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FREE LEVEL FINITE KOVUSHOK-ELASTIC MECHANICAL SYSTEM FREE VIBRATION

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Annotation: The degree of freedom in the article is equal to a parallelepiped mounted on a support, which is a free-bearing simulator. He hesitates. Characteristics of the apparatus The Lagrange differential of the second kind is called the Tenge differential. Frequency Mueller criticized the results of the Mueller investigation keeling.

Supporting groans: frequency, elastic support, xos shape, Lagrange equation, sleepy sound.

Enter it. Free oscillations of mass spectrometers mounted on aircraft constructionsnotes and referencesA catheter mounted on a deformable support has been the subject of many scientific papers. [1,2,3].Due to bucket formation of deformable elements , the Olybrian oscillations [4,5]. But the free fluctuations of masalasi tulik.

The method of burning and solving the issue.

Assuming the kilaylik degree of freedom is given by a six-point construction bulsin (Figure 1) . It is a matter of hitting the free vibration of the structure let it burn.

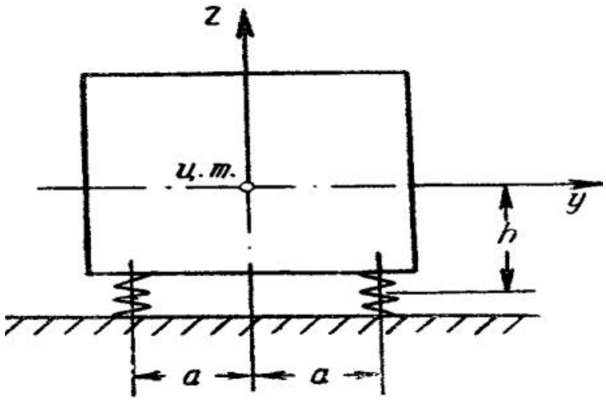

Figure 1. Calculation scheme.

The equilibrium differential equation is Lagrange's type 2 differential it is obtained from the equation and then smears

$$\left.\begin{aligned}
&\beta_{11}\ddot{\delta}_1+\alpha_{11}\delta_1+\alpha_{15}\varphi_2+\alpha_{16}\varphi_3=0,\\
&\beta_{11}\ddot{\delta}_2+\alpha_{22}\delta_2+\alpha_{24}\varphi_1+\alpha_{26}\varphi_3=0,\\
&\beta_{11}\ddot{\delta}_3+\alpha_{33}\delta_3+\alpha_{34}\varphi_1+\alpha_{35}\varphi_2=0,\\
&\beta_{44}\ddot{\varphi}_1+\beta_{45}\ddot{\varphi}_2+\beta_{46}\ddot{\varphi}_3+\alpha_{24}\delta_2+\alpha_{34}\delta_3+\alpha_{44}\varphi_1+\alpha_{45}\varphi_2+\alpha_{46}\varphi_3=0,\\
&\beta_{45}\ddot{\varphi}_1+\beta_{55}\ddot{\varphi}_2+\beta_{56}\ddot{\varphi}_3+\alpha_{15}\delta_1+\alpha_{35}\delta_3+\alpha_{45}\varphi_1+\alpha_{55}\varphi_2+\alpha_{56}\varphi_3=0,\\
&\beta_{46}\ddot{\varphi}_1+\beta_{56}\ddot{\varphi}_2+\beta_{66}\ddot{\varphi}_3+\alpha_{16}\delta_1+\alpha_{26}\delta_2+\alpha_{46}\varphi_1+\alpha_{56}\varphi_2+\alpha_{66}\varphi_3=0,
\end{aligned}\right\}\quad(1)$$

Here $\delta_1, \delta_2, \delta_3$ the displacement of the center of gravity of the object along the X, Y, and Z axes, respectively; $\varphi_1, \varphi_2, \varphi_3$ - angles of rotation of the body around the coordinate axes;

c_x, c_y, c_z - stiffness coefficients of elastic elements (shock absorbers) in the direction of the corresponding axes;

$$\alpha_{11}=\sum c_x,\quad \alpha_{16}=-\sum c_x y,\quad \alpha_{35}=-\sum c_z x,$$
$$\alpha_{22}=\sum c_y,\quad \alpha_{24}=-\sum c_y z,\quad \alpha_{45}=-\sum c_z xy,$$
$$\alpha_{33}=\sum c_z,\quad \alpha_{26}=\sum c_y x,\quad \alpha_{46}=-\sum c_y xz,$$
$$\alpha_{15}=\sum c_x z,\quad \alpha_{34}=\sum c_z y,\quad \alpha_{56}=-\sum c_x yz;$$
$$\alpha_{44}=\sum\left(c_z y^2+c_y z^2\right),\quad \beta_{11}=m,\quad \beta_{66}=J_z,$$
$$\alpha_{55}=\sum\left(c_x z^2+c_z x^2\right),\quad \beta_{44}=J_x,\quad \beta_{45}=-J_{xy},$$
$$\alpha_{66}=\sum\left(c_x y^2+c_y x^2\right),\quad \beta_{55}=J_y,\quad \beta_{56}=-J_{yz},\quad \beta_{46}=-J_{xz}.$$

$J_x, J_y, J_z, J_{xy}, J_{xz}, J_{yz}$ X, Y, Z passing through the body's center of gravity moments of inertia with respect to their axes and centrifugal inertia moments. In this case, the XY plane is where the elastic supports are located parallel to the plane, the directions of the X and Y axes are calculated selected voluntarily based on convenience; x, y, z-X, Y, Z coordinates of shock absorbers in the coordinate system. X, The particular solutions of the system of differential equations have the following form:

$$\delta_1=A_1\cos(\omega t+\psi),\qquad \varphi_1=A_4\cos(\omega t+\psi),$$
$$\delta_2=A_2\cos(\omega t+\psi),\qquad \varphi_2=A_5\cos(\omega t+\psi),$$
$$\delta_3=A_3\cos(\omega t+\psi),\qquad \varphi_3=A_6\cos(\omega t+\psi),$$

Here, A_1, A_2, A_3- constant coefficients, ω angular frequency, initial phase of oscillations. By putting these solutions in (1) we derive the following system of same-sex algebraic equations This is nonzero when the determinant of the system is zero will have solutions.

$$\left(\alpha_{11}-\beta_{11}\omega^2\right)\delta_1+\alpha_{15}\varphi_2+\alpha_{16}\varphi_3=0,$$
$$\left(\alpha_{22}-\beta_{11}\omega^2\right)\delta_2+\alpha_{24}\varphi_1+\alpha_{26}\varphi_3=0,$$
$$\left(\alpha_{33}-\beta_{11}\omega^2\right)\delta_3+\alpha_{34}\varphi_1+\alpha_{35}\varphi_2=0,$$
$$\alpha_{24}\delta_2+\alpha_{34}\delta_3+\left(\alpha_{44}-\beta_{44}\omega^2\right)\varphi_1+\left(\alpha_{45}-\beta_{45}\omega^2\right)\varphi_2+\left(\alpha_{46}-\beta_{46}\omega^2\right)\varphi_3=0,$$
$$\alpha_{15}\delta_1+\alpha_{35}\delta_3+\left(\alpha_{45}-\beta_{45}\omega^2\right)\varphi_1+\left(\alpha_{55}-\beta_{55}\omega^2\right)\varphi_2+\left(\alpha_{56}-\beta_{56}\omega^2\right)\varphi_3=0,$$
$$\alpha_{16}\delta_1+\alpha_{26}\delta_2+\left(\alpha_{46}-\beta_{46}\omega^2\right)\varphi_1+\left(\alpha_{56}-\beta_{56}\omega^2\right)\varphi_2+\left(\alpha_{66}-\beta_{66}\omega^2\right)\varphi_3=0.$$

Isolates the body to four points (shock absorber) is the most common in practice when installing $\omega_3, \omega_4, \omega_4, \omega_5$ - specific frequencies (6) and (7) make complex fluctuations in the equations Mopa is simple using a circular diagram similar to a voltage circle, and can be defined graphically. For this, the equations (6) and (7) are as follows to be seen:

$$\omega^4-(\alpha+\gamma)\omega^2+\alpha\gamma-\frac{\beta^2}{i_y^2}=0, \quad (8)$$

Here we have those for equation (6) :

$$\alpha=\frac{\alpha_{11}}{\beta_{11}}=\frac{\sum c_x}{m}, \beta=\frac{h\sum c_x}{m},$$

$$\gamma=\frac{\alpha_{55}}{\beta_{55}}=\frac{\sum\left(c_x z^2+c_x x^2\right)}{J_y}=\frac{h^2\sum c_x+b^2\sum c_z}{mi_y^2}.$$

Here we have those for equation (7):

$$\alpha=\frac{\alpha_{22}}{\beta_{22}}=\frac{\sum c_y}{m}, \beta=\frac{h\sum c_y}{m},$$

$$\gamma=\frac{\alpha_{44}}{\beta_{44}}=\frac{y^2\sum c_z+z^2\sum c_y}{J_x}=\frac{a^2\sum c_z+h^2\sum c_y}{mi_y^2}.$$

The coordinates of the abscissa of points A and B intersecting the abscissa axis of the circle are both interconnected ω_1^2 and ω_2^2 frequencies determines

A rigid body (insulated object) freely fixed to elastic elements located on a fixed base is a body with six degrees of freedom and the same number of specific vibrational frequencies. In order to avoid resonance with the frequencies of the repulsive forces, it is necessary to be calculated in advance by calculating the specific frequencies of the body. Which ignores the mass of elastic elements and the absorbent assuming that the displacement of the body is small enough, such that linear homogeneous differential of the second order of motion of the system the equations can be described by:

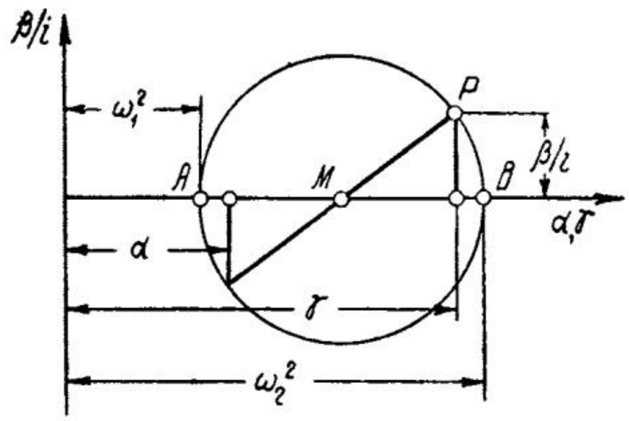

Image. 2. Circular to find the specific frequencies of the system

Diagram

The frequency pattern confirms his anonymity. Changing system parameters

кesults b, $c_z \backslash c_x$, h, i.

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If , for example, the diameter of a circle is equal, α+γ, b=0 or i=∞, then AX. This means that the body is unstable. when h= 0, ω_1 , and ω_2 , frequencies are consistent with unrelated frequencies

$$\omega_x = \sqrt{\alpha} \;\; u \;\; \omega_{0\varphi} = \omega_x \frac{b}{i_y} \sqrt{\frac{c_z}{c_y}}.$$

This means that both tangential motions are along the X-axis the directed ω_x switches to a pure longitudinal oscillation of frequency or a pure rotational oscillation of frequency $\omega_{o\varphi}$ around the center of gravity. The reasoning here for the XZ plane also holds for the YZ plane. If an isolated body has a frequency spectrum wide of the digital axis if the periodic excitation forces located in the range are affected, then in the case of all six specific frequencies of the isolated system, or at least in Resonance, which led to the greatest amplitude, to ensure the high efficiency of vibration isolation, they are equals or roughly equals each other. of specific frequencies the combination includes the stiffness of the shock absorbers and their relative the location can be achieved by choosing the right one.

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