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The MLPG for Bending Analysis of Circular Porous Piezoelectric Plate under a Thermal Load

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A meshless method based on the local Petrov-Galerkin approach is proposed for plate bending analysis of a circular porous piezoelectric plate under a thermal load. Constitutive equations for porous piezoelectric materials possess a coupling between mechanical displacements and electric intensity vectors for solid and fluid phases. The axial symmetry of geometry and boundary conditions for a circular plate reduces the original three-dimensional (3-D) boundary value problem into a two-dimensional (2-D) problem on the axial cross section. Thermal loads under stationary and transient dynamic conditions are considered in this paper. The local weak formulation is employed on circular subdomains on the axial cross section. Subdomains surrounding nodes are randomly spread over the analyzed domain. The test functions are taken as unit step functions in the derivation of the local integral equations (LIEs). The moving least-squares (MLS) method is adopted for the approximation of the physical quantities in the LIEs.

Keywords: MLS approximation, Local weak form, Heat conduction, Porous piezoelectricity, Simply supported plate