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APPLICATIONS OF THE RIEMANN – HILBERT BOUNDARY VALUE PROBLEM ON RIEMANN SURFACES IN MECHANICS AND PHYSICS

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The following problems of mechanics and physics are considered:

(1) scattering problem of electromagnetic waves by a right-angled wedge when one of the sheets is magnetically conductive and the second one is perfectly electrically conductive, and a scattering problem of a plane electromagnetic wave from an anisotropic half-plane with four different complex impedance parameters,

(2) cavitational flow of ideal fluid in multiply-connected regions,

(3) stress concentration in 2d composites with cracks and inclusions along the interface (the Comninou type models of frictionless contact and other models),

(4) contact of a stringer of piecewise thickness and rigidity located (i) on the boundary of a plate or (ii) on the junction of two different plates.

Mathematically, these models are formulated as the vector Riemann – Hilbert boundary value problem with a generalized Chebotarev – Khrapkov matrix coefficient, a system of first-order difference equations or a scalar second-order difference equation with meromorphic periodic coefficients, or a vector Riemann – Hilbert problem with a piece-wise constant matrix coefficient. A closed-form solution to the problems listed are found by a technique based on the reduction to the Riemann – Hilbert problem on a hyperellitic surface and its solution. The practical implementation of the procedure proposed requires the solution of the associated Jacobi inversion problem. Formulas for the Riemann constants by different authors are revised. Numerical solution of the Jacobi problem on a surface of genus 3 arising in the scattering problem is discussed.

The main results are reported in [1–6].

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