KASR TARTIBLI TENGLAMALARDA MANBA VA BOSHLANG'ICH FUNKSIYANI ANIQLASH BO'YICHA TESKARI MASALALAR.

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ANNOTATSIYA

Kasr tartibli tenglamalaring texnik, fizik va biologik jarayonlarga tadbiqi oshib borayotgani uchun matematiklar orasida kasr tartibli tenglamalarni o'rganishga bo'lgan qiziqishni oshirish.

Kasr tartibli tenglamalar uchun to'g'ri masalalardan tashqari teskari masalalarni o'rganish ham muhim ahamiyat kasb etadi

KEY WORDS: Difference, concept, consecutive,degree, derivative, differentiate, digit, equation, formula, integration, solution.

KIRISH

Kasr tartibli hosila va integral haqidagi dastlabki tushinchalar XVII asr oxirlarida olimlar tomonidan paydo bo'la boshlagan.Dastlabki tushinchalar Leybnits va Lopital tomonidan kiritila boshlangan bo'lsa,darajali funksiyalarning kasr tartibli hosilalarini hisoblashlar 1738-yil Eyler tomonidan kiritilgan.Kasr tartibli hosilalarini

$$\int f(t)t^{-x}dt$$

integral ko'rinishida hisolash P.S.Laplas tomonidan kiritilgan.

1867 yil A.K. Gryunvold va 1868 A.V.Letnikov kasr tartibli differensiallashni Rimanning oddiy hosilasini aniqlagandek aniqlash g'oyasini ilgari surdi,ya'ni

$$D^{\alpha} f = \lim_{h\to\infty} \frac{(\Delta_h^{\alpha} f)(x)}{h^{\alpha}}$$

Kasr tartibli hosila va integrallar yo'nalishi bo'yicha Riman-Luivill, Caputo, Gryunvold-Letnikov ,Erdelyi-Kober kasr tartibli hosilasi va integrali mavjud.

Kasrtartibli hisoblashlar bu kasrlar hisobini anglatmaydi, bu ixtiyoriy tartibli hosila va integrallar nazariyasi nomi bo'lib n-tartibli hosila va n-tartibli integral tushinchalarini birlashtiradi va umumlashtiradi.n- tartibli integral va n-tartibli hosilalar ketma-ketligini ko'rib chiqaylik.

$$....\int_{\alpha}^{t} d\tau_2 \int_{\alpha}^{\tau_2} f(\tau_1)d\tau_1, f(t), \frac{df(t)}{dt}, \frac{d^2 f(t)}{dt^2}, ...$$

Biz bu ketma –ketlikni nomlashda devis tomonidan kiritilgan belgidan foydalanamiz.

$${}_{\alpha}D_t^{\alpha} f(t)$$

Bu qisqacha kasr tartibli hosilalar deb ataladi.

Ushbu tezisda kasr tartibli xususiy hosilali differensial tenglamaning o'ng tomonini topish bo'yicha teskari masala o'rganilgan.

Quyidagi masalani qaraylik,

$$D_t^{\rho} u(x,t) - a^2 u_{xx}(x,t) = f(x), \qquad 0 < t \le T; \qquad (1)$$

$$u(x,+0) = \varphi(x), \qquad 0 < x < l, \qquad (2)$$

$$u(0,t) = 0, \qquad 0 < t \le T, \qquad (3)$$

$$u(l,t) = 0, \qquad 0 < t \le T, \qquad (4)$$

bu yerda $\varphi(x)$ berilgan funksiyalar, α – o'zgarmas son, ξ –fiksirlangan nuqta, D_t^{ρ} – Caputo ma'nosidagi ρ, $0 < \rho < 1$ [1] tartibli kasr tartibli hosila belgilangan.

Faraz qilaylik (1) – (4) masalada $u(x,t)$ funksiyadan tashqari $f(x)$ funksiya ham noma'lum bo'lsin. Bu masalani yechish uchun bizga qo'shimcha shart kerak boladi. Biz qo'shimcha shart sifatida quyidagi shartni olamiz:

$$u(x,\tau) = \psi(x), \quad 0 < \tau < T. \qquad (5)$$

Ushbu (1) – (5) masalada $u(x,t)$ va $f(x)$ funksiyalarni topish masalasiga tenglamaning o'ng tomonini topish bo'yicha *teskari masala* deb ataladi.

Ushbu maqolada (1) – (5) masalaning yechimi mavjud va yagonaligi isbotlangan.

XULOSA

So'nggi yillarda ko'pgina hayotiy jarayonlarning matematik modelini tuzib, uni matematik usullar bilan yechish matematiklar ichida keng tarqaldi. Bu jarayonlar meditsina va texnikalar rivojlanishi bilan uzviy bo'g'liqdir. Bizda savol tug'ilishi mumkin,kasr tartibli tenglamalarni yechish bizga qaysi sohalarda kerak bo'ladi degan? Kasr tartibli tenglamalar neyro fizikada, modellashtirishda, kimyo, fizika fanlarining ba'zi sohalarida qo'llaniladi.

Masalan, so'nggi 2 yilda global muammoga aylangan koronavirus pandemiyasini tarqalish tezligini modellashtirish va uni hisoblashda kasr tartibli tenglamalardan foydalangan holda aniqlasak bo'ladi.

References

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