Contents

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EDITORIAL

ARTICLES

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The Vibrations Influence upon Strain and Stress States of Long Linear Elastic Bar Type Links of Mechanisms

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Abstract: - For long linear elastic links of mechanisms subjected to vibration, the determination of displacements fields depending on the motion kinematic parameters makes possible the calculus of additional strains tensor components and then the calculus of the additional stress tensor components. The paper presents the calculus of the components of these two additional tensors that occur due to vibration

for a specific mechanism, a crank and connecting rod assembly, in precise work conditions. The data are very significant in mechanisms links rigorous designing and dimensioning.

Keywords: vibration, stress state, strain field, linear elastic link, crank and connecting rod assembly

Influence of Damping Over the Rudder Control System of an Aircraft

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Abstract: - The control system of the rudder of an aircraft can be modeled in a first order approximation as a system of rigid bodies that transmits instantaneously the desired motion to the movable part of the vertical tail. However, the elasticity of the component parts, as well as the damping in the hinge system, may provide oscillation effects that can alter the flying qualities of the aircraft. By using a simple mechanical model, the present paper investigates the effects of the damping over the control system of the rudder.
Keywords: - vertical tail, rudder, harmonic perturbation, periodic perturbation, small oscillations.

Limits of the Discrete Fourier Transform in Exact Identifying of the Vibrations Frequency

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Abstract: This paper present the limitations encountered by using the Discrete Fourier Transform for the analysis of vibration signals. Difficulties in determining the precise frequencies appear particularly in cases where the acquired vibration signals are characterized by low frequency and short duration. The performed analyzes, made for different specific situations by using the signal processing toolbox of the

Scilab program, succeed highlighting the reduced capability of the Discrete Fourier Transforms to accurately evaluate the frequency values.

Keywords: vibration analysis, signal processing, Discrete Fourier Transform (DFT), Scilab

Evaluation of Optimum Modes and Conditions of Ultrasonic Cavitation Influence on High-Viscous and Non-Newtonian Liquid Mediums

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Abstract: - The article is devoted to the results of modeling of the formation of cavitation area under ultrasonic influence on liquid media, which differ in flow curves and acoustic properties. Taking into account influence of liquid viscosity on the formation of cavitation area it helps to determine the modes (intensity) and conditions (the size of technological volume) of influence.

Keywords: - Ultrasound, cavitation, viscous liquid media, technological volume.

On the Spatial Characteristics of a Circular Piston

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Abstract: - In this paper a theoretical overview of existing and well known mathematical techniques for calculating the sound pressure level (SPL) created by a circular piston in its near and far field is presented. A unified approach for explaining the acoustic transducers' spatial characteristics is proposed. The polar responses and the frequency responses of given circular pistons are modeled and visualized by means of Matlab®-based scripts. Finally some experimental data are presented. Conclusions with practical value have been made. A few topics for future works are considered.

Keywords: - Polar response, Frequency response, Near field, Far field, Matlab®.

About the Neutral Axis Distortion due to Cracks and its Influence upon the Beams Natural Frequencies

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Abstract: In this paper the distortion of the neutral axis of cantilever beams due to damage is analyzed via numerical simulations. Both static and dynamic behaviors are considered, aiming to prove that the damage affects all bending vibration modes in a similar manner. Thus, the beam deflection under its own mass is identified for the healthy state and for a series of imagined damage scenarios. Afterwards, the natural frequencies are numerically evaluated and the correspondence between the deflection increase as a measure of energy lost and the frequency shifts is found. It was also demonstrated that the local value of the neutral axis of damaged beams is not anymore an indicator of the locally stored energy.

Keywords: - Euler-Bernoulli beam, vibration, modal analysis, frequency, deflection, neutral axis

Comparison of Analytical, FEM and Experimental Modal Analysis of Plate for Free-Free Boundary Condition with Uncertain Parameters

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Abstract: - Modal analysis of plates has been an active research subject of engineering field. The plates are used for manufacturing many engineering structures such as in aerospace, mechanical, civil structures etc. This work attempts to present comprehensive comparison of modal analysis of square plate with free-free boundary condition. The first six natural frequencies of square plate with free-free boundary condition is first determined by analytical method. The modal analysis of plate is than solved by FEM using ANSYS 14.5 simulation. In this method the first six natural frequencies of plate are determined. Then the experimental setup is developed to identify the first six natural frequencies of plate. All the methods of finding the first six fundamental frequencies are compared. During comparison it is observed that all the six fundamental frequencies obtained by different methods are close to each other. Hence, from this it is clear that the results of analytical, FEM (simulation) and experimental methods are in agreement with each other.

Keywords: - Modal Analysis, Finite Element Method, Experimental modal analysis, Uncertain Parameters and Plate Vibration.

A Study on Free Vibration of Visco-elastic Tapered Plate with Clamped Ends

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Abstract: - A mathematical analysis is presented here to analyze the free vibration of visco-elastic isotropic rectangular plate. The main objectives of the study are to assist engineers and scientists in designing of structures which are mostly used building, bridges, satellites etc. Authors studied the vibrational behavior of isotropic rectangular plate with two dimensional thickness and temperature variations. It is assumed that temperature varies bi-parabolic i.e. parabolic in *x*-direction & parabolic in *y*-direction and thickness is considered to vary linearly in both *x* & *y* direction. Fourth order differential equation of motion is solved by Rayleigh-Ritz method for clamped boundary condition. Time period, deflection and logarithmic decrement for first two modes of vibration at various values of thermal gradient, taper constants and aspect ratio are calculated. All the numeric results are carried out for an alloy of Aluminium, '*Duralumin*'. The results are presented in tabular form.

Keywords: - Vibration, frequency, thermal gradient, taper constant, clamped.

Passive and semi-active bracing systems for seismic protection: a comparative study

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Abstract: - This paper analyses comparatively the seismic response of structures equipped by two types of dissipative bracing systems: passive devices with variable friction and semi-active devices with magnetoreological fluids. Both passive and semi-active seismic devices have hysteresis force-displacement characteristics with "butterfly" shape, controlled by the instantaneous inter-story drift. This type of hysteresis behavior can be achieved by appropriate design of passive friction coupling and semi-active control strategy implemented for magnetorheological dampers. The forces developed by both protection devices are calibrated such as to dissipate the same amount of energy per hysteresis loop for imposed cyclic motion The efficiency of passive and semi-active protection systems, installed in a shear frame structure, is assessed by numerical analysis for Vrancea 1977 earthquake.

Keywords: - energy dissipation devices, friction damper, magnetorheological damper.

Experimental Investigation of Behavior of Fine Particles in Acoustic Air Flow

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Abstract: - This paper deals with the influence of acoustic field on agglomeration of quartz sand particles in the air flow. It is established that particle concentration in polluted air flow decreases in presence of acoustic field. The change in concentration of particles in air caused by application of acoustic field is sensitive to particle size.

Keywords: - quartz sand particles, air flow, acoustic agglomeration.

Some Aspects Regarding the Transition from Beam to Plate Behavior of Vibrating Structures

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Abstract: - The paper introduces a new vision about the vibrational behavior of beams and plates, aiming to show the correlation between vibration modes which nowadays are considered of different types. An analysis was performed by means of the finite element method (FEM) on a structure with constant length

and thickness, for which the width was progressively increased. The evolution of resulted natural frequencies and mode shapes in respect to the structure width was observed and described by diagrams and illustrations. In this way it was possible to make a link between certain vibrations characteristic for beams with that reflecting the vibration of plates.

Keywords: - Euler-Bernoulli beam, rectangular plate, vibration, frequency, mode shape, FEM.

Finite Element Analysis of thin plates clamped on the rim of different geometric forms. Part I: Simulating the Vibration Mode Shapes and Natural Frequencies

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Abstract: - This paper comprises an introductive part, in which theoretic notions regarding plates and their classification are presented, as well as stating some national and international researches published regarding the study and computing of plates. Also, there are described the defining parameters of the plate behavior, the mechanic and physic characteristics of steel plates and the geometric characteristics of rectangular, square, trapeze and parallelogram plates that are to be analyzed. For the finite element analysis, make with the SolidWorks program, concerning thin plates of different geometric forms, clamped on the rim, have been described the working condition, the simulation, as well as recording under the form of images, tables and graphics, the results obtained concerning the natural frequencies for 30 vibration mode shapes of these plates, frequencies that had values between 70 and 1138 Hz.

Keywords: - Finite Element Analysis, clamped thin plates, vibration mode shapes, natural frequencies

Regenerative Model with Delay for the Cutting Process. Part I: Analytical Approach

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Abstract: - This paper makes an analytical approach for the study of a new regenerative model with delay for the cutting processes. The model has two degrees of freedom and the delay is considered for both of them. In addition, in the most general case, the delays are non-linear ones. The analytical study is based on the Lambert (omega) functions, the solution (when it is possible) being given in series of these functions. The stability of the process is studied using the Rouché criterion.

Keywords: - regenerative, Rouché criterion, Lambert function

Finite Element Analysis of thin plates clamped on the rim of different geometric forms. Part II: The Absolute and Relative Variation of Natural Frequencies

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Abstract: - In this paper, according to the natural frequencies resulted from the simulation for 30 vibration mode shapes of rectangular, square, trapeze and parallelogram plates that are analyzed with the SolidWorks program, the absolute respectively the relative variation has been obtained for thin clamped plates with the same area. The absolute and relative variation of natural frequencies was made for 6 possible cases of the 4 type of plates, namely: rectangle-square, trapeze-rectangle, trapeze-square, parallelogram-rectangle, parallelogram-square and trapeze-parallelogram.

Keywords: - Finite Element Analysis, natural frequencies, absolute variation, relative variation

Regenerative Model with Delay for the Cutting Process. Part II: Numerical Approach

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Abstract: - This paper continues the first one making the numerical analysis of the regenerative model with delay presented in the first paper. The numerical analysis is performed using a variant of the fourth order Runge–Kutta method. All the cases discussed in the first paper are analyzed here, the theoretical results (obtained in Part I) being compared to the numerical ones obtained in this paper. An excellent agreement was found between the two approaches.

Keywords: - regenerative, numerical simulation, modified Runge–Kutta method

Vibrations of the Rigid Solid with a Point Constrained to Move on a Mobile Curve

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Abstract: - This paper makes a numerical study for the vibrations of a physical pendulum for which the suspension point is constrained to move on a mobile curve. The matrix equation of motion is presented and the study is performed analyzing the variations of different parameters of motion as function of the parameters that define the mobile curve.

Keywords: - multibody, mobile curve, constraints, motion

Behavior of the Voigt-Kelvin Viscous-elastic Linear Materials to Stationary Dynamic Actions with Control in the Inertial Rotational Force

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Abstract: - The dynamic response and the dissipated energy of the Voigt-Kelvin antivibration linear modular materials are presented. Thus, for the perturbing inertial rotational force the cases of systems without mass or with an added mass are analyzed, highlighting the significant dynamic response. On this basis, the results obtained from dynamic analyses and experimental evaluations are shown both for the dynamic response parameters as well as for the parameters of the internal energy dissipation.

Keywords: - dynamic, inertial, viscous elastic, elastomeric, hysteresis

Exact Controllability in Oblique Gridworks Structures

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Abstract: - The article studies the problem of the exact internal controllability on a gridwork structure that depends on two small parameters ε and δ. The controll is provided by the HUM method (Hilbert Uniqueness Method). We apply the homogenization methods: the energetic method of Tartar and the dilatation method. The limit problem is a problem of vibrations on a rectangle which is controlled by the limit of the control.

Keywords: - controllability, homogenization, method of Tartar, dilatation method