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PII: S0997-7538(16)30082-1

DOI: 10.1016/j.euromechsol.2016.06.011

Reference: EJMSOL 3326

To appear in: *European Journal of Mechanics / A Solids*

Received Date: 27 October 2015

Revised Date: 11 June 2016

Accepted Date: 30 June 2016

Please cite this article as: Xie, L., Zhang, C., Hwu, C., Pan, E., On novel explicit expressions of Green's function and its derivatives for magnetoelectroelastic materials, *European Journal of Mechanics / A Solids* (2016), doi: 10.1016/j.euromechsol.2016.06.011.

On novel explicit expressions of Green's function and its derivatives for magnetoelectroelastic materials

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Abstract

It is well known that the Green's function for anisotropic magnetoelectroelastic materials can be written as a line integral by solving the governing equations and thereafter explicit expressions can be obtained by applying the Cauchy residue calculus to the line integral. Alternatively, the Green's function can be evaluated explicitly by constructing the integral in terms of the solutions of a standard eigen-system known as the Stroh eigen-relation. In this paper, explicit expressions of the Green's function for the magnetoelectroelastic materials are successfully constructed by the solutions of the Stroh eigen-relation associated with the oblique plane perpendicular to the position vector $\boldsymbol{x}$. With the distinctness assumption on the eigenvalues, the first and second derivatives of the Green's function are expressed as linear combinations of the eigenvectors, where the corresponding coefficients are determined explicitly. As a special case, the numerical results of these explicit expressions are validated by analytical results for the transversely isotropic magnetoelectroelastic materials. Furthermore, the present explicit expressions of the Green's function and its derivatives are applied to calculate the generalized displacement and stress fields due to a buried quantum dot in an infinite magnetoelectroelastic solid.

Keywords: Green's function, Derivatives of Green's function, Magnetoelectroelasticity, Quantum dots

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