VIBRATIONS INFLUENCE ON THE ACCELERATIONS FIELD IN THE CASE OF A THIN PLANE PLATE WITH LINEAR VISCOUS-ELASTIC BEHAVIOUR

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We all know the tendency of replacing metallic materials with other materials having rheological behavior which have the advantage of needing low forces and inertial torques due to the much smaller specific masses compared to metallic materials for similar rigidity. One rheological aspect yet unsolved is solving the elastodynamics and elastokinematics problems of kinematical chains containing elements made from various solid state polymers (plastics). For this reason in this paper we present at first the mathematical model for the transversal vibrations of a kinematic element of type thin plane plate with linear viscoelastic behavior (Figure 1), rototranslating, which can be a constituent of a kinematic chain. Using the Laplace's integral transformation and the Fourier double transformation sinus finite, convenient for the simple support we'll find the field of the transversal displacements. Then, when the transversal displacements was determinated, the accelerations field was obtained under shape:

$$a_{3,M}\left(x_1,x_2,t\right)=\frac{4}{L_1L_2\pi^2}\sum_{n=1}^{\infty}\sum_{m=1}^{\infty}\frac{1}{nmA_{5,nm}}\left\{ch[\frac{1}{2}t\left(\omega_{nm}-2\Omega_{nm}\right)]+sh[\frac{1}{2}t\left(\omega_{nm}-2\Omega_{nm}\right)]\right\}\cdot$$

$$\cdot\left\{\left[ch\left(\frac{\omega_{nm}}{2}t\right)+sh\left(\frac{\omega_{nm}}{2}t\right)\right]\cdot\omega_{nm}^2\left(A_{1,nm}+A_{2,nm}A_{4,nm}\right)-2\left[ch\left(\frac{\omega_{nm}}{2}t\right)+sh\left(\frac{\omega_{nm}}{2}t\right)\right]\cdot\right.$$

$$\left.\cdot\omega_{nm}\Omega_{nm}\left(A_{1,nm}+A_{2,nm}A_{4,nm}\right)+2\Omega_{nm}^2\left[A_{2,nm}A_{4,nm}ch\left(\frac{\omega_{nm}}{2}t\right)+A_{1,nm}sh\left(\frac{\omega_{nm}}{2}t\right)\right]\right\}\cdot$$

$$\cdot\sin\left(\alpha_n x_1\right)\cdot\sin\left(\beta_m x_2\right)$$

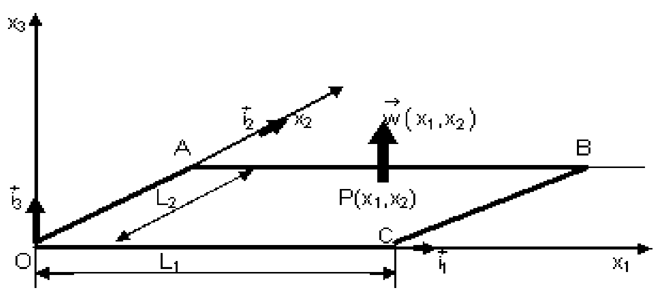

Figure 1. Plane plate linear viscous-elastic

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