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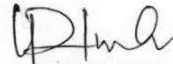
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Static buckling analysis of shape memory alloy reinforced composite laminated plate

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Abstract. With high strength and stiffness composites are being widely used as structural materials. The properties of composites can further improve by reinforcing with advanced structural components like shape memory alloys (SMA). In the present study nonlinear buckling analysis of laminated composite plate with layer of shape memory alloys are done. Finite element governing equation based higher order shear deformation theory with principle of virtual work is considered. Properties of composite plates are formulated with micro-mechanical approach. A MATLAB program is developed with nine nodes isoperimetric element. Influence of volume fraction of SMA, recovery stress, with and without SMA layer, with temperature on critical buckling load is revealed. Convergence and validation study presented here shows the exactness and efficiency of the model.

1. Introduction

In the recent decades, laminated composites have found an increasing applications in various engineering fields especially in defence, marine, automobile, space and many more due to its high strength to weight ratio and stiffness. Reliability of the structure is still one of the major issue which can get fulfil with the utilisation of the smart material incorporation. Smart / intelligent materials, are those have one or more properties that can be considerably vary in a skilful fashion by peripheral stimuli, such as moisture, electric or light, stress, temperature, magnetic fields, pH, or chemical compounds. Piezoelectric materials, SMA and shape-memory polymers (SMP), Photovoltaic materials, Halochromic materials, Ferrofluids are the few examples of the smart materials. Generally when SMA wires are incorporated with layered composite materials, these are pre-strained, so that when it get utilised in high temperature application or environment, it regains its original shape. With the utilisation of this shape memory effect, in present paper, tried to show effect over nondimensional critical buckling temperature.

Initially the incorporation of SMA wire with various volume fractions were get utilised to regulate buckling of the composites. Rogers and Bakers [1] used SMA in laminated composites to improve in its natural frequency and control its vibration. Baz et al. [2] studied the control of SMA wires on the vibration and buckling performance on composite material. Abbas et al. [3] performed the study to show the influence of volume portion of composite fibers, plate dimensions, fiber orientation angle and SMA wires,



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