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A First Order Shear Deformation Theory Approach for the Buckling Behavior of Nanocomposite Beams

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Abstract : Due to their high strength-to-weight ratio, carbon nanotube (CNTs) reinforced polymer composites are being considered as one of the most promising nanocomposites which can improve the performance when used in structural applications. The buckling behavior is one of the most important parameter needs to be considered in the design of structural members like beams and plates. In the present paper, the elastic constants of CNT reinforced polymer composites are evaluated by using Mori-Tanaka micromechanics approach. Knowing the elastic constants, an analytical study is being conducted to investigate the buckling behavior of nanocomposites for different CNT volume fractions at different boundary conditions using first-order shear deformation theory (FSDT). The effect of stacking sequence and CNT radius on the buckling of beam has also been presented. This study is being conducted primarily with an intension to find the stiffening effect of CNTs when used in polymer composites as reinforcement.

Keywords : CNT, buckling, micromechanics, FSDT
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