

Samarqand davlat universitetning Kattaqo'rg'on filiali Aniq va tabiiy fanlar fakulteti bahorgi semestr Matematika ta'lim yo'nalishi: 4-kurs talabalariga «Matematik fizikaganning tanlangan boblari» fanidan yakuniy nazorat savollari

Imtihon shakli: yozma

No	Mavzu	1-QISM “NAZARIY SAVOLLAR 1” deb nomlanadi va semestrda o'qitilishi rejalashtirilgan mavzularning kirish va 1-reja qismidan asosan nazariy savollardan iborat bo'ladi (tayanch iborasi bo'ladi).	2-QISM “NAZARIY SAVOLLAR 2” deb nomlanadi va semestrda o'qitilishi rejalashtirilgan mavzularning 2-rejasidan asosan mulohazaviy savollardan iborat bo'ladi (tayanch iborasi bo'ladi).	3-QISM “AMALIY SAVOLLAR 1” deb nomlanadi va semestrda o'qitilishi rejalashtirilgan mavzularning asosan misol, masala kabi savollardan iborat bo'ladi (tayanch iborasi bo'lmaydi).	4-QISM “AMALIY SAVOLLAR 2” deb nomlanadi va semestrda o'qitilishi rejalashtirilgan mavzularning misol hamda masala kabi savollardan iborat bo'ladi (tayanch iborasi bo'lmaydi).	5-qism “AMALIY SAVOLLAR 3” deb nomlanadi va semestrda o'qitilishi rejalashtirilgan mavzularning misol masalalardan iborat bo'ladi (tayanch iborasi bo'lmaydi).
1.	Matematik fizikaning korrekt qo'yilgan masalalari (Chegaraviy masalalar, Koshi masalasi, korrekt masala, korrektlik shartlar)	Giperbolik turdagi tenglamalar uchun qoyiladigan korrekt masalalar	Tor tebranish tenglamasi uchun Dirixle masalasi	Берилган масаланинг ҳос қийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = a^2 u_{xx} - 2021\beta u, \\ t > 0, 0 < x < l \\ u_x(0, t) = u_x(l, t) = 0, \\ u(x, 0) = \sin \frac{\pi x}{l} \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, 0 < x < l, t \in (0, T) \\ u(0, t) = T, u(l, t) = U, u(x, 0) = 0 \end{cases}$	Koshi masalasini yeching. $\begin{aligned} \Delta u(x, y, z) &= 0 \\ u(x, y, 0) &= x^2 + y^2, \\ u_z(x, y, 0) &= 8x^2 - 6y^2 \end{aligned}$

		Elliptik turdagi tenglamalar uchun qoyiladigan korrekt masalalar	Laplas tenglamasi uchun Dirixle masalasining korrektiligi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $u_t = 625u_{xx}$, $u_x(0, t) = u(l, t) = 0$, $u(x, 0) = 306x$	Retrospektiv masalani yeching $\begin{cases} u_t = -25u_{xx}, t \in (0, T), 0 < x < l \\ u(0, t) = 0, u(l, t) = 0, u(x, 0) = e^{-nx} \end{cases}$	Koshi masalasini yeching. $\Delta u(x, y, z) = 0$ $u(x, y, 0) = 3x^2 + y$, $u_z(x, y, 0) = 5 - xy^2$
2.	Tor tebranish tenglamasi uchun birinchi boshlang'ich-chegaraviy masala yechimining turg'unligi (Birinchi boshlang'ich-chegaraviy masala, yechimning boshlang'ich shartlarga uzluksiz bog'liqligi)	Tor tebranish tenglamasi uchun birjinsli chegaraviy shartli birinchi boshlang'ich-chegaraviy masala yechimining turg'unligi	Tor tebranish tenglamasi uchun Koshi masalasi yechimining mavjudligi	Штурм –Лиувилл масаласини ечинг: $X''(x) + \lambda^2 X(x) = 0$, $0 < x < l$ $X(0) = X(l) = 0$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, t \in (0, T), 0 < x < l \\ u_x(0, t) = T, u(l, t) = U, u(x, 0) = 0 \end{cases}$	Koshi masalasini yeching. $\Delta u(x, y, z) = 0$ $u(x, y, 0) = x^3 + 2$, $u_z(x, y, 0) = 2x^2 - y$
		Tor tebranish tenglamasi uchun birjinsli bo'lmagan chegaraviy shartli birinchi boshlang'ich-chegaraviy masala yechimining turg'unligi	Tor tebranish tenglamasi uchun Koshi masalasi yechimining turg'unligi	Штурм –Лиувилл масаласини ечинг: $X''(x) + \lambda^2 X(x) = 0$, $0 < x < l$ $X'(0) = X(l) = 0$	Retrospektiv masalani yeching $\begin{cases} u_t = -81u_{xx}, t \in (0, T), 0 < x < l \\ u(0, t) = T, u_x(l, t) = U, u(x, 0) = 0 \end{cases}$	Koshi masalasini yeching. $\Delta u(x, y, z) = 0$ $u(x, y, 0) = x^2 - 2y$, $u_z(x, y, 0) = 2xy^2$
3.	Parabolik tipdagi tenglamalar uchun korrekt qo'yilgan masalalar.(Koshi masalasi, aralash masalalar, yechimning boshlang'ich shartlarga uzluksiz bog'liqligi)	Parabolik turdagi tenglamalar uchun qoyiladigan korrekt masalalar	Parabolik turdagi tenglamalar uchun Koshi masalasining mavjudligi	Штурм –Лиувилл масаласини ечинг: $X''(x) + \lambda^2 X(x) = 0$, $0 < x < l$ $X(0) = X'(l) = 0$	Retrospektiv masalani yeching $\begin{cases} u_t = -100u_{xx}, t \in (0, T), 0 < x < l \\ u_x(0, t) = T, u_x(l, t) = U, u(x, 0) = 0 \end{cases}$	Usbu Koshi masalasini yeching. $u_{xx} - 6u_{xy} + 5u_{yy} = 0$, $u(x, y) _{y=x} = \sin x$, $u_y(x, y) _{y=x} = \cos x$.
		Parabolik turdagi tenglamalar uchun maksimal qiymat prinsipi	Parabolik turdagi tenglamalar uchun Koshi masalasining yagonaligi	Штурм –Лиувилл масаласини ечинг: $X''(x) + \lambda^2 X(x) = 0$, $0 < x < l$ $X'(0) = X'(l) = 0$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, t > 0, 0 < x < l \\ u(0, t) = 0, u(l, t) = 0, \\ u(x, 0) = \sin \frac{5\pi}{l} x \end{cases}$	Usbu Koshi masalasini yeching. $3u_{xx} - 5u_{xy} + 2u_{yy} = 0$, $u(x, y) _{y=x} = \frac{x}{1+x^2}$, $u_y(x, y) _{y=x} = \sin x$.

4.	Parabolik tenglamalar uchun Koshi masalasi va birinchi boshlang'ich-chegaraviy masala yechimining turg'unligi (birinchi boshlang'ich-chegaraviy masala, turg'unlik shartlari)	Parabolik tenglamalar uchun Koshi masalasining turg'unligi	Parabolik tenglamalar uchun birinchi boshlang'ich-chegaraviy masala yechimining mavjudligi	Штурм –Лиувилл масаласини ечинг: $X''(x) + \lambda^2 X(x) = 0,$ $0 < x < l$ $X(0) = X'(l) + hX(l) = 0$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx} + x e^t, & t \in (0, T), \\ 0 < x < l \\ u(0, t) = 0, u(l, t) = 0, \\ u(x, 0) = 0 \end{cases}$	Usbu Koshi masalasini yeching. $u_{xx} + 2 \cos x u_{xy} - \sin^2 x u_{yy} + u_x + (1 + \cos x - \sin x) u_y = 0,$ $u(x, y) _{y=\sin x} = \cos x,$ $u_y(x, y) _{y=\sin x} = \sin x.$
		Parabolik tenglamalar uchun birinchi boshlang'ich-chegaraviy masala yechimining turg'unligi	Issiqlik tarqalish tenglamasining fundamental yechimi	Штурм –Лиувилл масаласини ечинг: $X''(x) + \lambda^2 X(x) = 0,$ $0 < x < l$ $X'(0) - hX(l) = X'(l) = 0$	Retrospektiv masalani yeching $\begin{cases} u_t = -u_{xx} + x \sin t, & t \in (0, T), \\ 0 < x < l \\ u(0, t) = 0, u(l, t) = 0, \\ u(x, 0) = 0 \end{cases}$	Usbu Koshi masalasini yeching. $u_{xx} + 2 \sin x u_{xy} - \cos^2 x u_{yy} + u_x + (\sin x + \cos x + 1) u_y = 0,$ $u(x, y) _{y=-\cos x} = 1 + 2 \sin x,$ $u_y(x, y) _{y=-\cos x} = \sin x.$
5.	Teskari va nokorrekt masalalarni o'rganishdagi ayrim zaruriy tushunchalar. (teskari masala, nokorrekt masala, chiziqli fazo, Evklid fazosi, norma tushunchasi)	Teskari masalalar, nokorrekt masalalar, chiziqli fazo.	Skalyar ko'paytma va metrika tushunchasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = 81 u_{xx}, \\ t > 0, 0 < x < l \\ u(0, t) = T, u_x(l, t) = U, \\ u(x, 0) = 9 \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx} + x e^{2t}, & t \in (0, T), \\ 0 < x < l \\ u_x(0, t) = 0, u(l, t) = 0, u(x, 0) = 0 \end{cases}$	Usbu Koshi masalasini yeching. $u_{xx} - 2 \sin x u_{xy} - (3 + \cos^2 x) u_{yy} + u_x + (2 - \sin x - \cos x) u_y = 0,$ $u(x, y) _{y=\cos x} = 0,$ $u_y(x, y) _{y=\cos x} = e^{-\frac{x}{2}} \cos x.$
		Evklid fazosi. Norma tushunchasi	Operator va funksional tusunchasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = a^2 u_{xx} + x e^{2t}, \\ t > 0, 0 < x < l \\ u_x(0, t) = 0, u(l, t) = 0, \\ u(x, 0) = x \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -81 u_{xx} + x \cos t, & t \in (0, T), \\ 0 < x < l \\ u(0, t) = 0, u_x(l, t) = 0, \\ u(x, 0) = 0 \end{cases}$	Koshi masalani yeching $\Delta u = u_{xx} + u_{yy} = 0, \quad y > 0$ $u(x, 0) = 0,$ $u_y(x, 0) = e^{-\sqrt{n}} \cos nx,$ $n > 0, \quad x \in R$

6.	Chiziqli operatorlar. Topologik fazolar. Gilbert va Banax fazolariga misollar (Operator tushunchasi, norma, norma kiritish)	Chiziqli operatorlar. Topologik fazolar.	Gilbert va Banax fazolari	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = a^2 u_{xx} - \beta u, \\ t > 0, 0 < x < l \\ u(0, t) = u_x(l, t) = 0, \\ u(x, 0) = \sin \frac{\pi x}{l} \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -100u_{xx} + Axt, \\ t \in (0, T), 0 < x < l \\ u_x(0, t) = 0, u_x(l, t) = 0, \\ u(x, 0) = 0 \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u &= u_{xx} + u_{yy} = 0, \quad y > 0 \\ u(x, 0) &= 0, \\ u_y(x, 0) &= e^{-\sqrt{n}} \sin nx, \\ n > 0, \quad x \in R \end{aligned}$
		Gilbert va Banax fazolariga misollar	Skalyar ko'paytma, norma va metrika.	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = a^2 u_{xx} - \beta u, \quad t > 0, \\ 0 < x < l \\ u_x(0, t) = u_x(l, t) = 0, \\ u(x, 0) = \varphi(x), \\ \varphi(x) = x^2 \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx} + xt^2, \\ t \in (0, T), 0 < x < l \\ u(0, t) = 0, u(l, t) = 0, \\ u(x, 0) = 0 \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u &= u_{xx} + u_{yy} = 0, \quad y > 0 \\ u(x, 0) &= 0, \\ u_y(x, 0) &= \frac{2e^{-\sqrt{n}}}{n} \sin nx, \\ n > 0, \quad x \in R \end{aligned}$
7.	Korrekt va nokorrekt masalalar. Adamar ma'nosida korrektlik. Shartli korrektlik. (nokorrekt masala tushunchasi, Adamar ma'nosida korrektlik, shartli korrekt masalalar)	Korrekt va nokorrekt masalalar.	Nokorrekt masalalarga misollar	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = a^2 u_{xx} - \beta u, \\ t > 0, 0 < x < l \\ u_x(0, t) - hu(0, t) = u_x(l, t) = 0, \\ u(x, 0) = U, \quad h > 0 \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx} + xe^{6t}, \\ t \in (0, T), 0 < x < l \\ u_x(0, t) = u_x(l, t) = 0, \\ u(x, 0) = 0 \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u &= u_{xx} + u_{yy} = 0, \\ y > 0 \\ u(x, 0) &= 0, \\ u_y(x, 0) &= \frac{4e^{-\sqrt{n}}}{n} \cos nx, \\ n > 0, \quad x \in R \\ xu_x + 2yu_y &= x^2 y + u \end{aligned}$
		Adamar ma'nosida korrektlik. Shartli korrektlik.	Ivanov teoremasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{aligned} u_t &= a^2 u_{xx} - u, \\ u(0, t) &= u(l, t) = 0, \\ u(x, 0) &= \phi(x) \end{aligned}$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, \quad t \in (0, T), 0 < x < l \\ u(0, t) = u(l, t) = 0, u(x, 0) = \varphi(x) \end{cases}$	Коши масасласини ечинг $\begin{aligned} \Delta u(x, y) &= 0 \\ u(x, 0) &= 0 \\ u_y(x, 0) &= \frac{1}{n} \sin nx \\ u(0, y) &= u(\pi, y) = 0 \end{aligned}$

8.	A.N. Tixonov bo'yicha regularizatsiya usuli, taqribiy yechimni qurish)	A.N. Tixonov bo'yicha regularizatsiyala sh.	Kvaziyechim tushunchasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $u_t = a^2 u_{xx} + f(x),$ $u_x(0, t) = u(l, t) = \alpha,$ $u(x, 0) = \phi(x)$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, & t \in (0, T), \\ 0 < x < l \\ u(0, t) = u(l, t) = 0, \\ u(x, 0) = \frac{1}{n^2} \sin \frac{\pi n x}{l} \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u(x, y) &= 0 \\ u(x, 0) &= e^{-\sqrt{n}} e^{inx} \\ u_y(x, 0) &= 0 \\ u(0, y) &= u(\pi, y) = 0 \end{aligned}$
		Tixonov bo'yicha korrektlik. Taqribiy yechimni qurish	Tixonov teoremasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $u_t = 400 u_{xx},$ $u(0, t) = u_x(l, t) = 0,$ $u(x, 0) = 404$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, & t \in (0, T), 0 < x < l \\ u_x(0, t) = u_x(l, t) = 0, u(x, 0) = \varphi(x), \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u &= u_{xx} + u_{yy} = 0, \quad y > 0 \\ u(x, 0) &= 0, \\ u_y(x, 0) &= \frac{e^{-\sqrt{n}}}{n} \cos nx, \\ n > 0, \quad x \in R \end{aligned}$
9.	Issiqlik tarqalish tenglamasi uchun teskari vaqtli teskari masala (retrospektiv masala, teskari vaqtli teskari masala, maslarning nokorrektligi)	Issiqlik tarqalish tenglamasi uchun teskari vaqtli teskari masala	Sterjenda issiqlik tarqalish tenglamasi uchun Koshi masalasining turg'unligi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $u_t = u_{xx},$ $u_x(0, t) = u_x(l, t) = 0,$ $u(x, 0) = 407x$	Retrospektiv masalani yeching $\begin{cases} u_t = -a^2 u_{xx}, \\ t \in (0, T), 0 < x < l \\ u_x(0, t) - hu(0, t) = u_x(l, t) = 0, \\ u(x, 0) = U, \quad h > 0 \end{cases}$	$\begin{aligned} \Delta u &= u_{xx} + u_{yy} = 0, \\ y > 0 \\ u(x, 0) &= 0, \\ u_y(x, 0) &= e^{-\sqrt{k}} \cos kx, \\ k > 0, \quad x \in R \end{aligned}$
		Retrospektiv masalalar, teskari vaqtli teskari masala, maslarning nokorrektligi	Xususiylas hosilali birinchi tartibli tenglamalar uchun teskari masalalar	Koshi masalani yeching $u_t = 16u_{xx}, \quad u(x, t) _{t=0} = 8$	Retrospektiv masalani yeching $\begin{cases} u_t = -36u_{xx}, & t \in (0, T), 0 < x < l \\ u(0, t) = \alpha, u(l, t) = \beta, u(x, 0) = 0 \end{cases}$	Коши масаласини ечинг $\begin{aligned} \Delta u &= u_{xx} + u_{yy} = 0, \quad y > 0 \\ u(x, 0) &= 0, \\ u_y(x, 0) &= \frac{e^{-\sqrt{n}}}{n} \sin nx, \\ n > 0, \quad x \in R \end{aligned}$
10.	Matematik fizikaning asosiy nokorrekt masalalari. Adamar misoli. (Laplas tenglamasi, Koshi masalasi, Adamar misoli)	Matematik fizikaning asosiy nokorrekt masalalari.	Laplas tenglamasi uchun Neyman masalasining yagonaligi	Koshi masalani yeching $u_t = u_{xx} + 3t^2,$ $u(x, t) _{t=0} = x^2$	Retrospektiv masalani yeching: $\begin{cases} u_t = -121u_{xx}, & t \in (0, T), 0 < x < l \\ u_x(0, t) = T, u_x(l, t) = U, u(x, 0) = 0 \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u(x, y, z) &= 0 \\ u(x, y, 0) &= xy + x^2, \\ u_z(x, y, 0) &= e^x + y \end{aligned}$
		Laplas tenglamasi uchun Koshi	Laplas tenglamasi uchun	Koshi masalani yeching $u_t = u_{xx}, \quad u(x, t) _{t=0} = e^{-x^2}$	Retrospektiv masalani yeching:	Koshi masalani yeching

		masalasi, Adamar misoli	qo'yilgan korrekt masalalar		$\begin{cases} u_t = -144u_{xx}, & t \in (0, T), & 0 < x < l \\ u_x(o, t) = \alpha, & u(l, t) = \beta, & u(x, o) = 0 \end{cases}$	$\begin{aligned} \Delta u(x, y, z) &= 0 \\ u(x, y, 0) &= x^3 + 2, \\ u_z(x, y, 0) &= 2x^2 - y \end{aligned}$
11.	Differensiallash masalasining nokorrektligi (Differensiallash, masalasining nokorrektligi)	Differensiallash masalasining nokorrektligi	Tixonov ma'nosida korrektlik	Koshi masalani yeching $u_t = u_{xx}, \quad u(x, t) _{t=0} = chx$	Retrospektiv masalani yeching: $\begin{cases} u_t = -a^2 u_{xx}, & t \in (0, T), & 0 < x < l \\ u(o, t) = 0, & u_x(l, t) = 0, \\ u(x, o) = \sin \frac{5\pi}{2l} x \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u(x, y, z) &= 0 \\ u(x, y, 0) &= x + 2y, \\ u_z(x, y, 0) &= 2x - y^2 \end{aligned}$
12.	Xususiy hosilali birinchi tartibli tenglamalar uchun teskari masalalar (teskari masala, to'g'ri masala, teskari masalani to'g'ri masalaga keltirish)	Xususiy hosilali birinchi tartibli tenglamalar uchun teskari masalalar	Regulyarizatsi yalashgan oila tushunchasi	Koshi masalani yeching $u_t = u_{xx}, \quad u(x, t) _{t=0} = shx$	Retrospektiv masalani yeching: $\begin{cases} u_t = -a^2 u_{xx}, & t > 0, & 0 < x < l \\ u(o, t) = 0, & u_x(l, t) = 0, \\ u(x, o) = \sin \frac{7\pi}{2l} x \end{cases}$	Koshi masalani yeching $\begin{aligned} \Delta u(x, y, z) &= 0 \\ u(x, y, 0) &= x^2 - 2y, \\ u_z(x, y, 0) &= 2xy^2 \end{aligned}$
		Teskari masala, to'g'ri masala, teskari masalani to'g'ri masalaga keltirish	Karleman lemmasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{cases} u_t = a^2 u_{xx} - 2021\beta u, \\ t > 0, & 0 < x < l \\ u_x(o, t) = u_x(l, t) = 0, \\ u(x, o) = \sin \frac{\pi x}{l} \end{cases}$	Retrospektiv masalani yeching $\begin{cases} u_t = -u_{xx} + 9x \sin t, \\ t \in (0, T), & 0 < x < l \\ u(o, t) = 0, u(l, t) = 0, \\ u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $\begin{aligned} U_{tt} &= 9U_{xx}, \\ U(x, 0) &= \cos 3x, \\ U_t(x, 0) &= \sin 2x. \end{aligned}$
13.	Fredgolm birinchi tur intrgral tenglamasi yechimining nokorrektligi (Integral tenglamalar, yechimining nokorrektligi, korrektlik shartlarni keltirib chiqorish)	Fredgolm birinchi tur intrgral tenglamasi yechimining nokorrektligi	Karleman funksiyasi	Берилган масаланинг ҳос кийматлари ва ҳос функцияларини топинг. $\begin{aligned} u_t &= 625u_{xx}, \\ u_x(o, t) &= u(l, t) = 0, \\ u(x, 0) &= 306x \end{aligned}$	Retrospektiv masalani yeching: $\begin{cases} u_t = -a^2 u_{xx} + xe^{2t}, \\ t \in (0, T), & 0 < x < l \\ u_x(o, t) = 0, u(l, t) = 0, \\ u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $\begin{aligned} U_{tt} &= 9U_{xx}, \\ U(x, 0) &= e^x, \\ U_t(x, 0) &= \cos 2x. \end{aligned}$
		Integral tenglamalar, yechimining nokorrektligi, korrektlik	Analitik davom ettirish masalasi va uning regulyarizatsiy asi	Koshi masalasini yeching. $\begin{aligned} xu_x + yu_y + xyu_z &= 0, \\ u(x, y, 0) &= x^2 + y^2 \end{aligned}$	Retrospektiv masalani yeching: $\begin{cases} u_t = -u_{xx} + xe^t, & t \in (0, T), & 0 < x < l \\ u(o, t) = 0, & u_x(l, t) = 0, & u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $\begin{aligned} U_{tt} &= 4U_{xx} + t, \\ U(x, 0) &= \sin 2x, \quad U_t(x, 0) = 0. \end{aligned}$

		shartlarni keltirib chiqorish				
14.	Shartli korrekt masala yechimining turg'unligini baholash. Taqribiy yechimni oddiy tanlash orqali topish (Shartli korrekt masala, Taqribiy yechim, oddiy tanlash usuli)	Shartli korrekt masala yechimining turg'unligini baholash.	Adamar ma'nosida korrektlik	Koshi masalasini yeching. $xu_x - 2yu_y = x^2 + y^2$, $u(x,1) = x^2$	Retrospektiv masalani yeching: $\begin{cases} u_t = -u_{xx} + 2024xt, \\ t \in (0, T), 0 < x < l \\ u_x(o, t) = 0, u_x(l, t) = 0, \\ u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $U_{tt} = 4U_{xx} + x$ $U(x,0) = x^2, U_t(x, 0) = 0.$
		Taqribiy yechimni oddiy tanlash orqali topish	Tixonov ma'nosida korrektlik	Koshi masalasini yeching. $y^2u_x + xyu_y = x$, $u(0, y) = y^2$	Retrospektiv masalani yeching: $\begin{cases} u_t = -a^2u_{xx} + xt^2, t \in (0, T), \\ 0 < x < l \\ u_x(o, t) = 0, u(l, t) = 0, \\ u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $U_{tt} = 4U_{xx} + tx$ $U(x,0) = x, U_t(x, 0) = 0.$
15.	Garmonik o'lchov va uning tadbiqi (potensial, vazn funksiyasi, garmonik o'lchov)	Garmonik o'lchov va uning tadbiqi	Potensiallar nazariyasi, vazn funksiyasi	Koshi masalasini yeching. $xu_x - 2yu_y = x^2 + y^2$, $u(x,1) = x^2$	Retrospektiv masalani yeching: $\begin{cases} u_t = -144u_{xx} + xe^{9t}, \\ t \in (0, T), 0 < x < l \\ u_x(o, t) = u_x(l, t) = 0, \\ u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $U_{tt} = 4U_{xx} + \sin x$ $U(x,0) = 0, U_t(x, 0) = e^x$
16.	Analitik davom ettirish masalasi va uning regularizatsiyasi (Analitik davom, regularizatsiya, regularizatsiya parametri)	Analitik davom ettirish masalasi va uning regularizatsiyasi	Regularizatsiya yalashgan yechimni qurish	Koshi masalasini yeching. $xu_x + yu_y = u - xy$, $u(x,1) = y^2 + 1$	Retrospektiv masalani yeching: $\begin{cases} u_t = -a^2u_{xx} + x, t \in (0, T), 0 < x < l \\ u(o, t) = \alpha, u(l, t) = \beta, u(x, o) = 0 \end{cases}$	Koshi masalasini yeching: $U_{tt} = 2U_{xx} + xt^2, U(x,0) = 0, U_t(x, 0) = x$