TAQSIMLANGAN ELASTIK PLASTINKANI ZARARLI TEBRANISHLARINI SO'NDIRISH.

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Annotatsiya. Ushbu ishda elastik plastinkaning dinamik so'ndirgich bilan birgalikdagi chiziqlimas tebranishlari masalasi qaralgan. Plastinka materiali gisterezis tipidagi elastik dissipativlik xossasiga ega bo'lib, unga qovushoq elastik elementli dinamik so'ndirgich o'rnatilgan. Qaralayotgan sistemaning matematik modeli bo'yicha dinamikasini o'rganilgan. Plastinkaning uzatuvchi funksiyasining analitik ifodasi yordamida sonli hisoblashlar natiyjasida dinamik so'ndirish effektivligi baholangan.

Kalit so'zlar. Plastinka, dinamik so'ndirgich, elastik, dissipative, gisterezis, tebranish, dinamika, uzatuvchi funksiya,

Zamonaviy texnika va texnologiyalarning jadal suratlar bilan rivojlanishi mashinasozlik, aviatsiya, kemasozlik, sanoat ishlab chiqarish va qurilish sohalarida zararli tebranishlardan himoyalash masalalari dolzarb muommolardan hisoblanadi. Turli tipdagi to'plangan va taqsimlangan massali mexanik sistemalarning zararli tebranishlarini so'ndirish masalalariga bag'ishlangan ko'plab ilmiy tadqiqot ishlari olib borilgan, yangi tipdagi dinamik so'ndirgichlarni matematik modellari yaratilgan, dinamikasi tekshirilgan va qo'llash bo'yicha tavsiyalar ishlab chiqilgan [1-4]. Ushbu ishda materialining elastik dissipativlik xarakteristikalari gisterezis tipida olingan plastinkaning dinamik so'ndirgich bilan birgalikdagi ko'ndalang tebranishlarini o'rganish masalasi qaralgan. Plastinkaning unga o'rnatilgan dinamik so'ndirgich bilan birgalikdagi harakat differensial tenglamalar sistemasi quyidagicha bo'ladi [5]:

$$\frac{\partial^2 M_x}{\partial x^2} + 2\frac{\partial^2 M_{xy}}{\partial x \partial y} + \frac{\partial^2 M_y}{\partial y^2} - (c\xi + b\dot{\xi})\delta(x - x_0)\delta(y - y_0) = -\rho h \frac{\partial^2 w_a}{\partial t^2};$$

(1)

$$m_0 \frac{\partial^2 w_{ik}(x_0, y_0)}{\partial t^2} + m_0 \frac{\partial^2 \xi}{\partial t^2} + c\xi + b\dot{\xi} = -m_0 \frac{\partial^2 w_0}{\partial t^2},$$

bunda M_x , M_y- eguvchi momentlar; M_{xy} −burovchi moment; c, b – dinamik so’ndirgichning elastik element bikrligi va qovushoqlik koeffitsenti; m_0 – dinamik so’ndirgichning massasi; x_0 , y_0 – dinamik so’ndirgich o’rnatilgan nuqta; w_0 −asosning ko’chishi; w_a −plastinkaning absolyut ko’chishi; ξ −dinamik so’ndirgichning plastinkaga nisbatdan ko’chishi; ρ −plastinka materiali zichligi; h- plastinka qalinligi Gisterezis tipidagi elastik dissipativ xarakteristikali plastinka uchun momentlarini hisoblaymiz.

$$M_x = \int_{-\frac{h}{2}}^{\frac{h}{2}} \sigma_x z dz, \; M_y = \int_{-\frac{h}{2}}^{\frac{h}{2}} \sigma_y z dz, \; M_{xy} = \int_{-\frac{h}{2}}^{\frac{h}{2}} \sigma_{xy} z dz, \qquad (2)$$

bunda z- plastinkaga perpendikulyar yo’nalgan o’q; $\sigma_x, \sigma_y, \sigma_{xy}$ −normal va urinma kuchlanishlar. Ushbu ifodalar orqali bazi hisoblashlarni va kuchlanish momentlar ifodasini hisoblab quyidagi tenglamalarga kelamiz. Bu yerda hisoblashlarni va almashtirishlarni bajarib quyidagi (3) tenglamaga kelamiz.

$$W_{ik}(S, x, y) = 1 + \frac{u_{ik} s^2 q_{ik}(s)}{\ddot{w}_0}. \qquad (3)$$

S=jω almashtirishni bajarish orqali hamda (1) ifodani hisobga olib, (3) tebranishlardan himoyalanuvchi plastinkaning uzatish funksiyasini yozish mumkin

$$W_{ik}(j\omega, x, y) = 1 + \frac{A_1 + jA_2}{B_1 + jB_2} u_{ik}, \qquad (4)$$

bunda $A_1 = -d_{3ik} u_{ik0} c - d_{ik}(n^2 - \omega^2)$; $A_2 = -d_{ik} f_0 \omega - d_{3ik} u_{ik0} b\omega$;

$$B_1 = [-\omega^2 + [1 - (C_0 + T_1)\eta_1 - (T_3 + T_2)\nu_1]p_{ik}^2][n^2 - \omega^2] - u^2{}_{ik0}d_{3ik}\omega^2 c - [(C_0 + T_1)\eta_2 + (T_1 + T_2)\nu_2]p_{ik}^2 f_0\omega;$$

$$B_2 = [-\omega^2 + [1 - (C + T_1)\eta_1 - (T_3 + T_2)\nu_1]p_{ik}^2]f_0\omega - [(C_0 + T_1)\eta_2 + (T_1 + T_2)\nu_2]p_{ik}^2[n^2 - \omega^2] - u^2{}_{ik0}d_{3ik}b\omega^3.$$

Olingan (4) uzatish funksiyasi tebranishlardan himoyalanuvchi plastinka dinamikasini sistema parametrlarining turli qiymatlarida tahlil qilish imkonini beradi. Sonli hisoblashlarni Maple 17 matematik paketi yordamida amalga oshiramiz.

Adabiyotlar

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