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A generalized complex eigenvector method for dynamic analysis of heterogeneous viscoelastic structures. (English) [Zbl 1017.74026](#)

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Summary: We describe a generalized complex eigenvector method which can be used for linear dynamic analysis of viscoelastic structures. Here the dynamic analysis is understood as transient analysis and frequency response analysis. The generalized complex eigenvector method is based on finite element discretization of structures on the approximation of viscoelastic properties by differential operators, and on mode superposition technique. Coefficients of differential operator are defined from the condition of best matching of complex characteristics of viscoelastic material and complex characteristics of differential operator in a pre-set frequency range. Advantage of this method is that it allows to take into account the real changes of viscoelastic properties in frequency range. Also, the generalized complex eigenvector method allows to describe viscoelastic properties by two functions: complex Young's modulus, and complex Poisson's ratio. The method is verified by comparing its results with solutions obtained by complex modulus method. The effect of viscoelastic Poisson's ratio on transient and frequency responses of structures is demonstrated.

MSC:

- 74H15 Numerical approximation of solutions of dynamical problems in solid mechanics Cited in 1 Document
- 74H45 Vibrations in dynamical problems in solid mechanics
- 74S05 Finite element methods applied to problems in solid mechanics
- 74D05 Linear constitutive equations for materials with memory

Keywords:

heterogeneous viscoelastic structures; frequency response analysis; generalized complex eigenvector method; transient analysis; finite element discretization; differential operators; mode superposition technique; complex Young's modulus; complex Poisson's ratio

Full Text: [DOI](#)

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