

BO'LAKLI O'ZGARMAS ARGUMENTLI DIFFERENSIAL TENGLAMANING YECHIMLARI HAQIDA

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Annotatsiya: Ushbu maqolada bo'lakli doimiy argumentli diffuziya teng-lamasi o'rganildi. Qaralayotgan differensial tenglamalarning yechimini mavjudlik shartlari va topish masalasi keltiriladi.

Kalit so'zlar: differentsial tenglama, bo'lakli doimiy argumentli, davriy yechim, metod, xususiyl hosila, uzluksiz, Fur'e qatori.

Annotation: In this paper, the diffusion equation with a constant argument is studied. The conditions of existence and the problem of finding the solution of the differential equations under consideration are given.

Key words: differential equation, partial constant argument, periodic solution, method, special product, continuous, Fourier series.

Bo'lakli o'zgarmas argumentli differensial tenglamalar gibrid tizimli modellashtirish masalalarida, biologik tizimlarni o'rganishda paydo bo'ladi [1-4].

Bo'lakli o'zgarmas argumentli xususiyl hosilali differensial tenglamalarga keluvchi amaliyl masallar [5, 6] ishlarda keltirib o'tilgan.

Ushbu maqolada, biz bo'lakli konstanta argumentli differentsial tenglamaning N – davriy yechimini topish metodini keltiramiz

$$u_t'(x, t) = a^2 u_{xx}''(x, t) + bu(x, [t]), 0 < x < 1, t > 0, \quad (1)$$

$$u(0; t) = u(1; t) = 0, \quad (2)$$

$$u(x; 0) = v(x) = 0, \quad (3)$$

bu yerda $v(x)$ funksiya $[0, 1]$ intervalda uzluksiz.

(1-3) tenglama yechimining ta'rifini keltiramiz.

Ta'rif. Agar $u(x, t)$ funksiya quyidagi shartlarni qanoatlantirsa, unga (1-3) masalaning yechimi deyiladi,:

(i) $u(x, t)$ funksiya Ω to'plamda uzluksiz, $\Omega = [0, 1] \times R_+, R_+ = [0, \infty)$;

(ii) u_t' va u_{xx}'' xususiy hosilalar $(x;[t]) \in \Omega$ nuqtalardan tashqari Ω to'plamda mavjud va uzluksiz, hamda $(x;[t]) \in \Omega$ nuqtalarda esa faqat bir tomonlama hosilalar mavjud;

(iii) $u(x, t)$ funksiya $(x;[t]) \in \Omega$ nuqtalardan tashqari Ω da (1-3) tenglamalarni qanoatlantiradi.

(1) tenglama yechimini quyidagi formal qator ko'rinishda izlaymiz:

$$u(x, t) = \sum_{j=1}^{\infty} T_j(t) \sin j\pi x. \quad (4)$$

Bu yerda $T_j(t)$ funksiya ushbu

$$T_j'(t) + a^2 \pi^2 j^2 T_j(t) + b T_j([t]) = 0, \quad t > 0, \quad j = 1, 2, \dots. \quad (5)$$

$$v_j = T_j(0) \quad (6)$$

tenglamaning yechimi, $v_j - v(x)$ funksiya Fur'ye qatori koefitsientlari

$$v(x) = \sum_{j=1}^{\infty} v_j \sin j\pi x, \quad v_j = 2 \int_0^1 v(x) \sin j\pi x dx$$

Teorema 1. Agar (5-6) tenglama yechimga ega bo'lsa, (1-3) masala yagona yechimga ega va u (4) ko'rinishda aniqlanadi.

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