THE EFFECT OF RANDOM MATERIAL PROPERTIES ON THE PROBABILISTIC BEHAVIOR OF FUNCTIONALLY GRADED PLATES

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In this study, the stochastic response of a functionally graded (FG) plates with uncertain material properties is addressed. In the FG materials, the material properties, such as elastic modulus and mass density, vary along the thickness direction following exponential law. Since this feature defines the essence of FG materials, we assume that the through thickness variation does not have any randomness. This means that we only assume the spatial random variation of material constants in the plane-direction of the FG plates.

In case of elastic modulus of FG plates, the deterministic properties at top and bottom are different from each other, defining the boundary values of the property at both surfaces[1]. This circumstance necessitates the need to have two independent random variables in order to deal with material randomness in analyses FG material plane structures.

In order to investigate into the response variability of FG plates, the brute force Monte Carlo simulation is employed. Random fields, which represent the spatial fluctuation of material properties, are numerically generated by using spectral representation method[2]. In order to investigate the effect of correlation between material properties at top and bottom surfaces, we consider whole range of correlation: from negative perfect to positive perfect correlation and no correlation as well.

The probabilistic response of FG plates is shown to be different from the isotropic material plates and composite plate as well[3]. Furthermore, the response is observed to be affected by the correlation between the randomness at the top and bottom surfaces.

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