

عنوان مقاله:

A PML Solution for Vibration of Infinite Beams on Elastic Supports under Seismic Loads

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خلاصه مقاله:

The purpose of this study is to develop a model for a class of unbounded domains with application in infinite beams on elastic supports. An unphysical layer is included in the model in order to absorb the crossing waves into the unbounded domain. To this end, the Perfectly Matched Layer (PML) is used along with a displacement-based Finite Element scheme that provides an appropriate vehicle for such problems. Most PML applications appearing in the literature have dealt with lower order governing differential equations. The case of a beam on elastic foundation, on the other hand, involves a fourth-order equation. The governing equation is reduced into a series of four first-order equations by introducing auxiliary variables. This leads to internal moments and shear forces that represent non-linear behaviour in the artificial medium. The accuracy of PML results is validated by comparison with regular finite element solutions of beams with substantially long spans. The solution method is used to investigate dynamic response of railroad tracks under earthquake excitations. The effect of various parameters on seismic response and the resonance phenomenon has been examined. Numerical results demonstrate the accuracy and efficacy of the method, which is due to use of small bounded domains in the solution process.

کلمات کلیدی:

Perfectly matched layers, Infinite beams on elastic supports, Earthquake excitation

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