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Nonlinear dynamic characteristics and stability of composite orthotropic plate on elastic foundation under thermal environment

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1        **Nonlinear dynamic characteristics and stability of composite orthotropic**  
2                                    **plate on elastic foundation under thermal environment**

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6        **Abstract**

7        An analytical computational scheme for nonlinear dynamic characteristics and stability of an  
8        eccentrically composite orthotropic plate on Winkler-Pasternak elastic foundation subjected to  
9        different axial velocities is proposed with the incorporation of mercurial damping effects under  
10       thermal environment. Incorporating the classical plate theory and Von-Kármán strain-  
11       displacement relation, the nonlinear compatibility equation is derived. The Galerkin method and  
12       Airy's stress function are implemented to establish the nonlinear dynamic buckling equation  
13       accommodating the thermal and damping effects. Then the developed nonlinear differential  
14       equations are solved numerically by the fourth-order Runge-Kutta method. The characteristics  
15       of natural frequency, linear and nonlinear vibration, frequency-amplitude curve and nonlinear  
16       dynamic responses are investigated by the developed approach with validations by other  
17       literatures. The nonlinear dynamic buckling loads are determined by using Budiansky-Roth  
18       criterion. Additionally, various effects of velocity, damping ratio, temperature change, buckling  
19       mode, initial imperfection and foundation parameter on nonlinear dynamic buckling of the  
20       orthotropic plate are discussed.

21

22        **Keywords**

23        Nonlinear dynamic analysis; dynamic stability; thermal effects; damping effects; elastic  
24        foundation; orthotropic plate.

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