2-Noded zigzag beams element based in the extended Euler Bernoulli theory – COMPLAS XIII

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ABSTRACT

In this paper we present a two-noded beam element for the static analysis of composite laminated and sandwich beams based on the combination of classical Euler-Bernoulli beam theory and the refined zigzag kinematics proposed by Tessler et al. [1]. The element has just four kinematic variables per node. The finite element model is free of shear locking. The stiffness matrix and load vector can be calculated in closed form using exact integration. The formulation is validated by comparing the results with the computed 2D-FE results for several multilayer composite beams with various loading and boundary conditions.

It is also proposed a new model to simulate the delamination phenomenon based in incorporating a zigzag function corresponding with the kinematic of zero thickness delaminate layer. An example showing the capability of the proposed model for accurately reproducing delamination effects is presented.

REFERENCES

[1] Tessler, A.; Di Sciuva, M.; Gherlone, M.;, "A refined zigzag beam theory for composite and sandwich beams," *Journal of Composite Materials*, vol. 43, no. 9, p. 1051–1081, 2009.