

*A New Type of Multidimensional Singular Linear Integral Equation**

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I. Introduction. In the theory of radiative transfer through a plane-parallel atmosphere, the optical properties of which vary with optical depth, one has to solve the following system of nonlinear singular integral equations [3]:

$$(1a) \quad X^*(\alpha, \beta; \mu) = 1 + \int_0^1 \left[\int_\alpha^\beta X^*(\alpha, \beta'; \mu) X^*(\alpha, \beta'; \mu') \Omega(\beta') \cdot \exp \left\{ -(\beta - \beta') \left(\frac{1}{\mu} + \frac{1}{\mu'} \right) \right\} d\beta' \right] \psi(\mu') \frac{d\mu'}{\mu'},$$

$$(1b) \quad Y^*(\alpha, \beta; \mu) = \exp \left\{ \frac{-(\beta - \alpha)}{\mu} \right\} + \int_0^1 \left[\int_\alpha^\beta Y^*(\alpha, \beta'; \mu) X^*(\alpha, \beta'; \mu') \Omega(\beta') \cdot \exp \left\{ \frac{-(\beta - \beta')}{\mu'} \right\} d\beta' \right] \psi(\mu') \frac{d\mu'}{\mu'},$$

$$(1c) \quad X(\alpha, \beta; \mu) = 1 + \int_0^1 \left[\int_\alpha^\beta Y^*(\alpha, \beta'; \mu) Y^*(\alpha, \beta'; \mu') \Omega(\beta') d\beta' \right] \psi(\mu') \frac{d\mu'}{\mu'},$$

$$(1d) \quad Y(\alpha, \beta; \mu) = \exp \left\{ \frac{-(\beta - \alpha)}{\mu} \right\} + \int_0^1 \left[\int_\alpha^\beta X^*(\alpha, \beta'; \mu) Y^*(\alpha, \beta'; \mu') \Omega(\beta') \cdot \exp \left\{ \frac{-(\beta - \beta')}{\mu} \right\} d\beta' \right] \psi(\mu') \frac{d\mu'}{\mu'},$$

where the positive constants α and β are the optical depths at the boundaries of the atmosphere, μ and μ' are the cosines of the angles of emergence and incidence, respectively, measured from the outward normal, $\Omega(\beta')$ is the variable

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