

**ELLIPTIK TURDAGI TENGLAMALAR UCHUN MANBANI
ANIQLASH TESKARI MASALASINI ANIQLASHDA SHAUDER
BAHOLASHLARI**

Sh.A.Rustamov

e-mail: rustamovshaxzod1997@gmail.com

$x = (x_1, \dots, x_n)$ nuqta R^n evklid fazosiga tegishli bo'lsin. x' orqali x nuqtaning $x_n = 0$ gipertekislikga proeksiyasi bo'lgan $(x_1, \dots, x_{n-1}, 0)$ nuqtani belgilaymiz. Ω orqali R^n ga tegishli chegaralangan sohani belgilaymiz.

$u(x)$ funksiyaning Ω dagi gyolder normasini kiritamiz:

$$[u]^\lambda(\Omega) = \sup |u(x) - u(y)| \cdot |x - y|^{-\lambda}, \quad x, y \in \Omega \quad x \neq y$$

$$|u|^0(\Omega) = \sup |u| \quad \Omega \text{ da}$$

$$[u]^{k+\lambda}(\Omega) = \sum_{j=0}^n (\text{diam } \Omega)^j \max |D^j u|^0(\Omega) +$$

$$+ (\text{diam } \Omega)^{k+\lambda} \max |D^k u|^\lambda(\Omega), \quad k = 0, 1, 2, \dots,$$

bunda $\lambda \in (0, 1)$ dagi belgilangan son. $C^{k+\lambda}(\bar{\Omega})$ orqali Ω da $|u|^{k+\lambda}(\Omega)$ normasi chegaralangan u funksiyalar to'plami belgilanadi. A operatorni quyidagicha kiritamiz.

$$A = - \sum_{j,k=1}^n a^{jk}(x) \partial^2 / \partial x_j \partial x_k + \sum_{j=1}^n a^{jk}(x) \partial / \partial x_j + a(x)$$

bunda a^{jk} , a^j , a lar $C^\lambda(R^n)$ ga tegishli bo'lib,

$$\sum_{j,k=1}^n a^{jk}(x) \xi_j \xi_k \geq \varepsilon_0 |\xi|^2, \quad \xi \in R^n, \quad x \in \Omega$$

tekis elliptiklik shartini qanoatlantiradi.

A' orqali A ning x_n bo'yicha xosila qatnashmagan operatorni belgilaymiz.

Ω' orqali E_{n-1} dagi chegarasi $-\partial\Omega'$ $C^{2+\lambda}$ sinfga tegishli sohani belgilaymiz $\Omega = \Omega' \times (-H, 0)$, $0 < H$, $\Gamma_\tau = \Omega' \times \{-\tau\}$, $\Gamma = \partial\Omega \setminus (\Gamma_0 \cup \Gamma_H)$ bo'lsin.

$\rho \in C^\lambda(E_n)$ vazn funksiyasi quyidagi shartlarni qanoatlantirsin:

$$\Omega' \times (-\varepsilon_0, 0) \text{ da } 0 < \varepsilon_0 < \rho \quad (1)$$

(u, q) funksiyalar juftligini quyidagi shartlar asosida izlaymiz

$$Au = \rho q + f, \quad \partial q / \partial x_n = 0, \quad x \in \Omega \quad (2)$$

$$u = g \quad x \in \partial\Omega, \quad \frac{\partial u}{\partial x_n} = h \quad x \in \Gamma_0. \quad (3)$$

Keyinchalik C orqali Ω ga, A operator koeffitsientlarining C^λ normalariga hamda ρ, ε_0 ga bog'liq bo'lgan o'zgarmaslarni belgilaymiz. Ularni nomerlamaslik maqsadida, har bir keyingi o'zgarmasni oldingisidan katta deb olamiz.

(2), (3) masalada $f \in C^\lambda(\bar{\Omega})$, $g \in C^{2+\lambda}(\partial\Omega)$, $h \in C^{1+\lambda}(\bar{\Gamma}_0)$ deb olamiz.

Teorema. Agar $u \in C^{2+\lambda}(\bar{\Omega})$ va $q \in C^\lambda(\bar{\Omega}')$ funksiyalar (2), (3) shartlarni qanoatlantirsa, u holda shunday o'zgarmas C son topiladiki

$$\begin{aligned} & |u|^{2+\lambda}(\Omega) + |q|^\lambda(\Omega') \leq \\ & \leq C \left(|f|^\lambda(\Omega) + |g|^{2+\lambda}(\partial\Omega) + |h|^{1+\lambda}(\Gamma_0) + |u|^0(\Omega) \right) \end{aligned} \quad (4)$$

tengsizlik o'rinli bo'ladi.

Lemma 1. Shunday o'zgarmas C son mavjudki, (2), (3) masalaning Ω_1 dagi yechimi uchun $A = -\Delta$ va $\rho = 1$ bo'lganda, quyidagi tengsizlik o'rinli

$$\begin{aligned} & |u|^{2+\lambda}(B_\varepsilon^-) + \varepsilon^2 |q|^\lambda(\sigma_\varepsilon) \leq C(\varepsilon^2 |f|^\lambda(B_{2\varepsilon}^-) + |g|^{2+\lambda}(\sigma_{2\varepsilon}) + \\ & + \varepsilon |h|^{1+\lambda}(\sigma_{2\varepsilon}) + |u|^1(B_{2\varepsilon}^-)) \end{aligned}$$

Adabiyotlar ro'yxati

1. Хайдаров А. Один класс обратных задач для эллиптических уравнений.

// Докл. АН СССР, 1984. Т. 277.

2. Агмон С., Дуглис А., Ниренберг Л. Оценки решений эллиптических уравнений вблизи границы. М.: ИЛ. 1962. – 205 с.