formulas for Natural Frequency and Mode Shape
Natural Frequencies and Mode Shapes of Plates with Interior Cut-Outs. X
Analytical Method for Determining the Natural Frequencies and Mode Shapes of Orthotropic Plates
The natural frequencies and mode shapes are theoretically determined for a simply supported square plate with discontinuous boundary conditions created by clamping segments of the boundary. Two different clamping configurations are investigated: (1) partial clamping at the end of one edge, and (2) partial clamping on opposite edges. Satisfying the conditions of clamping leads to a Fredholm integral equation of the first kind for the first clamping configuration and a system of integral equations for the second configuration. The frequencies are found by approximating the integral equations with a finite set of homogeneous algebraic equations and insisting that this set have a nontrival solution. (Author).
Research Paper (postgraduate) from the year 2014 in the subject Engineering - Civil Engineering, grade: unknown, University of Weimar, language: English, abstract: The vibration characteristic of a cable stayed bridges structure is the main axis of the study in this paper, many structural parameters are used to simulate and determine the effect of vibration on the structural performance by identifying the natural frequencies of the system and the mode shapes that can occur in the real structure. Modeling the stay cables with three famous styles of arrangements such as Harp, Semi Harp and Fan styles, and assigning roller, hinged and fixed boundary conditions on the deck support of the cable stayed bridge, in addition to using two design cases of the girders and pylons dimensions in the global structure for that purpose. Through the use of ABAQUS finite element analysis, the models were generated for each mentioned cases and the results of the frequency linear perturbation step of 10 mode shapes were determined through the simulation of the deformed shapes and the determined values of the natural frequencies of each mode for each case of interest. It was seen that the roller boundary condition was much prone to the early vibration and the stay cables of the direction near to the roller support were vibrated and stressed much more than the other direction compared with the hinged and fixed boundary conditions, and the mode shapes 7, 8, 9 and 10 were the most vibrated cases for all the boundary conditions without any distinction. The week design of the girders and the pylons has the great effect on the vibration of the stay cables, pylons and deck of the structure especially near the roller support direction due to the early vibration of the case of roller support, so the use of cross ties and damping between the stay cables and the girders are very important in the cases of significant vibrations which affect the performance of the cable stayed bridges.
Frequencies and Mode Shapes for Axisymmetric Vibration of Shells

The Determination of Natural Frequencies and Normal Mode Shapes of Vibrating Structures Through Transient Analysis ...
Effects of Cutout Orientation on Natural Frequencies and Mode Shapes of Curved Rectangular Composite Panels
A finite element computer code, STAGSC-1 and holographic interferometry were used to determine the effects of interior cutouts on the first five natural frequencies and mode shapes of curved Graphite Expoxy panels. The panels are a quasi-isotropic layup with a 12 inch chord and height. Both the finite element and holographic analysis were conducted using clamped-clamped boundary conditions. The vibration branch of STAGSC-1 is a energy technique based on small displacements and linear elastic stress-strain relationships. When compared with the time averaged holograms of the experimentally determined natural frequencies and mode shapes, the two techniques show a close correlation of both frequency and shape. It was found that for the 2 x 2 inch cutout, the mode shapes change very little while the natural frequencies displayed a small decrease for the higher modes. The 2 x 4 inch cutout retained the general mode shape of the solid panel for the first two modes. The third through the fifth mode shapes were changed by this cutout and the loss of panel stiffness was visible. The 4 x 4 inch cutout exhibit both a switch in symmetry of the first two modes and a general decrease in natural frequencies. (Theses).
An experimental investigation was conducted to gain some understanding of the character of the free vibration modes of liquids in oblate spherodial tanks applicable in missile and space vehicle systems. Measured natural frequencies were obtained for the lowest three or four antisymmetric modes of oscillation as a function of the liquid depth for three orientations of each of several such tanks of different size and oblateness. The frequency data are presented as dimensionless parameters developed for each orientation to permit the application of the experimental results to the prediction of the natural frequencies of tanks of different size and oblateness. Photographs were made of representative surface wave or mode shapes for each orientation. (Author).
Effects of Cutout Orientations on Natural Frequencies and Mode Shapes of Curved Rectangular Composite Panels
The Natural Frequencies and Mode Shapes of a Hanging Chain of Discrete Links
A Variational Method for Calculating the Natural Frequencies and Mode Shapes of a Cantilevered Open Cylindrical Shell
Mechanical Vibration Analysis and Computation
Focusing on applications rather than rigorous proofs, this volume is suitable for upper-level undergraduates and graduate students concerned with vibration problems. In addition, it serves as a practical handbook for performing vibration calculations. An introductory chapter on fundamental concepts is succeeded by explorations of frequency response of linear systems and general response properties, matrix analysis, natural frequencies and mode shapes, singular and defective matrices, and numerical methods for modal analysis. Additional topics include response functions and their applications, discrete response calculations, systems with symmetric matrices, continuous systems, and parametric and nonlinear effects. The text is supplemented by extensive appendices and answers to selected problems. This volume functions as a companion to the author's introductory volume on random vibrations (see below). Each text can be read separately; and together, they cover the entire field of mechanical vibrations analysis, including random and nonlinear vibrations and digital data analysis.
The goal of this paper is to analyze the modal characteristics of a mistuned bladed disk assembly. We compute the expected value and standard deviation of eigenvalues and eigenvectors of such a system by using a polynomial chaos technique. The model of the bladed disk assembly considers only one mode of vibration of each blade and the mistuning phenomenon has been simulated by treating the modal stiffness of each blade as a stochastic variable. A Monte Carlo simulation and a Taylor series expansion are used to validate the result of this method.
Sumner A. Leadbetter, Vernon L. Alley Jr., Robert W. Herr and A. Harper Gerringer
A Method for Determining the Natural Frequencies and Mode Shapes of a Flat Panel Clamped on Four Edges
Parametric Study of the Natural Frequencies and Mode Shapes for a Underground Piping System
Natural Frequencies and Mode Shapes of a 1/3-scale Dynamic Model of a Delta Wing
This report develops a variational technique for the analysis of the vibration characteristics of an open cylindrical cantilevered shell. The technique is developed by modifying Reissner's principle, which normally applies to static problems, through the use of Hamilton's principle so that it applies to dynamic problems. The variational technique is first derived in general for an elastic system, and then specifically tailored to an open cylindrical cantilevered shell. The technique is implemented by first finding a general solution which satisfies the equations of motion for a cylindrical shell. A method is then formulated to use this general solution to construct a set of trial solution functions. With the variational method, the coefficients to this trial solution function are then calculated so that the function not only satisfies the equations of motion, but aslo the boundary conditions around the four edges of the shell. A computer method was developed to perform the necessary calculations to implement the variational procedure, but preliminary results have shown that numerical problems must be eliminated before accurate results can be expected. Experimental data for an open cylindrical cantilevered shell was also collected on a modal analyzer.
The effect of square holes on the natural frequencies and mode shapes of a 7 in. x 10 in. clamped rectangular plate were investigated. The frequencies of the first five modes were obtained in separate experiments using holographic interferometry and accelerometers and analytically using the finite element method. The shapes were observed in the holography experiment and photographs were taken. For a plate without holes, the experimental frequencies were approximately 10% lower than the theoretical values possible due to some rotation of the plate edges. Using a 25 element model, the finite element program gave frequencies within 1% of the theoretical values. For central square holes, the frequencies of each mode varied with hole size in a number of ways. A correlation between the variation of frequencies and mode shapes was noted. (Modified author abstract).
Natural Frequencies and Mode Shapes of a Square Plate with Discontinuous Boundary Conditions
ASME 65-APMW-5
An Analysis of the Flapwise Bending Frequencies and Mode Shapes of Rotor Blades Having Two Flapping Hinges to Reduce Vibration Levels
Determination of Natural Frequencies and Mode Shapes of Chassis Frames
STAGSC-1, a finite element code, and holographic interferometry were used to analyze the effects of cutout orientation (O, +45, -45 and 90) on the first five natural frequencies and mode shapes of a curved Gr-Ep panel. The clamped-clamped panels had a quasi-isotropic layup 0, -45, 45, 90s and measured 12 inch high with a 12 inch chord. When the finite element code was compared to the time averaged holograms, the two techniques showed close correlation of both the natural frequencies and mode shapes. It was found that the 0 cutout orientation had a significant effect on the panel stiffness while the other cutout orientations did not adversely effect the stiffness. It was also found that if a large number of elements in the finite element mesh are oriented at an angle other than 0 or 90, then the STAGSC-1 model is artificially stiffened. The phenomenon of mode switching was investigated analytically and determined to be a function of the cutout dimensions. Keywords: Composites, Vibrations, Holography, Finite Elements, Natural Frequencies, Mode Shapes.
This report treats the axisymmetric vibration of thin elastic shells. Estimates of natural frequencies and mode shapes are obtained for a general class of thin shells by applying the approximations obtained in a previous paper by one of the authors. Numerical results are obtained for ellipsoidal shells, and one new theoretical result is found. (Author).
Comparison of Methods in Calculating Frequencies of Corner-supported Rectangular Plates
Natural Frequencies and Mode Shapes of Guy Cables
Natural Frequencies and an Atlas of Mode Shapes for Generally-laminated, Thick, Skew, Trapezoidal Plates
Vibration and Mode Shapes Analysis of Cable Stayed Bridges Considering Different Structural Parameters