To theory one class of integral equation by tube domain

Nusrat RAJABOV

Research Institute Tajik National University, Tajikistan
E-mail: nusrat38@mail.ru

Abstract: Let Ω denote the tube $\Omega = \{(t,z) : a < t < b, |z| < R\}$. Lower ground this cylinder denote by $D = \{t = a,\ |z| < R\}$ and lateral surface denote by $= \{a < t < b,\ |z| = R\}$, $z = x + iy$. In Ω we shall consider the following integral equation

$$\varphi(t,z) + \lambda \int_a^x \frac{\varphi(\tau,z)}{\tau - a} d\tau - \frac{\mu}{\pi} \iint_D \frac{exp[i\theta]\,\varphi(t,s)}{(R-\rho)^{\beta}(s-z)} ds -$$
$$\frac{\delta}{\pi} \int_a^x \frac{d\tau}{\tau - a} \iint_D \frac{exp[i\theta]\,\varphi(\tau,s)}{(R-\rho)^{\beta}(s-z)} ds = f(t,z), \qquad (1)$$

where λ, μ, δ – are given real constants, $f(t,z)$ – are given function, $\theta = \arg\ s$, $s = \xi + i\eta$, $ds = d\xi d\eta$, $\varphi(t,z)$ – unknoun function, $\rho^2 = \xi^2 + \eta^2$.

The solution to this equation is sought in the class of function $\varphi(t,z) \in C\left(\overline{\Omega}\right)$, $\varphi(a,z) = 0$, $\varphi(t, Re^{i\theta}) = 0$, $\theta = \arg z$ and its asymptotic behavior at $t \to a$, $r \to R$ is given by formulas

$$\varphi(t,z) = 0\left[(t-a)^{\varepsilon}\right],\ \varepsilon > 0 \text{ at } t \to a,\ \varphi(t,z) = 0[(R-r)^{\delta_1}],\ \delta_1 > \beta - 1,\ \text{at } t > a.$$

For integral equation (1) found condition to parameters, present in kernels, at fulfilment which, the problem found solution this type integral equation reduce, to problem found two splitting system integral equation, theory which detailed investigation in author works. In this case solution integral equation (1) found in explicit form. In those cases, when general solution contain arbitrary function, found inverse formula, that is arbitrary functions found by valued solution integral equation in surface cylinder. In the case, when constants present in kernels no among themselves, the solution integral equation(1) found in form absolutely and uniformly converges generalized power series by power $(t-a)$, by infinite numbers analytic functions variable point ground this cylinder. Found invers formula, that is arbitrary analytic functions founded by valued solution integral equation and its derivative at $t = 0$. Obtained integral representation and its inverse formula use for stand and investigate Dirichlet type boundary value problems.

Keywords: integral equation, tube domain, two splitting system integral equation

2010 Mathematics Subject Classification: 45E05, 45B05