

NUMERICAL APPROACHES FOR BEAMS ON NONLINEAR FOUNDATION - PART 1 (THEORY)

TOMEČKOVÁ Ivona, FRYDRÝŠEK Karel, MORÁVKOVÁ Zuzana

Abstract: Our work presents theory and numerical approaches suitable for the solutions of straight plane beams rested on elastic foundations (i.e. nonlinear modified bilateral and unilateral Winkler's models). The nonlinear boundary value problems of 4th-order are solved via finite element method with semi-smooth Newton's method (which discretize the weak formulation of the problem) and central difference method with classical Newton's method (which discretize directly the differential equation). Reaction forces in foundation are defined via nonlinear dependencies based on previous experiments.

Keywords: unilateral and bilateral elastic foundation, nonlinear foundation, beam, Finite Element Method, semi-smooth Newton's method, Central Difference Method.