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Sambhaji Lore, Suganyadevi Sarangan, B.N. Singh

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Sambhaji Lore[a,1,*], Suganyadevi Sarangan[b,2], B. N. Singh[a,3]

[a]*Department of Aerospace engineering, IIT Kharagpur, India*
[b]*Department of Aeronautical Engineering, Malla Reddy college of Engineering and Technology, Dullapally, Telangana, India*

Abstract

In the present study, epistemic uncertainty is quantified for bending and buckling analysis of laminated composite plates using evidence theory. By employing vertex and uniform sampling methods the degree of confidence of the failure analysis is carried out in terms of belief and plausibility. Dempster's rule of combination is used when the analysis subjected to more number of experts under vertex and sampling methods. To proceed the uncertainty quantification for the composite plates a trigonometric higher order shear deformation theory is assessed by analytical and finite element formulation. Numerical examples are carried out to illustrate the effectiveness of the proposed methods for failure analysis based evidence theory of real engineering problems. Considering various parameters such as size of focal element, uncertain variables as material and geometric parameters, more number of uncertain variables and more number experts for each uncertain variable the quantification is executed. From the numerical examples, it is observed that for quantifying the epistemic uncertainty employing more experts for uncertain variables is the favorable choice.

Keywords: *Evidence theory -Vertex method-Sampling method-Shear deformation theory-Laminated composites*

Nomenclature

Ω	Frame of discernment
$\overline{\lambda}$	Non-dimensional critical buckling load
$\overline{W}$	Non-dimensional transverse deflection
ϕ_x, ϕ_y	Mid-plane rotational deformations
θ	Fiber orientation angle
$r_{i,j}$	Weight function
u_0, v_0, w_0	Mid-plane displacements
U_F	Limit state value
a, b, h	Length, width and thickness of the laminate
h(x)	Limit state function
X, Y, Z	Cartesian co-ordinate of the laminate
$\varnothing$	Empty set

*Corresponding author
Email address: sambhajilore@gmail.com (Sambhaji Lore)
[1]Research Scholar (Dept. of Aerospace Engineering IIT, Kharagpur)
[2]Assistent Professor (Dept. of Aeronautical Engineering, Malla Reddy college of Engineering and Technology, Telangana)
[3]Professor (Dept. of Aerospace Engineering IIT, Kharagpur)