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**Analytical solutions for plane problem of functionally graded magneto-electric cantilever beam.** (English) [Zbl 1322.74039](#)

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**Summary:** In this paper, an exact analytical solution is presented for a transversely isotropic functionally graded magneto-electro-elastic (FGMEE) cantilever beam, which is subjected to a uniform load on its upper surface, as well as the concentrated force and moment at the free end. This solution can be applied for any form of gradient distribution. For the basic equations of plane problem, all the partial differential equations governing the stress field, electric, and magnetic potentials are derived. Then, the expressions of Airy stress, electric, and magnetic potential functions are assumed as quadratic polynomials of the longitudinal coordinate. Based on all the boundary conditions, the exact expressions of the three functions can be determined. As numerical examples, the material parameters are set as exponential and linear distributions in the thickness direction. The effects of the material parameters on the mechanical, electric, and magnetic fields of the cantilever beam are analyzed in detail.

**MSC:**

[74K10](#) Rods (beams, columns, shafts, arches, rings, etc.)

[74E30](#) Composite and mixture properties

[74F15](#) Electromagnetic effects in solid mechanics

[74G10](#) Analytic approximation of solutions (perturbation methods, asymptotic methods, series, etc.) of equilibrium problems in solid mechanics

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**Keywords:**

functionally graded material (FGM); analytical solution; magneto-electric (ME) material; cantilever beam; plane stress problem

**Full Text:** [DOI](#)

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