

## ANOTHER APPROACH TO VIBRATION ANALYSIS OF STEPPED STRUCTURES\*

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**Abstract.** In this paper a model of an  $N$ -stepped bar with variable Cross-sections coupled with foundation by means of lumped masses and springs is studied. It is assumed that the process of vibrations in each section of the bar is described by a wave equation. The analytical tools of vibration analysis are based on finding eigenfunctions with piecewise continuous derivatives, which are orthogonal with respect to a generalized weight function. These eigenfunctions automatically satisfy the boundary conditions at the end points as well as the non-classical boundary conditions at the junctions. The solution of the problems is formulated in terms of Green function. By means of the proposed algorithm a problem of arbitrary complexity could be considered in the same terms as a single homogeneous bar. This algorithm is efficient in design of low frequency transducers. An example is given to show the practical application of the algorithm to a two-stepped transducer.

**Key words.** PDE with discontinuous coefficients, numerical approximation of eigenvalues, stepped structure, transducers, waveguide, variable cross-section, non-classical boundary conditions, Green function, resonance

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