28th Southeastern-Atlantic Regional Conference on Differential Equations, October 10–11, 2008, University of Arkansas at Little Rock, Little Rock Arkansas, USA

MAC-SOLUTION OF HERTZ PROBLEM FOR AN ELASTIC PLATE

NEYGEBAUER IGOR

Consider the linear partial differential equation with the delta-function on the right side. The particular solutions of this equation are called the Greens functions and they play an important role in the method of Greens functions to solve the correspondent boundary value problems. Let us consider the physical value of these Greens functions. Then, for example, the string and the beam problems in statics are one dimensional problems and represent the physically accepted finite solutions for displacements and for the stresses for the fixed boundary conditions. The two dimensional problem for membrane creates singularity in displacements which is not physical. The two dimensional problem for an elastic plate gives finite displacements but infinite stresses which are not physical. The Hertz problem is an elastic infinite plate on elastic support under a transverse force. This problem has finite displacements and nonphysical infinite stresses. The method of additional conditions (MAC) creates the nonsingular solution on the base of the solution with singularity. MAC is not an asymptotic method or a method of regularization because for example they are applied only to the problems with existent solutions. MAC can be applied to the problems with nonexistent solutions. Strictly speaking the solution of Hertz problem does not exist because the Hertz solution includes the function with singularities in stresses. It is not too logically to accept the functions which give the singularities in stresses and to avoid the functions which give singularities in displacements. The MAC-solution for the Hertz problem for an elastic plate with finite stresses but using additional condition in form of line integral is obtained. The MAC-solution for the plate follows from the MAC-solution of the membrane.

National University of Rwanda
E-mail address: newigor52r@yahoo.com