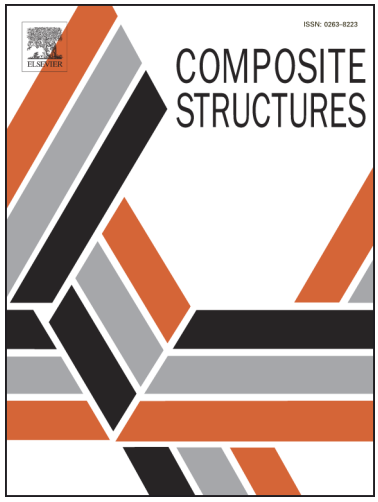

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Variational solution for buckling of nonlocal carbon nanotubes under uniformly and triangularly distributed axial loads

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ABSTRACT

In the present study buckling loads are computed for carbon nanotubes subject to a combination of concentrated and axially distributed loads. Distributed axial loads are taken as uniformly distributed and triangularly distributed. Carbon nanotubes are modelled as nonlocal Euler-Bernoulli beams. Variational formulation of the problem is derived and variationally consistent boundary conditions are obtained. The Rayleigh quotients for the distributed axial loads are formulated. Numerical solutions are obtained by Rayleigh-Ritz method and employing orthogonal Chebyshev polynomials. Results are given in the form of counter plots for a combination of simply supported, clamped and free boundary conditions. It is observed that the sensitivity of the buckling loads to small scale parameter depends on the specific boundary conditions.

Keywords: Buckling of nanotubes; Distributed axial loads; Variational formulation; Nonlocal model; Rayleigh quotient.

1. Introduction

Advanced properties of carbon nanotubes (CNT) such as high stiffness to weight ratio, large failure strain, to name a few, make them materials of choice in a large number of technologically advanced applications [1, 2]. An expanding area of application for their use is as reinforcing

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