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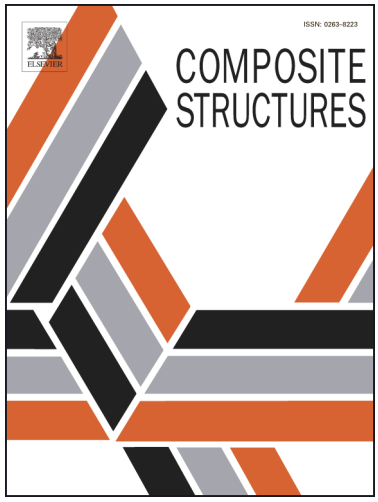

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Ngoc-Duong Nguyen, Trung-Kien Nguyen, Huu-Tai Thai, Thuc P. Vo

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A Ritz type solution with exponential trial functions for laminated composite beams based on the modified couple stress theory

Ngoc-Duong Nguyen[a], Trung-Kien Nguyen[a,*], Huu-Tai Thai[b], Thuc P. Vo[c,d]

[a] Faculty of Civil Engineering, Ho Chi Minh City University of Technology and Education, 1 Vo Van Ngan Street, Thu Duc District, Ho Chi Minh City, Viet Nam.

[b] School of Engineering and Mathematical Sciences, La Trobe University, Bundoora, VIC 3086, Australia

[c] Institute of Research and Development, Duy Tan University, 03 Quang Trung, Da Nang, Vietnam

[d] Faculty of Engineering and Environment, Northumbria University, Newcastle upon Tyne, NE1 8ST, UK.

Abstract

This paper proposes novel Ritz functions for the size-dependent analysis of micro laminated composite beams with arbitrary lay-ups. Displacement field is based on a higher-order deformation beam theory and size effect is captured by the modified couple stress theory. Lagrange's equations are used to obtain the governing equations of motion. The present beam model, which can recover the classical one by neglecting the material length scale parameter, is used to predict the size-dependent responses of micro composite beams. The results indicate that the present study is efficient for bending, vibration and buckling problems of micro composite beams. Some new results are given to serve as benchmarks for future studies.

Keywords: Size-dependent behaviour; Ritz method; Bending; Vibration; Buckling; Micro composite beams.

* Corresponding author. Tel.: + 848 3897 2092.
E-mail address: kiennt@hcmute.edu.vn (Trung-Kien Nguyen)

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