Analysis of FGM thin elastic plates by mesh-free methods

*V. Sladek[1], J. Sladek[1], and L. Sator[1]

[1]Institute of Construction and Architecture, Slovak Academy of Sciences, 845 03 Bratislava, Slovakia

*Corresponding author: vladimir.sladek@savba.sk

This paper, is devoted to the study of the effects due to continuous spatial variation of the bending stiffness on bending of thin plates. The gradation of the Young modulus across the plate thickness gives rise to coupling between the in-plane and deflection deformations. Furthermore, in contrast to the homogeneous plate, the generalized plane stress conditions are not valid any more. In the case of in-plane variability of bending stiffness, the governing equations become the PDE with variable coefficients. Mesh-free formulations based on either local integral equations (weak formulation) or collocation of PDE at interior nodes (strong formulation) have been developed, with using meshless approximations for spatial variations of field variables. In order to eliminate the higher order derivatives from the formulation, we proposed the decomposition of the 4th order PDE into two 2nd order PDE with introducing a new field variable.

Keywords: Kirchhoff − Love theory, Variable thickness, FGM, Decomposition, Meshless approximations,