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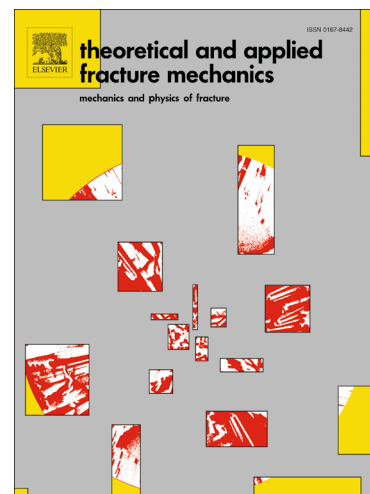
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Mixed Mode cracks in annular planes of cylindrical orthotropy subjected to inplane loading

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Abstract: This paper is concerned with the mixed mode crack problem in an orthotropic annular plane. First, the Michell solution is generalized for material of cylindrical anisotropy. Next by using this solution, fundamental solutions of climb and glide edge dislocations are provided for an annular orthotropic plane of cylindrical orthotropy. Then, an analytical solution to stress field of the intact annular plane under normal and shear tractions on its outer boundaries is presented in this article. The distributed dislocation technique is employed to analyze multiple arbitrary oriented interacting cracks in an annular orthotropic plane. The ensuing integral equations are solved numerically to obtain the dislocation density on the surfaces of the cracks. The stress intensity factors are evaluated by using these dislocation densities. The approach of this study is applied to example problems and shown to be accurate for cases where given in the literature. Finally, the effects of crack geometry and location, material anisotropy, and interaction of cracks on the resulting stress intensity factors at the crack tips are studied.

Keywords: Annular plane, Volterra dislocation, Dislocation density, Generalized Michell solution.

1. Introduction

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