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R-linear and Riemann-Hilbert problems for multiply connected domains. (English)

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Let $D$ be a multiply connected domain on the complex plane whose boundary $\partial D$ consists of $n$ simple closed Jordan curves. Let $D_k$ ($k = 1, 2, \ldots, n$) be simply connected domains complementing $D$ to the extended complex plane. The R-linear boundary value problem is stated as follows. Given Hölder continuous functions $a(t) \neq 0$, $b(t)$ and $f(t)$ on $\partial D$, to find a function $\phi(z)$ analytic in $\bigcup_{k=1}^{n} D_k \cup \partial D_k$ and in $D \cup \partial D$ satisfying the conjugation condition

$$\phi^+(t) = a(t)\phi^-(t) + b(t)\overline{\phi^-(t)} + f(t), \quad t \in \partial D.$$

Here $\phi^+(t)$ is the limit value of $\phi(z)$ when $z \in D$ tends to $t \in \partial D$, $\phi^-(t)$ is the limit value of $\phi(z)$ when $z \in D_k$ tends to $t \in \partial D$. Special cases of this problem can be reduced to the Riemann-Hilbert boundary value problem and certain other boundary value problems.

In previous works, these problems were solved under additional geometrical restrictions to the domains. In the present work, the solution of the R-linear boundary value problem with constant coefficients is constructed for any circular multiply connected domain in the form of modified Poincaré series, and the modified alternating Schwarz method is justified for an arbitrary multiply connected domain.

For the entire collection see [Zbl 1250.00024].

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