Free Vibration and Buckling Characteristics of Uniform Beam: A Modified Segmented Rod Method

Aleksandar Nikolić

Faculty of Mechanical and Civil Engineering in Kraljevo
University of Kragujevac, Dositejeva 19, Kraljevo, Serbia
nikolic.a@mfkv.kg.ac.rs

This paper proposes a modified segmented rod method (MSRM) in order to facilitate the introduction of boundary conditions in the analysis of free vibrations and buckling of Euler–Bernoulli beams. First, the basic idea of proposed modifications is presented in the case of elementary length beam, and then the idea is generalized to the full-length beam. In addition to facilitating the introduction of boundary conditions, by comparing the results of MSRM with segmented rod method (SRM) and Hencky bar-chain method (HBM), a faster convergence of MSRM results to the exact ones was observed. Although the case of uniform beam is considered in this paper, proposed MSRM may contribute to greater use of segmented beam approach in solving of various static, free vibration or buckling problems of non-uniform beams. Also, it was shown that MSRM can be easily adapted for the analysis of beams that resting on partial elastic foundation.

Keywords: Segmented rod method; modified segmented rod method; Hencky bar-chain model; Euler–Bernoulli beam; free vibration; buckling.