

Internal-external resonance of beams on non-linear viscoelastic foundation traversed by moving load

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Vibration of a finite Euler-Bernoulli beam, supported by non-linear viscoelastic foundation traversed by a moving load, is studied and the Galerkin method is used to discretize the non-linear partial differential equation of motion. Subsequently, the solution is obtained for different harmonics using the Multiple Scales Method (MSM) as one of the perturbation techniques. Free vibration of a beam on non-linear foundation is investigated and the effects of damping and non-linear stiffness of the foundation on the responses are examined. Internal-external resonance condition is then stated and the frequency responses of different harmonics are obtained by MSM. Different conditions of the external resonance are studied and a parametric study is carried out for each case. The effects of damping and non-linear stiffness of the foundation as well as the magnitude of the moving load on the frequency responses are investigated. Finally, a thorough local stability analysis is performed on the system. © ۲۰۱۰ Springer Science+Business Media B.V.