

Investigation of eigenvibrations of a simply supported beam with a load

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Abstract

© 2018 Author(s). The differential eigenvalue problem describing eigenvibrations of a simply supported beam with an attached load is investigated. This problem has an increasing sequence of positive simple eigenvalues with a limit point at infinity. To the sequence of eigenvalues, there corresponds a complete orthonormal system of eigenfunctions. We formulate a limit differential eigenvalue problem and prove the convergence of the eigenvalues and eigenfunctions of the initial problem to the corresponding eigenvalues and eigenfunctions of the limit problem as load mass tending to infinity. The original differential eigenvalue problem is approximated by the finite difference method on a uniform grid. Error estimates for approximate eigenvalues and eigenfunctions are established. The theoretical results are illustrated by numerical experiments for a model problem. Investigations of this paper can be extended to the cases of more complicated and important problems on eigenvibrations of plates and shells with attached loads.

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