

# C o n t e n t s

 <b>RJAV</b>	<b>Romanian Journal of Acoustics and Vibration</b>
A publication of the Romanian Society of Acoustics  Volume XI, Issue 1, 2014	
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## **Dynamic Response of Anchored Tower Cranes under Sinusoidal Damped Seismic Action. Case Study**

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*Abstract:* - The subject of the behavior of tower cranes under seismic motion, it is particularly one. On September 2009, in the XXXIII National Conference on Mechanics of Solids - Romania, the authors presented the hypothesis of analysis, the dynamic model and the general system of differential equations of motion, considering the tower with and without anchors to the building. The research was continued with the study of the response of the tower cranes without anchors, loaded by the payload, under sinusoidal seismic actions. The results were presented at the 10<sup>th</sup> International Conference on Acoustics and Vibration on 2011. However, this paper continues these studies, considering the seismic motion in a more accurate approach. The comparative results are presented in a case study, for the MTO-180 tower crane.

*Keywords:* tower cranes, dynamical analysis, differential equations of motion, canonic form, MTO 180

## **Gain-Frequency Characteristics for Several Models of Stratified Geological Medium**

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*Abstract:* - Gain-frequency characteristics of displacements of daylight area at forced oscillations are studied. Several models utilizing a layer sitting on top of a basement are considered. Together with a classical model (considering two homogeneous media), investigated are a model for the layer with absorption and a model for the layer having continuous variation of elasticity parameters at transition toward the basement. The case of linear variation of density and a constant velocity is considered in detail. For all structures under consideration, analytical expressions for displacements of daylight area are obtained.

*Keywords:* - gain-frequency characteristics, gradient medium, displacements of daylight area, elastic oscillation.

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## Parameters Influencing the Focalization Produced by a Graded Phononic Crystal

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*Abstract:* The geometrical distribution of immersed tubes has considerable influence on the propagation of an incident plane acoustic wave. A periodic distribution represents a phononic crystal (PC), which can be perfectly transparent or opaque at certain frequency ranges, called pass-bands and stop-bands respectively. If the periodicity is slightly perturbed, a graded phononic crystal (GPC) is obtained. Some selected graded phononic crystals having a linear variation of tube wall thickness from row to row, can produce wave focalization. The spacing between rows is however constant. The influence of this spacing, as well as the distance between rows, on the focalization point location and on the local acoustic pressure maxima are determined. A second analysis concerns the interlaced rows, in which the tubes of any two neighboring rows are placed in rhomboidal shapes. The variation of distances between tubes is correlated with focalization parameters.

*Keywords:* Graded phononic crystal, ultrasonic lens, focalization

## Stress Intensity Factor vs. Transversal Deflection - How to Determine the Damage Severity?

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*Abstract:* - This paper compare two methods to determine the severity of a damage occurring in cantilever; the first method is well-known in the literature and base on an approach from fracture mechanics, while the second is contrived by the authors and base on the transversal deflection under small loads. First the paper demonstrate the relation existing between the stiffness reduction due to damage (i.e. the value of the transversal deflection) and the change of the natural frequencies, exemplified for three shapes of the transversal cross-section. It is proofed that the relation is valid for all three cases, square, hexagon and circle, the damage depth being accurate determined. Afterwards, the results are compared with that provided by numerous researchers which used the fracture mechanics approach; a good concordance can be found, with the mention that the method developed by us is more accurate. This is justified by the fact that our method does not introduce empirical relations, being based on the formulized physical phenomena alone.

*Keywords:* - vibration, natural frequency, cantilever beam, damage severity

## **On the Seismic Cloaking**

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*Abstract:* - Geometric transformations are strongly sustained by manufacture of auxetic materials based on the pore size reduction through radial compression molds. In addition, geometric transformations underlie the development of seismic cloaking. The spatial compression of the conventional foams is determined by the shape of the cloaked object. The cloaking structures can effectively convert the destructive seismic waves into a different type of wave whose intensity dissipates quickly. The technique is the same to the scattering waves of light to render objects invisible.

*Keywords:* - Geometric transformations, Auxetic materials, Seismic cloaking.

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## **Numerical Study of the Vibrations with Collisions of a System with Nonlinear Cubic Stiffness, Dry Friction and Harmonic Excitation**

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*Abstract:* In this paper we consider a non-linear single degree of freedom system with dry friction consisting in a mass that oscillates between two fixed barriers. Our study is a numerical one and we determine the influences of different parameters of the system upon its motion.

*Keywords:* - mechanical model, time history analysis, numerical simulations

## **An Analysis of the Dynamic Behavior of Circular Plates from a Damage Detection Perspective**

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*Abstract:* This paper presents a study regarding the dynamics of thin circular plates, embedded on the circumference. A finite element analysis (FEA) as well as analytical investigations is performed, and the results in terms of frequencies and mode shapes are used to highlight the plate's dynamics. First we demonstrated the good fit between the results obtained in different ways. Analyzing the plate's dynamic behavior, we identified vibration modes able to be used to extract patterns characterizing a damage location. These damage signatures can be used, similar as in the case of beams, to find the damage location.

*Keywords:* - Circular plates, vibration, modal analysis, frequency, mode shape

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## **Determination of Antivibrational and Acoustical Properties of Some Materials Made From Recycled Rubber Particles and Sawdust**

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*Abstract:* - This paper presents research on determining the sound absorption coefficient and structural damping level, for five samples, thus determining the sound absorption capacity and antivibrational propriety of each obtained material. Materials were made from particles of recycled rubber, fir sawdust and a polyurethane binder, in combination with other materials existent on the market (cork or fabric). Using particles of recycled rubber in the domain of composites materials is of major importance from a technical, economic and ecological point of view.

*Keywords:* - sound absorption coefficient, logarithmic decrement, recycled rubber, fir sawdust.

## **Alternative Kinematic Assumptions for the Motions of Structures with Multiple Dynamic Degrees of Freedom Subjected to Seismic Actions**

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*Abstract:* - The paper represents a work of synthesis and research for the earthquake response of structures under various assumptions. The cases of a structure with multiple degrees of freedom, having a rigid body motion between the ground-structure interface and a random, spatial motion are presented. The earthquake induces a spatial, random motion to the ground-structure interface contact points and alternative ways and hypotheses of determining the equations of motion and their solutions are shown. New approaches are needed because the simplified manner in which this subject is usually treated (one degree of freedom or plane structures) is not compatible with the real, physical, phenomenon and may introduce coarse errors in analyses or design. When the non-synchronous nature of motion of the ground-structure interface is important, instead of dealing with the unknowns of relative displacements, absolute displacements should be considered.

*Keywords:* - relative and absolute displacements, equations of motion, matrices, random, spatial motion

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## **Influence of Position Angle of Elastic Anti-Vibration Elements on the Transmissibility**

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*Abstract:* - For a number  $N$  of elastomeric elements grouped in parallel, but mounted at an angle  $\alpha$  between the compression axis and the vertical axis, the total stiffness should be assessed accordingly. The vibration transmissibility will be determined for two borderline cases, so that intermediate values can be evaluated for an anti-vibration isolation techniques solution.

*Keywords:* - elastomeric elements, transmissibility, isolation degree

## **The Transformation of Vibrations of the High-Tension Pillars by Homogenization in the Vibrations of the Finite String**

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*Abstract:* - In this article we study the waves equation on an high-tension pillars with alveolar form. Geometric, high-tension pillars are represented by a thin, tall structure where the edge base is denoted by  $e$ , the thickness of the material - distributed along the layers is denoted by  $\delta$  and the alveoli is distributed with the period  $\varepsilon$ . The parameters  $e, \varepsilon, \delta$  are considered small,  $e \ll \varepsilon$ . This article consists in passing to the limit after  $e \rightarrow 0$ ,  $\varepsilon \rightarrow 0$ ,  $\delta \rightarrow 0$  in this order, in the problem of the free vibration, the result is a mixed problem for the one-dimensional wave equation, in which the homogenized coefficient that appears is a combination between the constants that characterized the material. The result of our paper is identically with the result from [3].

*Keywords:* - waves equation, homogenization, reticulated structure.

## **Dependence of the Concrete Strength on the Duration of the Compaction by Vibration Process**

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*Abstract:* - The aim of the paper is to present the experimental results performed on two categories of concrete, C35/40 and C40/50, in order to highlight the evolution of their compressive strength with respect to the duration of vibration. The strength of the concrete made with a determined dosage greatly depends on the compaction degree. The compaction process of the fresh concrete can be optimized through an efficient correlation of the compaction degree with the vibration parameters (amplitude, frequency).

*Keywords:* - dynamic model, fresh concrete, compaction degree

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## **Noise Control on Locomotive Driver Workingstation**

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*Abstract:* - Traffic safety and transport security are concepts according to which the train traffic and maneuvers must be conducted without danger and risks for the workers, for travelers, goods entrusted to transport, railway vehicles, railway infrastructure and the environment. Exposure to noise from the diesel engine and the locomotive air compressor is a risk factor for the mechanic in the first place because it can affect concentration and decision of the driver. This article sets out measures for prevention and control of noise exposure for workstation driver on a locomotive.

*Keywords:* - locomotive, engine, noise, driver, exposure, risk