O'ZBEKISTON RESPUBLIKASI AXBOROT TEXNOLOGIYALARI VA KOMMUNIKATSIYALARINI RIVOJLANTIRISH VAZIRLIGI

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C++ DA DASTURLASH FANIDAN

Kurs ishi

Mavzu: Transport masalasining boshlang'ich bazis rejasini topish usullari

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MUNDARIJA

I. **KIRISH**

Keyingi yillarda amaliy dasturchilarga juda ko'p integratsion dastur muhitlari taklif etilyapti.Bu muhitlar u yoki bu imkoniyatlari bilan bir-biridan farqlanadi.

Aksariyat dasturlashtirish muhitlarining fundamental asosi c++ tiliga borib taqaladi. C++ tili B.Straustrup tomonidan yaratilgan.

C++ standarti ayni vaqtda ISO-International

Standards Organizatsion (Standartlash bo'yicha xalqaro tashkilot)standarti deb ham nomlanadi.

Vaqt o'tishi bilan dasturchilar oldiga qo'yilgan masalalar o'zgarib boryapti. Bundan yigirma yil oldin dasturlar kata hajmdagi ma'lumotlarni qayta ishlash uchun tuzilar edi. Bunda dasturni yozuvchi ham foydalanuvchisi ham kompyuter sohasi bo'yicha talab etilardi. Hozirda esa ko'pgina o'zgarishlar ro'y berdi. Kompyuter odamlar tomonidan uni chuqur o'rganish vositasi emas, ko'proq o'zlarining oldilariga qo'yilgan,o'zlarining ishlariga tegishli bo'lgan muammolarni yechish vositasi bo'lib qoldi.

Axborot texnologiyalarining takomillashtirilishi jamiyatni axborottirishda muhim omil hisoblnadi. Ma'lumki, axborot texnologiyalari informatika qonun – qoidalari asosida takomillashtiriladi.

Texnologiya so'zi grekchadan tarjima qilinganda san'at, ustalik, malaka ma'nosini anglatadi. Texnikada texnologiya deganda ma'lum kerakli material mahsulotni hosil qilish uchun usullar, metodlar va vositalar yig'indisidan foydalanadigan jarayon tushuniladi.

Texnologiyani quyidagicha ta'riflash mumkin. Texnologiya – bu sun'iy obyektlarni yaratishga yo'naltirilgan jarayonlarni boshqarishdir. Kerakli jarayonlarni kerakli yo'nalishda borishini ta'minlash uchun yaratilgan shart-sharoitlar qanchalik yaxshi tashkil etilganligi texnologiyaning samaradorligini bildiradi. Bu yerda tabiiy jarayonlar nafaqat moddaning tarkibi, tuzilishi va

shaklini o'zgartirish maqsadida, balki axborotni qayta ishlash va yangi axborot hosil qilish maqsadida ham boshqariladi. Shuning uchun axborot texnologiyasini quyidagicha ta'riflash mumkin.

Axborot texnologiyasi – bu axboriy ma'lumotni bir ko'rinishdan ikkinchi, sifat jihatidan yangi ko'rinishga keltirish, axborotni yig'ish, qayta ishlash va uzatishning usul va vositalari majmuasidan foydalanish jarayonidir.

Katta xajmdagi ma'lumotlar bazasi va axborotlar ustida ishlashga to'g'ri kelyapti. Jamiyat taraqqiyotida yuz berayotgan jadal o'zgarishlar uning bir qismi bo'lgan informatika soxasiga xam o'z ta'sirini ko'rsatmoqda. Bu ta'sir shunchalik kuchliki, axborot texnologiyalarida bo'layotgan o'zgarishlar yillar ichida emas, balki oylar ichida o'zgarib va boyib bormoqda. Axborot texnologiyalarida juda katta yutuq va o'zgarishlar amalga oshdi. Yangi axborot texnologiyalarining yoki kompyuter texnologiyalarining paydo bo'lishi bu soxadagi xizmat qilish uslubini tubdan o'zgartirdi. Tasavvur qilib ko'ring, yaqin-yaqinlargacha biror maslani kompyuterda yechish uchun algoritmlarni, dasturlash tillaridan birini, dasturni kompyuter xotirasiga kiritishni, uning xatolariyu natijani taxlil qilishni talab qilar edi. Bu ishni faqat mutaxassislargina amalga oshirar edilar. Ammo bu soxada mutaxassis bo'lmagan foydalanuvchilar sonining kundan-kunga ko'payishi jamiyat oldida ma'lum qiyinchiliklarni tug'dirdi

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2.1 MASALANI QO'YILISHI

Transport masalasining boshlang'ich bazis rejasini topish usullari

Boshqa chiziqli dasturlash masalalari singari transport masalasini yechish jarayoni boshlang'ich bazis rejani topishdan boshlanadi. Transport masalasining bazis rejasini topish usullari ko'p bo'lib, quyida biz "shimoliy-g'arb burchak" usuli va "minimal harajatlar" usuli bilan tanishamiz.

1. Shimoliy-g'arb burchak usuli. Faraz qilaylik, transport masalasining shartlari quyidagi jadvalga joylashtirilgan bo'lsin.

ai	bj	$b2$		^{v}n
a_j	^{c}Jj	$^{c}J2$		^{c}Jn
$a2$	$^{c}2J$	$^{c}22$		$^{c}2n$
^{a}m	^{c}mj	$^{c}m2$		^{c}mn

Shimoliy-g'arb burchak usulining g'oyasi quyidagilardan iborat. Eng avval shimoliy-g'arbda joylashgan katakchadagi x_n noma'lumning qiymatini aniqlaymiz, $x_n=min\ (aj,bj)$. Agar $aj < b_j$ bo'lsa $x_{jj}=a_j$ va $x_{jj}=0$, $(j= 2,n)$, agar $b_j < a$^bo'lsa $x_{jj}=b_j$ va $x_{ij}=0$, $(i= 2,m)$ bo'ladi. Faraz qilaylik, birinchi hol bajarilsin. Bu holda 1- qadamdan so'ng masalaning yechimlaridan tashkil topgan matritsa quyidagi ko'rinishda bo'ladi.

1-qadam

$$\begin{array}{ccccc|c}
xjj-aj & 0 & 0 . & & .. 0 & 0 \\
^{x}2J & ^{x}22 & ^{x}23 & & ^{x}2n & a2 \\
^{x}mj & ^{x}m2 & ^{x}m3 & & ^{x}mn & ^{a}m \\
\hline
b_j\text{-}a_j & ^{v}2 & Б_3 . & & .. b_n
\end{array}$$

Endi ikkinchi qatordagi birinchi elementning qiymatini topamiz:
Agar $a_2>b_i\text{-}a_i$ bo'lsa, $x_{2i}=b_i\text{-}a_i$ va $x_{ii}=0$, $(i = 3,m)$,
Agar $a_2<b_j\text{-}a_j$ bo'lsa, $x_{2j}=a_2$ va $x_{2j}=0$, $(j = 2,n)$.

Faraz qilaylik, yangi matritsa uchun ham 1-hol bajarilsin, u holda 2-qadamdagi yechimlar matritsasi quyidagigacha bo'ladi.

$$\left|\begin{array}{cccccc}
x_{11}—a_1 & 0 & 0 \cdot & & \cdot 0 & 0 \\
x_{21}=b_1-a_1 & x_{22} & x_{23} \cdot & & & a_2-b_1+a_1 \\
0 & x_{32} & x_{33} \cdot & & & a_3 \\
0 & x_{m2} & x_{m3} & & x_{mn} & u_m \\
\hline
0 & b_2 & b_3 \cdot & & \cdot v_n &
\end{array}\right|$$

Xuddi shunday yo'l bilan davom etib, har bir qadamda birorta x_{ij} ning qiymati topiladi. $x_{ij}=min(a_i, b_j)$ va a_i yoki b_j nolga aylantiriladi.

Bu jarayon barcha a va b_j lar nolga aylanguncha takrorlanadi. Ma'lumki, har bir x_{ij} ning qiymati a_i va b_j laming turli kombinatsiyalarini ayirish yoki qo'shish yordami bilan topiladi, shuning uchun a_t va b_j lar butun bo'lganda topilgan bazis reja butun sonli bo'ladi. Bundan tashqari, yuqoridagi 2-teoremaga asosan bazis yechimdagi noldan farkli x_{ij} noma'lumlar soni $m+n-1$ dan oshmaydi.

Misol. quyidagi transport masalasining boshlang'ich bazis yechimini toping.

b_j / a_i	3	6	2	1
4	2	5	9	5
2	8	3	5	8
3	7	3	1	4
3	5	9	7	2

1-qadam.
$$x_{11}=min(4,3)=3\cdot$$
Shuning uchun $b_1=0$ *va* $a_1=4-3=1$, $x_{21}=x_{31}=x_{41}=0$

2- qadam.
$$x_{12}=min(1,6)$$
$=L$ *Bunda* $a_1=0$ *va* $b'_2=6-1=5$, $x_{13}=x_{14}=0\cdot$

3- qadam.
$$x_{22}=min(2,5)=2\cdot$$
Bunda $a_2=0$ *va* $b_2=5-2=3$, $x_{23}=x_{24}=0$.

4- qadam.
$$x_{32}=min(3,3)=3\cdot$$
Bunda $a''_2=b''_2=0$ *bo'ladi hamda* $x_{33}=x_{34}=0$, $x_{42}=0$.

5- *qadam.*

x₄₃=2, a '₄=3-2=1.

6-   qadam.

$$x_{44} = \min(1,1) = 1$$

Bunda *a $_4$=b 4=0* bo'ladi va masalani yechish jarayoni tugaydi. Topilgan boshlang'ich bazis yechim quyidagi ko'rinishda bo'ladi:

	3	6	2	1
4	2 3	5 1	9	5
2	8	3 2	5	8
3	7	3 3	1	4
3	5	9	7 2	2 1

Topilgan boshlang'ich bazis yechimdagi noldan farqli bo'lgan noma'lumlar soni 6 ta bo'lib, y *m+n-1=7* dan kichik. Agar masalaning bazis rejadagi noldan farqli bo'lgan xij noma'lumlar soni *m+n-1* dan kichik bo'lsa, bunday rejani xos reja deb ataymiz. Xos rejani to'g'rilash usullari bilan keyinroq tanishamiz.

II.   Minimal xarajatlar usuli. Transport masalasining optimal yechimini topish uchun kerak bo'ladigan iteratsiyalar soni boshlang'ich bazis yechimini tanlashga bog'liqdir. Optimal yechimga yaqin bo'lgan bazis yechimni topish masalaning optimal yechimini topishni tezlashtiradi. Yuqoridagi «shimoliy-g'arb burchak» usuli transport masalasining bazis yechimini ixtiyoriy ravishda, transport harajatlarini nazarga olmagan holda aniqlaydi. Bunday usul yordami bilan topilgan ko'pgina bazis yechim optimal yechim dan yiroq bo'lib, optimal yechimni topish uchun juda ko'p iteratsiyalarni bajarishga to'g'ri keladi.

Adabiyotda transport masalasining boshlang'ich bazis yechimini topish uchun transport xarajatlarini nazarga oluvchi ko'p usullar ma'lum(ustundagi minimal element usuli, minimal xarajatlar usuli, ikki tomonlama tanlash usuli va hokazolar).Ularning hammasi transport xarajatlarini nazarga oluvchi usullaridir.

Minimal xarajatlar usulining g'oyasi quyidagilardan iborat:

1. Transport masalasi xarajatlaridan tashkil topgan matritsa belgilab olinadi, ya'ni

$$c_{11} \ c_{12} \ 1 \ n$$

$$C=$$

$$c_{m1}\ c_{m2} \dots c_{mn}$$

Bu matritsaning minimal elementini topib belgilaymiz:

$$_{m} f\ ^{c}u = ^{c}_{,1J1}$$

U holda $x_{h\,J}$ quyidagicha aniqlanadi

$$\ddot{q}_{JJ}=\min(\hat{a}_{1}^{\,b}J1)^{y}$$

Bu erda ikki hol bo'lishi mumkin:

1) $a_{,}<^{b}{}_{h}$

$^{a}->^{b}{}_{h}$

Birinchi holda X_{HH} = a_i bo'lganda qatorning barcha $X_{H\,j}\ (J\wedge J_J)$ elementlari 0 ga teng, ya'ni

$$x,j = ^{0},\ ^{(}J\wedge JJ)$$

bo'ladi, bunday holda I_I qator o'chiriladi deb aytamiz. Ikkinchi holda $X_{K\,J} = B_H$ va J_J ustunning barcha $X_{LH}\ (I\wedge I_J)$ elementlari 0 ga teng, ya'ni

$$H = ^{0,\ (ы}1)$$

tenglik o'rinli bo'ladi, bunday holda J_J ustun o'chiriladi deb aytamiz.

2. Faraz qilaylik, C'matritsa C matritsaning I_J qatorini (1-hol) yoki J_J ustunini (2-hol) o'chirish natijasida hosil bo'lgan matritsa bo'lsin. Yangi matritsa uchun

$$(J)= \backslash^{b}i,^{j}\wedge^{j}1$$

$$K^{-x}i1\ h\,^{,j} =$$

$$h$$

bo'lsin.

Ma'lumki, C 'matritsadagi ustun va qatorlar soni C matritsanikidan bittaga kam bo'ladi. Ikkinchi qadamda yuqoridagi C matritsa uchun bajarilgan ishlar C'matritsa va $A_L\text{-}^{J)}, B_J\text{-}^{J)}$ miqdorlar uchun bajariladi. Natijada rej alar dan tashkil topgan $X=(XY)$ matritsaning yana bir qatori yoki ustuni to'ldiriladi. Bu jarayon C matritsaning hamma qator va ustunlari o'chirilguncha, ya'ni X matritsaning hamma qator va ustunlari to'ldirilguncha takrorlanadi.

M ta ishlab chiqaruvchi punktni n ta iste'mol qiluvchi punktga bog'lovchi transport masalasining boshlang'ich bazis rejasini topish uchun minimal xarajatlar usulida $N+M\text{-}J$ ta qadamdan iborat ishlarni bajarish kerak bo'ladi.

Misol. Berilgan transport masalasining bazis rejasini minimal xarajatlar usulidan foydalanib toping.

a_i \ b_j	5	9	9	7
11	7	8 3	5 1	3 7
11	2 5	4 6	5	9
8	6	3	1 8	2

2.2. Trasport masalasini optimal yechimini tavsifi

Transport masalasi chiziqli dasturlash masalalari ichida nazariy va amaliy nuqtai nazardan eng yaxshi o'zlashtirilgan masalalardan biri bo'lib, undan sanoat va qishloq xo'jalik mahsulotlarini tashishni optimal rejalashtirish ishlarida muvaffaqiyatli ravishda foydalanilmoqda. Transport masalasi maxsus chiziqli dasturlash masalalari sinfiga tegishli bo'lib, uning chegaralovchi shartlaridagi koeffitsientlardan tuzilgan (aij) matritsaning elementlari 0 va 1 raqamlardan iborat bo'ladi va har bir ustunda faqat ikkita elementan farqli, qolganlari esa 0 ga teng bo'ladi. Transport masalasini yechish uchun uning maxsus xususiyatlarini nazarga oluvchi usullar yaratilgan bo'lib, quyida biz ular bilan tanishamiz.

Potentsiallar usuli transport masalasini yechish uchun qo'llangan birinchi aniq usul bo'lib, u 1949 yilda rus olimlari L.V.Kantorovich va M.K.Gavurin tomonidan yaratilgan. Bu usulning asosiy g'oyasi transport masalasiga moslashtirilgan simpleks usuldan iborat bo'lib, birinchi marta chiziqli dasturlash masalalarini yechish usullariga bog'liq bo'lmagan holda tasvirlashgan. Keyinroq, xuddi shunga o'xshash usul Amerika olimi Dantsig tomonidan yaratildi. Dantsing usuli chiziqli dasturlashning asosiy g'oyalariga asoslangan bo'lib, Amerika adabiyotida bu usul modifitsirlangan

taqsimot usuli deb yuritiladi. Potentsiallar usuli yordamibilan boshlang'ich bazis rejadan boshlab, optimal yechimga yaqinroq bo'lganyangi bazis rejalarga o'tib borib, chekli sondagi iteratsiyadan so'ng masalaning optimal yechimi topiladi. Har bir iteratsiyada topilgan bazis reja optimal reja ekanini tekshirish uchun har bir ishlab chiqaruvchi (Ai)va iste'mol qiluvchi (Bj)punktga uning potentsiali deb ataluvchi ui va vj miqdor mos qo'yiladi. Bu potentsiallar shunday tanlanadiki, bunda o'zaro bog'langan

Ai va Bj punktlarga mos keluvchi potentsiallar yig'indisi cijga (Ai dan Bj ga birlik mahsulotni tashish uchun sarf qilinadigan transportxarajatiga) teng bo'lishi kerak.

Teorema: Agar X*=(xij*)reja transport masalasining optimal rejasi bo'lsa, u holda unga ui *+vj *=cij (xij*>0),   ui *+vj *≤cij   (xij*=0) shartlarni qanoatlantiruvchi n+m ta ui* va vj*potentsiallar mos kelishi zarur va yetarlidir.

Transport masalasini optimal echimini izlash. Potenciallar usuli.

Transport masalasini optimal echimini potenciallar usuli bilan izlash kuyidagi boskichlardan iborat:

1. Tayanch echim topiladi. Bunda tuldirilgan kataklar soni (Hij0 lar soni) n+m-1 ga aynan teng bulishi shart.

2. Junatuvchilar (ta'minotchilar) va iste'molchilarning potenciallari hisoblanadi.

3. Bush kataklar uchun psevdokiymatlar hisoblanadi. Agar hamma psevdokiymatlar nol yoki manfiy bulsa optimal echim topilgan hisoblanadi, aks holda navbatdagi echim izlanadi.

4. musbat psevdokiymat sonlari ichidan eng kattasi tanlanadi va bu katak (+) deb belgilanadi. Kayta taksimlash cikli kuriladi va yuklar cikl buyicha kayta taksimlanadi, natijada yangi echim hosil buladi. Yangi echim yana optimallik shartiga tekshiriladi, ya'ni 2 punktdan boshlab kaytariladi.

 Misol. Quyidagi transport masalasini optimal yechimi topilsin.

Jo'natish punktlari	Iste'molchilar				α_i
	B₁ 30	B₂ 30	B₃ 10	B₄ 20	
A₁ 50	1 **30**	2 - **20**	4 -4	1 + 3	$\alpha_1=0$
A₂ 30	2 0	3 + **10**	1 **10**	5 - **10**	$\alpha_2=-1$
A₃ 10	3 -2	2 0	4 -4	4 **10**	$\alpha_3=0$
β_j	$\beta_1=1$	$\beta_2=2$	$\beta_3=3$	$\beta_4=4$	

Yechish:

1. Shimoliy-garb usuli bilan tayanch yechimni topamiz.

Мисол. Қуйидаги транспорт масаласини оптимал ечими топилсин.

Жунатиш пунктлари	Истеъмолчилар				α_i Сатр потен-циали
	B₁ 30	B₂ 30	B₃ 10	B₄ 20	
A₁ 50	1 **30**	2 **20**	4	1	$\alpha_1=$
A₂ 30	2	3 **10**	1 **10**	5 **10**	$\alpha_2=$
A₃ 10	3	2	4	4 **10**	$\alpha_3=$
β_j устун потенциали	$\beta_1=$	$\beta_2=$	$\beta_3=$	$\beta_4=$	

Ечиш:

1. Шимолий-гарб усули билан таянч ечимни топамиз.
2. Нолдан фаркли ($X_{ij} \neq 0$) катаклар сони 6 та $n + m - 1 = 4 + 3 - 1 = 6$ та. Курилган дастлабки ечим (невыражденный)
$S_1 = 1*30+2*20+3*10+1*10+5*10+4*10 = 200$ бирлик харажат.

1.Noldan farkli (Xij0) kataklar soni 6 ta n + m - 1 = 4 + 3 - 1 = 6 ta.
   Kurilgan dastlabki echim (nevыrajdennыy)
   S1 = 1*30+2*20+3*10+1*10+5*10+4*10 = 200 birlik harajat.
2. Junatuvchilar va iste'molchilarning potenciallarini hisoblaymiz. Xij kataklar uchun kuyidagi tengsizlar urinli $\beta_j + \alpha_j = c_{ij}$ (1=1,3: j=1,4).

$$\begin{cases} \boldsymbol{\beta_1 + \alpha_1 = c_{11}} \\ \boldsymbol{\beta_2 + \alpha_1 = c_{12}} \\ \boldsymbol{\beta_2 + \alpha_2 = c_{22}} \\ \boldsymbol{\beta_3 + \alpha_2 = c_{23}} \\ \boldsymbol{\beta_4 + \alpha_2 = c_{24}} \\ \boldsymbol{\beta_4 + \alpha_3 = c_{34}} \end{cases} \qquad \begin{cases} \boldsymbol{\beta_1 + \alpha_1 = 1} \\ \boldsymbol{\beta_2 + \alpha_1 = 2} \\ \boldsymbol{\beta_2 + \alpha_2 = 3} \\ \boldsymbol{\beta_3 + \alpha_2 = 1} \\ \boldsymbol{\beta_4 + \alpha_2 = 5} \\ \boldsymbol{\beta_4 + \alpha_3 = 4} \end{cases}$$

Birinchi ta'minotchini potencialini nol olib (shunga nisbatan boshka junatuvchilar va iste'molchilarning potenciallarini aniklaymiz.

$$\alpha_1 = 0, \ \beta_1 = 1, \ \beta_2 = 2, \ \alpha_2 = -1, \ \beta_3 = 0, \ \beta_4 = 4, \alpha_3 = 0$$

3. Буш катаклар учун $\overline{c_{ij}}$ катталикнинг сон кийматлари хисобланади. $\overline{c_{ij}} = a_i + \beta_j - c_{ij}$

Агар хамма $\overline{c_{ij}} \le 0$ булса оптимал ечим аникланган хисобланади, акс холда навбатдаги ечим изланади.

$$\overline{c_{13}} = a_1 + \beta_3 - c_{13} = 0 + 0 - 4 = -4$$
$$\overline{c_{14}} = a_1 + \beta_4 - c_{14} = 0 + 4 - 1 = +3$$
$$\overline{c_{21}} = a_2 + \beta_1 - c_{21} = -1 + 1 - 2 = -2$$
$$\overline{c_{31}} = a_3 + \beta_1 - c_{31} = 0 + 1 - 3 = -2$$
$$\overline{c_{32}} = a_3 + \beta_2 - c_{32} = 0 + 2 - 2 = 0$$
$$\overline{c_{33}} = a_3 + \beta_3 - c_{33} = 0 + 0 - 4 = -4$$

larning kiymatlarini jadvaldagi mos kataklarga kavs ichiga olib olib ezamiz.   lar ichida musbat kiymatlari mavjud, Demak, kurilgan tayanch echim optimal emas.
4. >0 kiymatlar ichidan eng kattasini tanlaymiz
        max {} = max {3}, >0

bu X14 katak. X14 katakni (+) deb belgilab kayta taksimlash ciklini kuramiz. (+) katakdan boshlab yukoriga, pastga, ungga, chapga harakat kilib, Xij kataklarda burilish mumkin (bush kataklarda burilish mumkin emas), yana usha (+) katakga kaytib kelish shart. Natijada sinik chizikli berk kontur, yuklarni kayta taksimlash cikli hosil buladi. Burilish kataklarini (-) va (+) ketma-ketlikda belgilaymiz.

Jo'natish punktlari	Iste'molchilar				α_i Satr potensiali
	B₁ 30	B₂ 30	B₃ 10	B₄ 20	
A₁ 50	1 30	2 ⊝ (-) ↓20	4 (-4)	1 (+3) ⊕ (+) ↑	$\alpha_1 = 0$
A₂ 30	2 (-2)	3 ⊕ (+) 10	1 10	5 10 ⊝ (-)	$\alpha_2 = -1$
A₃ 10	3 (-2)	2 (0)	4 (-4)	4 10	$\alpha_3 = 0$
β_j ustun potensiali	$\beta_1 = 1$	$\beta_2 = 2$	$\beta_3 = 0$	$\beta_4 = 4$	

Endi cikldagi (-) bilan belgilangan kataklardagi Xij lar ichidan eng kichigini tanlab olamiz. min {Xij} = min {10, 20} = 10.
Demak 10 birlik yuk cikl buyicha kayta taksimlanadi:
(+) belgilangan katakdagi Xij larni kiymatiga 10 kushiladi,
(-) katakdagilardan 10 ayirib tashlanadi,
natijada transport masalasini yangi нechimi hosil buladi:

Jo'natish punktlari	Iste'molchilar				α_i Satr potensiali
	B₁ 30	B₂ 30	B₃ 10	B₄ 20	
A₁ 50	1 30	2 10	4	1 10	$\alpha_1 =$
A₂ 30	2	3 20	1 10	5	$\alpha_2 =$
A₃ 10	3	2	4	4 10	$\alpha_3 =$
β_j Ustun potensiali	$\beta_1 =$	$\beta_2 =$	$\beta_3 =$	$\beta_4 =$	

$S_2 = 1*30 + 2*10 + 1*10 + 3*20 + 1*10 + 4*10 = 170$ Yangi echimni optimallik shartiga tekshiramiz. Buning uchun yangi hisoblashlarni bajaramiz.

II - iteraciya. Satr va ustunlarning potenciallarini aniklaymiz:

Jo'natish punktlari	Iste'molchilar				α_i Satr potensiali
	B_1 30	B_2 30	B_3 10	B_4 20	
A_1 50	1 **30**	2 − **10**	4 (-4)	1 + **10**	$\alpha_1 = 0$
A_2 30	2 (0)	3 **20**	1 **10**	5 (-3)	$\alpha_2 = 1$
A_3 10	3 (1)	2 (3) +	4 (-1)	4 − **10**	$\alpha_3 = 3$
β_j ustun potensiali	$\beta_1 = 1$	$\beta_2 = 2$	$\beta_3 = 0$	$\beta_4 = 1$	

4. $\max\{\overline{c_{ij}}\} = \max\{1,3\} = 3$

     $\overline{c_{ij}} > 0$

X katakga mos keladi. X32 katakni (+) deb kayta taksimlash ciklini kuramiz va aniklaymiz, min {X } = min {10,10} = 10 birlik yukni kayta taksimlab yangi echimni hosil kilamiz:

Jo'natish punktlari	Iste'molchilar				α_i Satr potensiali
	B₁ 30	B₂ 30	B₃ 10	B₄ 20	
A₁ 50	1 **30**	2	4	1 **20**	$\alpha_1 =$
A₂ 30	2	3 **20**	1 **10**	5	$\alpha_2 =$
A₃ 10	3	2 **10**	4	4	$\alpha_3 =$
β_j ustun potensiali	$\beta_1 =$	$\beta_2 =$	$\beta_3 =$	$\beta_4 =$	

$S_3 = 1*30+1*20+3*20+1*10+2*10 = 140$ birlik xarajat.

III.Iteratsiya:

Jo'natish punktlari	Iste'molchilar				α_i Satr potensiali
	B_1 30	B_2 30	B_3 10	B_4 20	
A_1 50	1 (−) 30 ↓	2 (−3)	4 (−7)	1 (+) 20	$\alpha_1 = 0$
A_2 30	2 (3) (+) →	3 (−) 20 ↓	1 10	5 (0) ↑	$\alpha_2 = 4$
A_3 10	3 (1)	2 (+) 10 →	4 (−4)	4 (−) 0	$\alpha_3 = 3$
β_j ustun potensiali	$\beta_1 = 1$	$\beta_2 = -1$	$\beta_3 = -3$	$\beta_4 = 1$	

$$\max \{ \overline{c_{ij}} \} = \max \{1,3\} = 3$$

$$\overline{c_{ij}} > 0$$

X21 katakga mos keladi. X21 katakni (+) deb kayta taksimlash ciklini kuramiz va aniklaymiz, min {X } = min {0,20,30} = 0 birlik yukni kayta taksimlash kelib chikdi, demak topilgan plan optimal hisoblanadi.

2.3. Trasport masalasini optimal yechimini algoritmi (blok sxeasi)
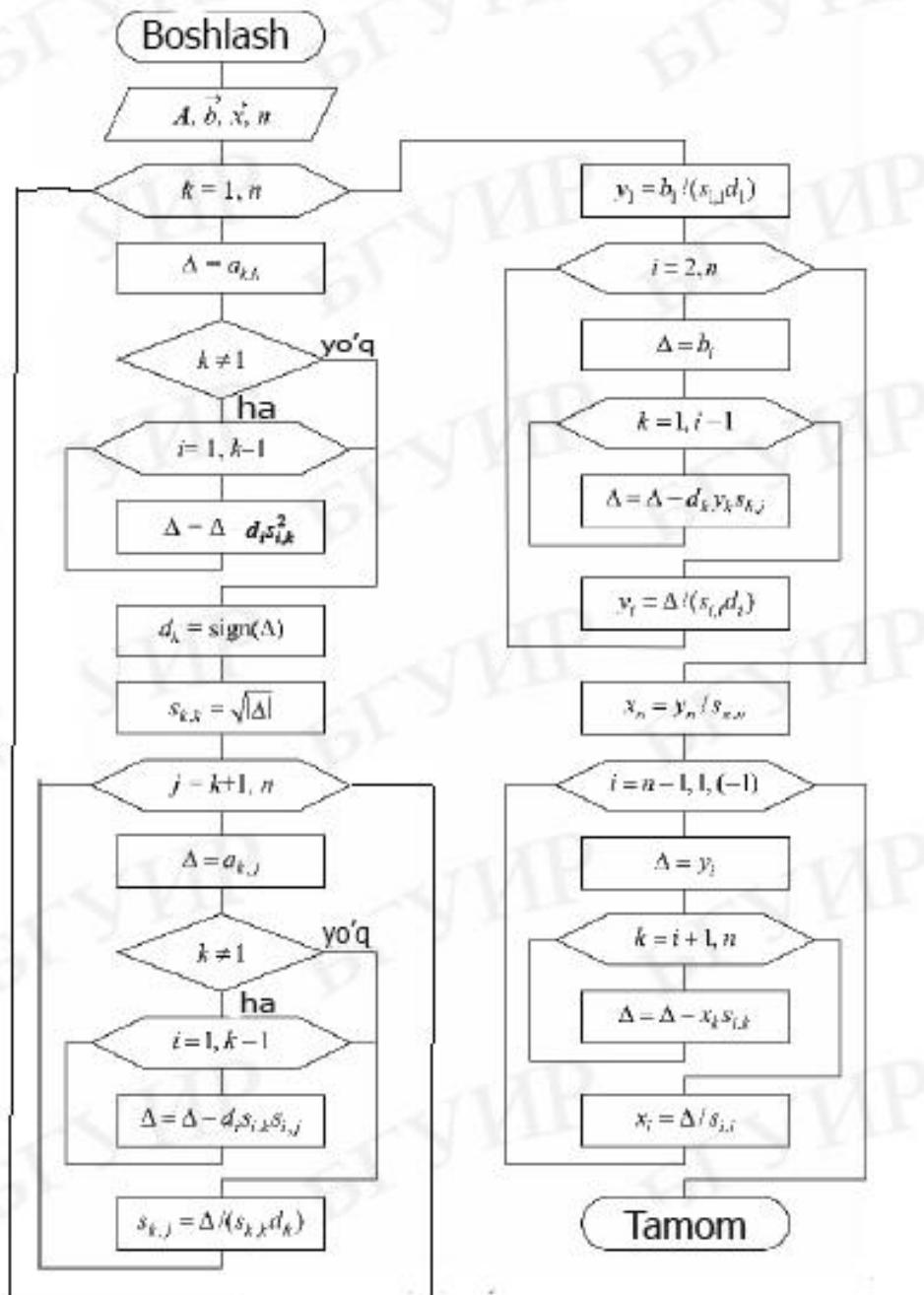
III. ASOSIY QISM

3.1. Microsoft Visual C++ da ilova dastur yaratish

Microsoft Visual C++ tilida ilovalar yozishning boshlang'ich ko'nikmalariga ega bo'lish.

Visual C++ da dasturlar ilovalar deb nomlanadi. Ilovalar maxsus konstruksiya ko'rinishidagi muhitda – foydalanuvchi uchun bir qancha fayllar majmui ko'rinishidagi *loyiha*da yaratiladi.

C tilidagi dastur bu – belgilangan talablarga javob beruvchi, maxsus dasturlash tuzilishiga ega funksiyalar majmuidir. Ilova – bu ichida ilova algoritmini amalga oshiruvchi operatorlar joylashtirilgan asosiy funksiyadir. Operatorlar ichida shundaylari ham borki, ular algoritmni amalga oshishida talab qilinadigan boshqa funksiyalarni chaqirishga xizmat qiladi. Ixtiyoriy dasturni ishga tushirish, dasturning qolgan barcha qismini o'zida jamlagan *asosiy funksiyani* ishga tushirishdan boshlanadi. Funksiyaning bir qismi dasturchi tomonidan, qolgan qismi – kutubxona funksiyalari – foydalanuvchiga dasturiy muhit tomonidan taqdim qilinadi va dasturni ishlab chiqish jarayonida foydalaniladi.

Yaratiluvchi ilovalarni 2 ta katta kategoriyaga ajratish mumkin. Ular *ishchi stol ilovalari* va *Windows 8 ilovalari*dir. Ishchi stol ilovalari bu biz bilgan sevadigan ilovalardir. Ular menyu paneli, instrumentlar paneli va ko'pincha ilova oynasining pastki qismida joylashgan holatlar satriga ega bo'ladilar. Biz ushbu fanda ishchi stol ilovalarini yaratishni maqsad qilib qo'ydik.

Windows 8 ilovalari ishchi stol ilovalaridan ancha farqli. Ularda foydalanuvchi interfeysi mavjud bo'lib u ishchi stol ilovalaridan butunlay farq qiladi. Foydalanuvchining to'g'ridan to'g'ri ma'lumotlar bilan bog'lanishi diqqat markazidadir, misol uchun menyu belgilari va instrumentlar tugmalari orasidagi boshqaruvga bog'lanisi.

C/C++ ni o'rganishda biz maxsus ilovalar ko'rinishidan foydalanamiz –

shablonlarni tayyorlash muhitida oldindan tayyorlangan konsol ilovalar asosida shakllantiriladi.

Konsol ilovalar – bu grafik interfeyssiz ilovalar bo'lib, ular foydalanuvchi bilan maxsus buyruqlar satri orqali o'zaro aloqada bo'ladi yoki asosiy menyu muhitidagi maxsus buyruqlar bilan ishga tushiriladi.Bunday ilovalar File/New Project buyrug'i bajarilishidan so'ng ochiluvchi dialog oynasiga ega bo'lgan maxsus shablonlar yordamida yaratiladi.

Konsol ilovalar shabloni yaratiluvchi ilovaga barcha zarur elementlarni qo'shadi, shundan so'ng dasturchi bu shablonga o'zining C/C++ tilidagi operatorlarini qo'shadi. Keyin ilova avtonom ishga tushuvchi fayl sifatida kompilyatsiyalanadi va bajarish uchun ishga tushirilishi mumkin. Foydalanuvchi bilan muloqot ilova ishga tushirilgandan so'ng ochiluvchi maxsus konsol oynasi orqali amalga oshiriladi (shu oynada dastur habarlari tasvirlanadi, u orqali hisoblash uchun ma'lumotlar kiritiladi va uning o'ziga hisoblangan natijalar chop qilinadi).

Kompilyatsiya va proyektni bitta joyga jamlash asosiy menyuning Build buyrug'I orqali amalga oshiriladi. Kompilyatsiya va proyektni bir joyga yig'ishdan so'ng uni bajarish uchun ishga tushirish mumkin. Bajarilish uchun ishga tushurish asosiy menyuning Debbug buyrug'I yordamida amalga oshiriladi.

3.2. Dasturda foydalanilgan komponentalar
Visual C++ da forma komponentalari
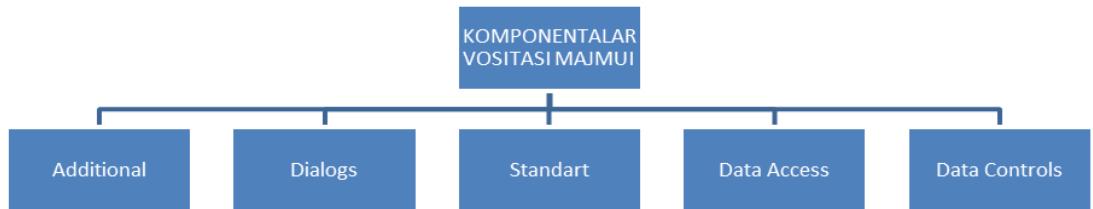
Label komponentasi

Label Yozuv (label komponenti) yorliqni ifodalaydi va ko`pincha o`zining Caption xususiyatiga ega bo`lmagan boshqa boshqaruv elementlarining sarlavasi sifatida ishlatiladi. Ko`pincha yozuvlarni tasvirlash uchun nishon deb nomlanadigan Label kompanenti ishlatiladi. U dastur bajarilish vaqti foydalanuvchi tahrirlashi mumkin bo`lgan oddiy matnni tasvirlash uchun ishlatiladi.

Visual Studio dasturida Label kompanentasini ishlatish uchun "Панель элементов" oynasida Label nomli kompanenta tanlanadi.

TextBox komponentasi

Bir satrli redaktor matn tasvirlanishi va o`zgartirilishi mumkin bo`lgan ma`lumot kiritish maydonini ifodalaydi. Visual Studioda bir qancha bir satrli redaktorlar mavjud bo`lib, ulardan TextBox kompanenti ko`p qo`llaniladi.

TextBox kompanenti klaviaturadan turli simvollarni kiritish va tahrirlashga imkon beradi. Bunda boshqaruv tugmalaridan foydalanib satr bo`ylab siljish, <BackSpace> va <Delete> tugmalari yordamida simvollarni

o`cherish, matn (bo`lagini) qismini belgilash va boshqa amallarni bajarish mumkin. Ta`kidlash joizki, bir satrli redaktorlar <Enter> va <Esc> boshqaruv tugmalariga javob bermaydi.(3.8-rasm)
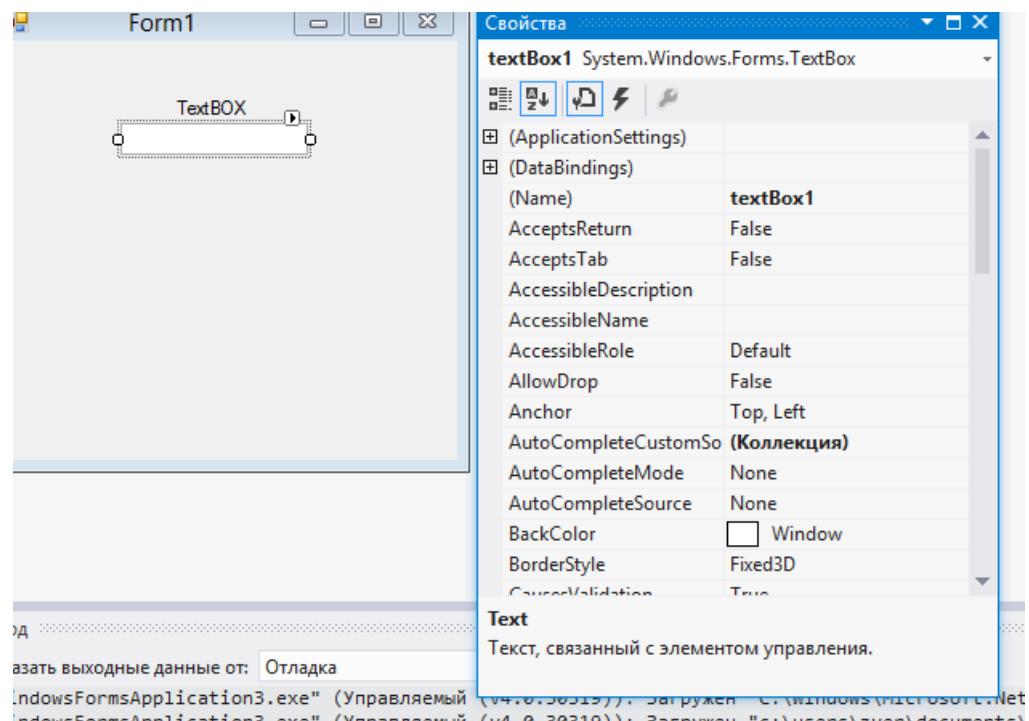
3.8-rasm

TextBox kompanentidan parolni kiritishda foydalanganda Char turidagi PasswordChar xususiyatidan foydalanish mimkin. U kiritish oynasiga tasvirlanadigan simvolni belgilaydi. Bu simvol matn kiritayotganda haqiqatda kiritilgan ma`lumot o`rnida paydo bo`ladi.

ComboBox Komponentasi

ComboBox komponentasiga kiritilgan ro`yxatlar bilan ishlashda foydalaniladi. Komponentaning o`ng tomonida ro`yxatni chiqarish tugmasi bosilganda ro`yxat paydo bo`ladi.

2.3. Loyihani Visual Studio 2012 dasturida C++ tilida yaratish

Dasturni yaratishni Visual Studioda ilova yaratish bilan boshlaymiz. Visual Studioda ilova quidagicha yaratiladi.

Forma oynasi

Visual Studio dasturida forma yaratish.

File ->Project(3.3-rasm)
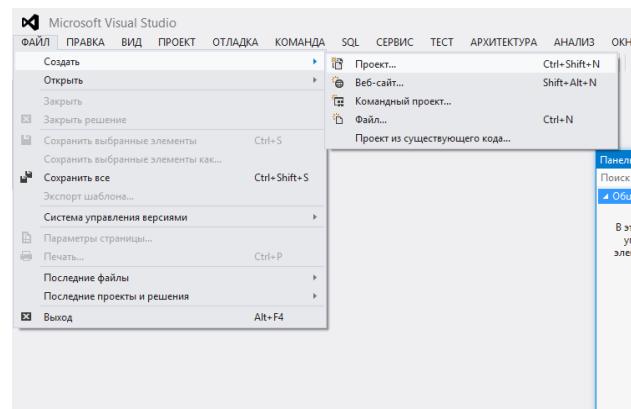
3.10-rasm

Visual C++ ->CLR->Windows Forms
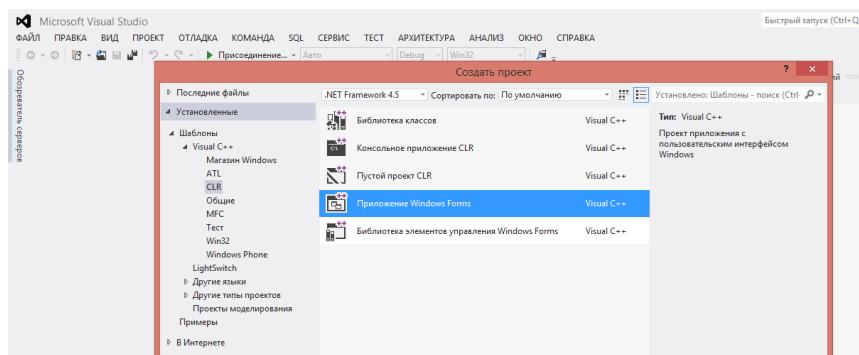
3.11-rasm

Yuqorida keltirilgan ketma – ketliklardan so`ng Form1 oynasi yaratiladi.
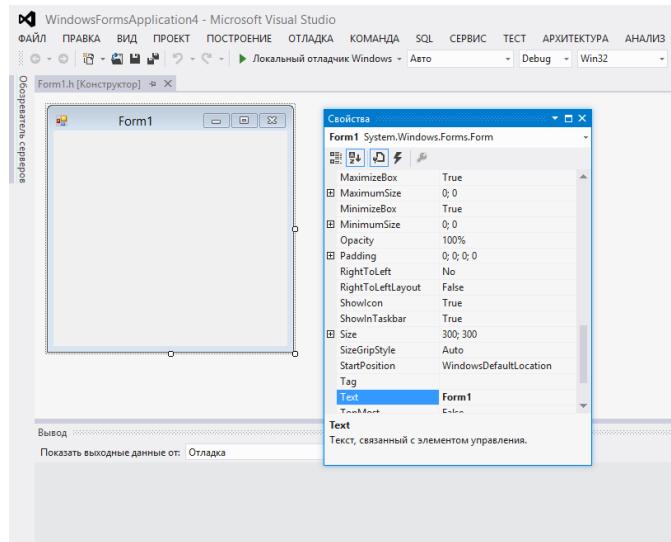
(3.12-rasm)

Dasturda zarur bo`lgan komponentalar tanlanadi va form oynasiga tashlanadi.
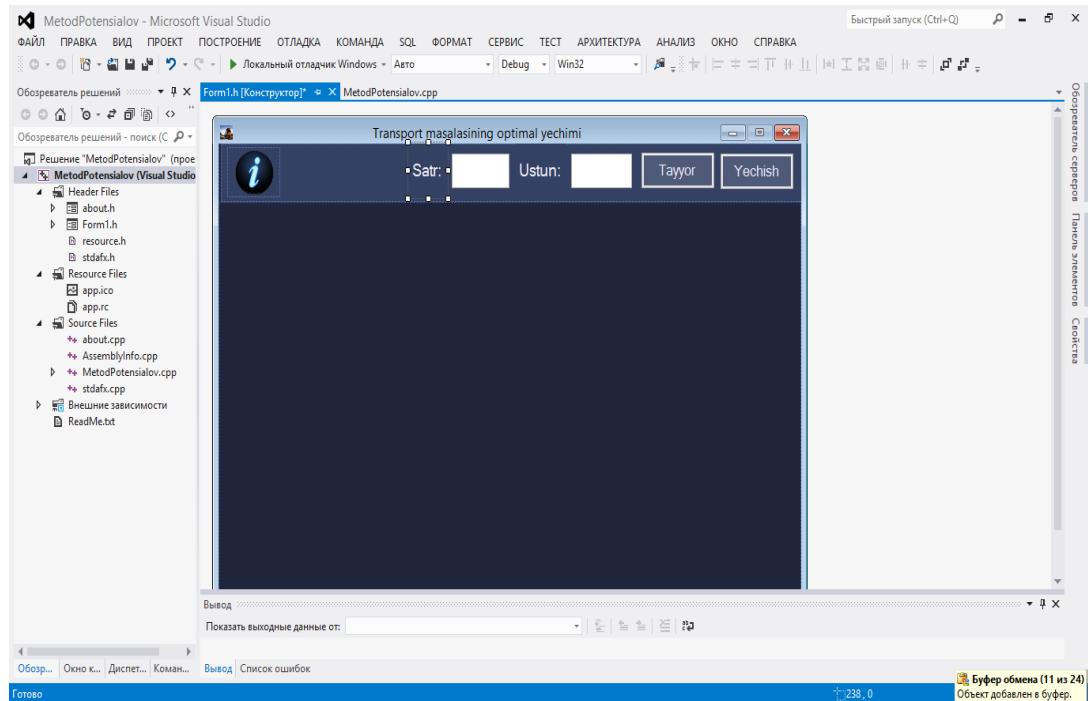
(3.13-rasm)

Dasturga kerak bo'ladigan barcha komponentalar yuqoridagidek ko'rinishga keltiriladi.
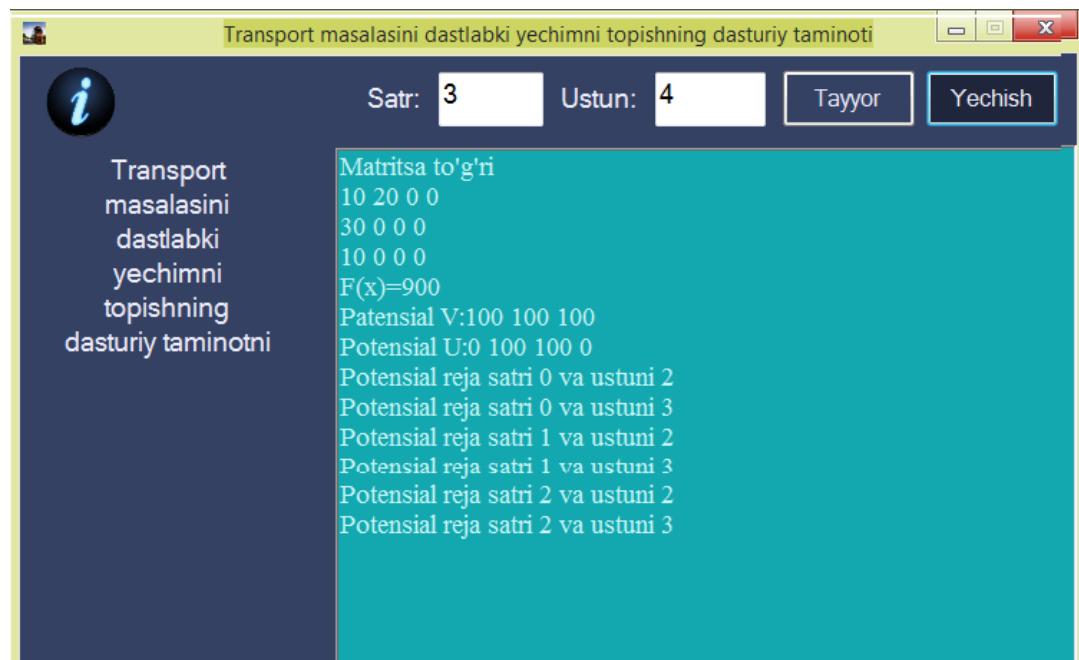
(3.14-rasm)

Transport masalasini optimal yechimini javobi.

XULOSA

Ushbu kurs ishi Transport masalasini dastlabki yechimini topish dasturiy ta`minot yaratishga qaratilgan bo`lib, bu dasturiy ta`minotning vazifasi Diskret mateatika va sonli usullar fanidan Transport masalasini dastlabki yechimini topish tushunchasiga ega bo`lish hisoblangan edi va bunga erishildi.

Dastur kompleksi quyidagi vazifalarni bajarildi.

- Transport masalasini dastlabki yechimi topish oynasi chiqadi;
- Matritsani o'lchamlari kiritiladi;
- Punktlar , jo'natuvchilar va masofalar kiritiladi va optimal yechim topiladi;

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2.   Зиборов В. - MS Visual C ++2010 в среде NET Питер, 2012

3.   http://library.ziyonet.uz/ru/book

4.   Khorton_Visual_C__2010_Polny_kurs-2011g Санкт-Петербург 2011

5.   Б. Пахомов - CC++ и MSVisualC++ 2008 для начинающих «БХВ-Петербург» 2008

6.   Horton I. - Beginning Visual C++ 2012 – 2012

7.   В.В. Язык С++ – М.: Финансы и статистика, 1996.

```cpp
#include "about.h"
#pragma once

namespace MetodPotensialov {

    using namespace System;
    using namespace System::ComponentModel;
    using namespace System::Collections;
    using namespace System::Windows::Forms;
    using namespace System::Data;
    using namespace System::Drawing;
    using namespace System::IO;

    /// <summary>
    /// Summary for Form1
    /// </summary>
    public ref class Form1 : public System::Windows::Forms::Form
    {
    public:
        Form1(void)
        {
            InitializeComponent();
            //
            //TODO: Add the constructor code here
            //
        }

    protected:
        /// <summary>
        /// Clean up any resources being used.
        /// </summary>
        ~Form1()
        {
            if (components)
            {
                delete components;
            }
        }


    private: System::Windows::Forms::Panel^  panel_form;
    protected:
    private: System::Windows::Forms::Panel^  panel_change;
    private: System::Windows::Forms::Panel^  panel_read;

    private: System::Windows::Forms::Panel^  panel_top;
    private: System::Windows::Forms::Label^  label_m;
    private: System::Windows::Forms::TextBox^  textBox_m;
    private: System::Windows::Forms::TextBox^  textBox_n;
    private: System::Windows::Forms::Label^  label_n;
    private: System::Windows::Forms::Button^  button_read;
    private: System::Windows::Forms::PictureBox^  pictureBox_info;
    private: System::Windows::Forms::Button^  button_result;

    private: System::Windows::Forms::Panel^  panel_read_right;
    private: System::Windows::Forms::Panel^  panel_read_left;
    private: System::Windows::Forms::Panel^  panel_read_fill;
    private: System::Windows::Forms::DataGridView^  dataGridView_read_fill;
```

```cpp
        private: System::Windows::Forms::DataGridView^  dataGridView_read_right;
        private: System::Windows::Forms::DataGridView^  dataGridView_read_left;
        private: System::Windows::Forms::DataGridViewTextBoxColumn^  Column2;
        private: System::Windows::Forms::DataGridViewTextBoxColumn^  Column1;


        private: System::Windows::Forms::Panel^  panel_result;
        private: System::Windows::Forms::Panel^  panel_result_left;
        private: System::Windows::Forms::Label^  label_result;
        private: System::Windows::Forms::RichTextBox^  richTextBox_result;



        private:
                /// <summary>
                /// Required designer variable.
                /// </summary>
                System::ComponentModel::Container ^components;

#pragma region Windows Form Designer generated code
                /// <summary>
                /// Required method for Designer support - do not modify
                /// the contents of this method with the code editor.
                /// </summary>
                void InitializeComponent(void)
                {
                        System::ComponentModel::ComponentResourceManager^  resources = (gcnew
System::ComponentModel::ComponentResourceManager(Form1::typeid));
                        this->panel_form = (gcnew System::Windows::Forms::Panel());
                        this->panel_change = (gcnew System::Windows::Forms::Panel());
                        this->panel_top = (gcnew System::Windows::Forms::Panel());
                        this->pictureBox_info = (gcnew System::Windows::Forms::PictureBox());
                        this->button_result = (gcnew System::Windows::Forms::Button());
                        this->label_m = (gcnew System::Windows::Forms::Label());
                        this->textBox_m = (gcnew System::Windows::Forms::TextBox());
                        this->textBox_n = (gcnew System::Windows::Forms::TextBox());
                        this->label_n = (gcnew System::Windows::Forms::Label());
                        this->button_read = (gcnew System::Windows::Forms::Button());
                        this->panel_read = (gcnew System::Windows::Forms::Panel());
                        this->panel_read_fill = (gcnew System::Windows::Forms::Panel());
                        this->dataGridView_read_fill = (gcnew
System::Windows::Forms::DataGridView());
                        this->panel_read_right = (gcnew System::Windows::Forms::Panel());
                        this->dataGridView_read_right = (gcnew
System::Windows::Forms::DataGridView());
                        this->Column2 = (gcnew
System::Windows::Forms::DataGridViewTextBoxColumn());
                        this->panel_read_left = (gcnew System::Windows::Forms::Panel());
                        this->dataGridView_read_left = (gcnew
System::Windows::Forms::DataGridView());
                        this->Column1 = (gcnew
System::Windows::Forms::DataGridViewTextBoxColumn());
                        this->panel_result = (gcnew System::Windows::Forms::Panel());
                        this->richTextBox_result = (gcnew
System::Windows::Forms::RichTextBox());
                        this->panel_result_left = (gcnew System::Windows::Forms::Panel());
                        this->label_result = (gcnew System::Windows::Forms::Label());
                        this->panel_form->SuspendLayout();
                        this->panel_top->SuspendLayout();
                        (cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
```

```cpp
>pictureBox_info))->BeginInit();
            this->panel_read->SuspendLayout();
            this->panel_read_fill->SuspendLayout();
            (cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>dataGridView_read_fill))->BeginInit();
            this->panel_read_right->SuspendLayout();
            (cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>dataGridView_read_right))->BeginInit();
            this->panel_read_left->SuspendLayout();
            (cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>dataGridView_read_left))->BeginInit();
            this->panel_result->SuspendLayout();
            this->panel_result_left->SuspendLayout();
            this->SuspendLayout();
            //
            // panel_form
            //
            this->panel_form->BackColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(31)
), static_cast<System::Int32>(static_cast<System::Byte>(37)),
                static_cast<System::Int32>(static_cast<System::Byte>(59)));
            this->panel_form->Controls->Add(this->panel_change);
            this->panel_form->Controls->Add(this->panel_top);
            this->panel_form->Dock = System::Windows::Forms::DockStyle::Fill;
            this->panel_form->Location = System::Drawing::Point(0, 0);
            this->panel_form->Name = L"panel_form";
            this->panel_form->Size = System::Drawing::Size(737, 523);
            this->panel_form->TabIndex = 0;
            //
            // panel_change
            //
            this->panel_change->BackColor = System::Drawing::Color::Gold;
            this->panel_change->Dock = System::Windows::Forms::DockStyle::Fill;
            this->panel_change->Location = System::Drawing::Point(0, 64);
            this->panel_change->Name = L"panel_change";
            this->panel_change->Size = System::Drawing::Size(737, 459);
            this->panel_change->TabIndex = 2;
            this->panel_change->Paint += gcnew
System::Windows::Forms::PaintEventHandler(this, &Form1::panel_change_Paint);
            //
            // panel_top
            //
            this->panel_top->BackColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(52)
), static_cast<System::Int32>(static_cast<System::Byte>(65)),
                static_cast<System::Int32>(static_cast<System::Byte>(99)));
            this->panel_top->Controls->Add(this->pictureBox_info);
            this->panel_top->Controls->Add(this->button_result);
            this->panel_top->Controls->Add(this->label_m);
            this->panel_top->Controls->Add(this->textBox_m);
            this->panel_top->Controls->Add(this->textBox_n);
            this->panel_top->Controls->Add(this->label_n);
            this->panel_top->Controls->Add(this->button_read);
            this->panel_top->Dock = System::Windows::Forms::DockStyle::Top;
            this->panel_top->Location = System::Drawing::Point(0, 0);
            this->panel_top->Name = L"panel_top";
            this->panel_top->Size = System::Drawing::Size(737, 64);
            this->panel_top->TabIndex = 0;
            //
            // pictureBox_info
```

```cpp
			//
			this->pictureBox_info->Cursor =
System::Windows::Forms::Cursors::Hand;
			this->pictureBox_info->Image =
(cli::safe_cast<System::Drawing::Image^  >(resources-
>GetObject(L"pictureBox_info.Image")));
			this->pictureBox_info->Location = System::Drawing::Point(8, 4);
			this->pictureBox_info->Name = L"pictureBox_info";
			this->pictureBox_info->Size = System::Drawing::Size(67, 55);
			this->pictureBox_info->SizeMode =
System::Windows::Forms::PictureBoxSizeMode::Zoom;
			this->pictureBox_info->TabIndex = 9;
			this->pictureBox_info->TabStop = false;
			this->pictureBox_info->Click += gcnew System::EventHandler(this,
&Form1::pictureBox_info_Click);
			//
			// button_result
			//
			this->button_result->BackColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(79)
), static_cast<System::Int32>(static_cast<System::Byte>(90)),
				static_cast<System::Int32>(static_cast<System::Byte>(120)));
			this->button_result->FlatAppearance->BorderColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(79)
),
				static_cast<System::Int32>(static_cast<System::Byte>(90)),
static_cast<System::Int32>(static_cast<System::Byte>(120)));
			this->button_result->Font = (gcnew System::Drawing::Font(L"Microsoft
Sans Serif", 12));
			this->button_result->ForeColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(236
)), static_cast<System::Int32>(static_cast<System::Byte>(235)),
				static_cast<System::Int32>(static_cast<System::Byte>(249)));
			this->button_result->Location = System::Drawing::Point(631, 9);
			this->button_result->Name = L"button_result";
			this->button_result->Size = System::Drawing::Size(94, 41);
			this->button_result->TabIndex = 8;
			this->button_result->Text = L"Yechish";
			this->button_result->UseVisualStyleBackColor = false;
			this->button_result->Click += gcnew System::EventHandler(this,
&Form1::button_result_Click);
			//
			// label_m
			//
			this->label_m->Font = (gcnew System::Drawing::Font(L"Microsoft Sans
Serif", 14, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
				static_cast<System::Byte>(204)));
			this->label_m->ForeColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(236
)), static_cast<System::Int32>(static_cast<System::Byte>(235)),
				static_cast<System::Int32>(static_cast<System::Byte>(249)));
			this->label_m->Location = System::Drawing::Point(372, 0);
			this->label_m->Name = L"label_m";
			this->label_m->Size = System::Drawing::Size(65, 59);
			this->label_m->TabIndex = 7;
			this->label_m->Text = L"Ustun:";
			this->label_m->TextAlign =
System::Drawing::ContentAlignment::MiddleCenter;
			//
			// textBox_m
```

```cpp
			// 
			this->textBox_m->Font = (gcnew System::Drawing::Font(L"Microsoft Sans
Serif", 14, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
				static_cast<System::Byte>(204)));
			this->textBox_m->Location = System::Drawing::Point(443, 11);
			this->textBox_m->Multiline = true;
			this->textBox_m->Name = L"textBox_m";
			this->textBox_m->Size = System::Drawing::Size(77, 38);
			this->textBox_m->TabIndex = 6;
			this->textBox_m->TextChanged += gcnew System::EventHandler(this,
&Form1::textBox_m_TextChanged);
			// 
			// textBox_n
			// 
			this->textBox_n->Font = (gcnew System::Drawing::Font(L"Microsoft Sans
Serif", 14, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
				static_cast<System::Byte>(204)));
			this->textBox_n->ForeColor =
System::Drawing::SystemColors::WindowText;
			this->textBox_n->Location = System::Drawing::Point(292, 11);
			this->textBox_n->Multiline = true;
			this->textBox_n->Name = L"textBox_n";
			this->textBox_n->Size = System::Drawing::Size(73, 38);
			this->textBox_n->TabIndex = 5;
			// 
			// label_n
			// 
			this->label_n->Font = (gcnew System::Drawing::Font(L"Microsoft Sans
Serif", 14, System::Drawing::FontStyle::Regular, System::Drawing::GraphicsUnit::Point,
				static_cast<System::Byte>(204)));
			this->label_n->ForeColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(236
)), static_cast<System::Int32>(static_cast<System::Byte>(235)),
				static_cast<System::Int32>(static_cast<System::Byte>(249)));
			this->label_n->Location = System::Drawing::Point(238, 0);
			this->label_n->Name = L"label_n";
			this->label_n->Size = System::Drawing::Size(48, 59);
			this->label_n->TabIndex = 4;
			this->label_n->Text = L"Satr:";
			this->label_n->TextAlign =
System::Drawing::ContentAlignment::MiddleCenter;
			// 
			// button_read
			// 
			this->button_read->BackColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(79)
), static_cast<System::Int32>(static_cast<System::Byte>(90)),
				static_cast<System::Int32>(static_cast<System::Byte>(120)));
			this->button_read->FlatAppearance->BorderColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(79)
),
				static_cast<System::Int32>(static_cast<System::Byte>(90)),
static_cast<System::Int32>(static_cast<System::Byte>(120)));
			this->button_read->Font = (gcnew System::Drawing::Font(L"Microsoft
Sans Serif", 12));
			this->button_read->ForeColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(236
)), static_cast<System::Int32>(static_cast<System::Byte>(235)),
				static_cast<System::Int32>(static_cast<System::Byte>(249)));
			this->button_read->Location = System::Drawing::Point(531, 9);
```

```cpp
            this->button_read->Name = L"button_read";
            this->button_read->Size = System::Drawing::Size(94, 41);
            this->button_read->TabIndex = 0;
            this->button_read->Text = L"Tayyor";
            this->button_read->UseVisualStyleBackColor = false;
            this->button_read->Click += gcnew System::EventHandler(this,
&Form1::button_read_Click);
            //
            // panel_read
            //
            this->panel_read->Controls->Add(this->panel_read_fill);
            this->panel_read->Controls->Add(this->panel_read_right);
            this->panel_read->Controls->Add(this->panel_read_left);
            this->panel_read->Dock = System::Windows::Forms::DockStyle::Fill;
            this->panel_read->Location = System::Drawing::Point(0, 0);
            this->panel_read->Name = L"panel_read";
            this->panel_read->Size = System::Drawing::Size(737, 459);
            this->panel_read->TabIndex = 0;
            //
            // panel_read_fill
            //
            this->panel_read_fill->Controls->Add(this->dataGridView_read_fill);
            this->panel_read_fill->Dock =
System::Windows::Forms::DockStyle::Fill;
            this->panel_read_fill->Location = System::Drawing::Point(120, 0);
            this->panel_read_fill->Name = L"panel_read_fill";
            this->panel_read_fill->Size = System::Drawing::Size(497, 459);
            this->panel_read_fill->TabIndex = 2;
            //
            // dataGridView_read_fill
            //
            this->dataGridView_read_fill->AllowUserToAddRows = false;
            this->dataGridView_read_fill->AllowUserToDeleteRows = false;
            this->dataGridView_read_fill->BackgroundColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(39)
),
                    static_cast<System::Int32>(static_cast<System::Byte>(33)),
static_cast<System::Int32>(static_cast<System::Byte>(61)));
            this->dataGridView_read_fill->ColumnHeadersHeightSizeMode =
System::Windows::Forms::DataGridViewColumnHeadersHeightSizeMode::AutoSize;
            this->dataGridView_read_fill->Dock =
System::Windows::Forms::DockStyle::Fill;
            this->dataGridView_read_fill->GridColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(19)
),
                    static_cast<System::Int32>(static_cast<System::Byte>(168)),
static_cast<System::Int32>(static_cast<System::Byte>(175)));
            this->dataGridView_read_fill->Location = System::Drawing::Point(0,
0);
            this->dataGridView_read_fill->Name = L"dataGridView_read_fill";
            this->dataGridView_read_fill->Size = System::Drawing::Size(497, 459);
            this->dataGridView_read_fill->TabIndex = 0;
            //
            // panel_read_right
            //
            this->panel_read_right->Controls->Add(this->dataGridView_read_right);
            this->panel_read_right->Dock =
System::Windows::Forms::DockStyle::Right;
            this->panel_read_right->Location = System::Drawing::Point(617, 0);
            this->panel_read_right->Name = L"panel_read_right";
```

```cpp
			this->panel_read_right->Size = System::Drawing::Size(120, 459);
			this->panel_read_right->TabIndex = 1;
			//
			// dataGridView_read_right
			//
			this->dataGridView_read_right->AllowUserToAddRows = false;
			this->dataGridView_read_right->AllowUserToDeleteRows = false;
			this->dataGridView_read_right->BackgroundColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(39)
),
				static_cast<System::Int32>(static_cast<System::Byte>(33)),
static_cast<System::Int32>(static_cast<System::Byte>(61)));
			this->dataGridView_read_right->ColumnHeadersHeightSizeMode =
System::Windows::Forms::DataGridViewColumnHeadersHeightSizeMode::AutoSize;
			this->dataGridView_read_right->Columns->AddRange(gcnew cli::array<
System::Windows::Forms::DataGridViewColumn^  >(1) {this->Column2});
			this->dataGridView_read_right->Dock =
System::Windows::Forms::DockStyle::Fill;
			this->dataGridView_read_right->GridColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(19)
),
				static_cast<System::Int32>(static_cast<System::Byte>(168)),
static_cast<System::Int32>(static_cast<System::Byte>(175)));
			this->dataGridView_read_right->Location = System::Drawing::Point(0,
0);
			this->dataGridView_read_right->Name = L"dataGridView_read_right";
			this->dataGridView_read_right->Size = System::Drawing::Size(120,
459);
			this->dataGridView_read_right->TabIndex = 0;
			//
			// Column2
			//
			this->Column2->HeaderText = L"Punktlar";
			this->Column2->MinimumWidth = 100;
			this->Column2->Name = L"Column2";
			//
			// panel_read_left
			//
			this->panel_read_left->Controls->Add(this->dataGridView_read_left);
			this->panel_read_left->Dock =
System::Windows::Forms::DockStyle::Left;
			this->panel_read_left->Location = System::Drawing::Point(0, 0);
			this->panel_read_left->Name = L"panel_read_left";
			this->panel_read_left->Size = System::Drawing::Size(120, 459);
			this->panel_read_left->TabIndex = 0;
			//
			// dataGridView_read_left
			//
			this->dataGridView_read_left->AllowUserToAddRows = false;
			this->dataGridView_read_left->AllowUserToDeleteRows = false;
			this->dataGridView_read_left->BackgroundColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(39)
),
				static_cast<System::Int32>(static_cast<System::Byte>(33)),
static_cast<System::Int32>(static_cast<System::Byte>(61)));
			this->dataGridView_read_left->ColumnHeadersHeightSizeMode =
System::Windows::Forms::DataGridViewColumnHeadersHeightSizeMode::AutoSize;
			this->dataGridView_read_left->Columns->AddRange(gcnew cli::array<
System::Windows::Forms::DataGridViewColumn^  >(1) {this->Column1});
			this->dataGridView_read_left->Dock =
```

```cpp
System::Windows::Forms::DockStyle::Fill;
                this->dataGridView_read_left->GridColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(19)
),
                        static_cast<System::Int32>(static_cast<System::Byte>(168)),
static_cast<System::Int32>(static_cast<System::Byte>(175)));
                this->dataGridView_read_left->Location = System::Drawing::Point(0,
0);
                this->dataGridView_read_left->Name = L"dataGridView_read_left";
                this->dataGridView_read_left->Size = System::Drawing::Size(120, 459);
                this->dataGridView_read_left->TabIndex = 0;
                //
                // Column1
                //
                this->Column1->HeaderText = L"Ehtiyojlar";
                this->Column1->MinimumWidth = 100;
                this->Column1->Name = L"Column1";
                //
                // panel_result
                //
                this->panel_result->Controls->Add(this->richTextBox_result);
                this->panel_result->Controls->Add(this->panel_result_left);
                this->panel_result->Dock = System::Windows::Forms::DockStyle::Fill;
                this->panel_result->Location = System::Drawing::Point(0, 0);
                this->panel_result->Name = L"panel_result";
                this->panel_result->Size = System::Drawing::Size(737, 459);
                this->panel_result->TabIndex = 0;
                //
                // richTextBox_result
                //
                this->richTextBox_result->BackColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(19)
),
                        static_cast<System::Int32>(static_cast<System::Byte>(168)),
static_cast<System::Int32>(static_cast<System::Byte>(175)));
                this->richTextBox_result->Dock =
System::Windows::Forms::DockStyle::Fill;
                this->richTextBox_result->Font = (gcnew System::Drawing::Font(L"Times
New Roman", 14));
                this->richTextBox_result->ForeColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(198
)),
                        static_cast<System::Int32>(static_cast<System::Byte>(246)),
static_cast<System::Int32>(static_cast<System::Byte>(247)));
                this->richTextBox_result->Location = System::Drawing::Point(220, 0);
                this->richTextBox_result->Name = L"richTextBox_result";
                this->richTextBox_result->Size = System::Drawing::Size(517, 459);
                this->richTextBox_result->TabIndex = 1;
                this->richTextBox_result->Text = L"";
                //
                // panel_result_left
                //
                this->panel_result_left->BackColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(52)
),
                        static_cast<System::Int32>(static_cast<System::Byte>(65)),
static_cast<System::Int32>(static_cast<System::Byte>(99)));
                this->panel_result_left->Controls->Add(this->label_result);
                this->panel_result_left->Dock =
System::Windows::Forms::DockStyle::Left;
```

```cpp
				this->panel_result_left->Location = System::Drawing::Point(0, 0);
				this->panel_result_left->Name = L"panel_result_left";
				this->panel_result_left->Size = System::Drawing::Size(220, 459);
				this->panel_result_left->TabIndex = 0;
				//
				// label_result
				//
				this->label_result->Font = (gcnew System::Drawing::Font(L"Microsoft
Sans Serif", 14));
				this->label_result->ForeColor =
System::Drawing::Color::FromArgb(static_cast<System::Int32>(static_cast<System::Byte>(236
)), static_cast<System::Int32>(static_cast<System::Byte>(235)),
					static_cast<System::Int32>(static_cast<System::Byte>(249)));
				this->label_result->Location = System::Drawing::Point(27, 3);
				this->label_result->Name = L"label_result";
				this->label_result->Size = System::Drawing::Size(154, 152);
				this->label_result->TabIndex = 0;
				this->label_result->Text = L"Transport masalasini dastlabki yechimni
topishning dasturiy taminotni yaratish ";
				this->label_result->TextAlign =
System::Drawing::ContentAlignment::MiddleCenter;
				//
				// Form1
				//
				this->AutoScaleDimensions = System::Drawing::SizeF(6, 13);
				this->AutoScaleMode = System::Windows::Forms::AutoScaleMode::Font;
				this->ClientSize = System::Drawing::Size(737, 523);
				this->Controls->Add(this->panel_form);
				this->Icon = (cli::safe_cast<System::Drawing::Icon^  >(resources-
>GetObject(L"$this.Icon")));
				this->MaximizeBox = false;
				this->MaximumSize = System::Drawing::Size(753, 562);
				this->MinimumSize = System::Drawing::Size(753, 562);
				this->Name = L"Form1";
				this->StartPosition =
System::Windows::Forms::FormStartPosition::CenterScreen;
				this->Text = L"Transport masalasini dastlabki yechimni topishning
dasturiy taminoti";
				this->Load += gcnew System::EventHandler(this, &Form1::Form1_Load);
				this->panel_form->ResumeLayout(false);
				this->panel_top->ResumeLayout(false);
				this->panel_top->PerformLayout();
				(cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>pictureBox_info))->EndInit();
				this->panel_read->ResumeLayout(false);
				this->panel_read_fill->ResumeLayout(false);
				(cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>dataGridView_read_fill))->EndInit();
				this->panel_read_right->ResumeLayout(false);
				(cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>dataGridView_read_right))->EndInit();
				this->panel_read_left->ResumeLayout(false);
				(cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this-
>dataGridView_read_left))->EndInit();
				this->panel_result->ResumeLayout(false);
				this->panel_result_left->ResumeLayout(false);
				this->ResumeLayout(false);

			}
#pragma endregion
```

```cpp
private: System::Void textBox_m_TextChanged(System::Object^  sender, System::EventArgs^
e) {
                        }
private: System::Void button_read_Click(System::Object^  sender, System::EventArgs^ e) {
                    button_read->BackColor = panel_form->BackColor;
                    button_result->BackColor = panel_top->BackColor;
                    //button_open->BackColor = panel_top->BackColor;
                    Int32 n = Convert::ToInt32(textBox_n->Text);
                    Int32 m = Convert::ToInt32(textBox_m->Text);
                    dataGridView_read_fill->ColumnCount = m;
                    dataGridView_read_fill->RowCount = n;
                    dataGridView_read_left->RowCount = n;
                    dataGridView_read_right->RowCount = m;
                    panel_change->Controls->Clear();
                    panel_change->Controls->Add(panel_read);
            }

private: System::Void button_result_Click(System::Object^  sender, System::EventArgs^  e)
{
                    button_read->BackColor = panel_top->BackColor;
                    button_result->BackColor = panel_form->BackColor;
                    //button_open->BackColor = panel_top->BackColor;
                    panel_change->Controls->Clear();
                    panel_change->Controls->Add(panel_result);
                    rishay();

            }
private: System::Void button_open_Click(System::Object^  sender, System::EventArgs^  e) {
                    button_read->BackColor = panel_top->BackColor;
                    button_result->BackColor = panel_top->BackColor;
                   // button_open->BackColor = panel_form->BackColor;
                    /*
                    OpenFileDialog^ sfd = gcnew OpenFileDialog();
                    sfd->Filter = "Text files|*.txt|All Files|*.*";
                    if( sfd->ShowDialog() == System::Windows::Forms::DialogResult::OK )
                    {
                        StreamReader^ st = gcnew StreamReader(sfd->FileName);
                        Int32 k = 0;
                        String^ temp;
                        while (!(temp = st->Read())){
                                if(k == 0) n = Convert::ToInt32(temp);
                                if(k == 1) m = Convert::ToInt32(temp);
                                if (k > 1){
                                        tm[k] = Convert::ToInt32(temp);
                                }
                                k++;
                        }
                        k = 2;
                        for (Int32 i = 0; i<n; i++){
                                a[i] = tm[k++];
                        }
                        for (Int32 i = 0; i<m; i++){
                                b[i] = tm[k++];
                        }
                        for (Int32 i = 0; i<n; i++){
                                for (Int32 j = 0; j<m; j++){
                                        matr_koef[i][j] = tm[k++];
                                }
                        }
```

```cpp
                        for(i=0; i<n; i++)
                        {
                                for(j=0; j<m; j++)
                                {
                                        matr_ind[i][j]=0;
                                        matr_pm[i][j]=0;
                                }
                        }
                        for(i=0; i<n; i++)
                        {
                                u[i]=100;
                        }
                        for(j=0; j<m; j++)
                        {
                                v[j]=100;
                        }
                }
                */
        }
private: System::Void Form1_Load(System::Object^  sender, System::EventArgs^  e) {
//              button_open->Hide();
        }
Void rishay(){

array<Int32>^u;
array<Int32>^b;
array<Int32>^a;
array<Int32>^v;
array<Int32>^tm;
array<Int32,2>^matr_koef,^matr,^matr_ind,^matr_pm;
Int32 n,m,F,min2,min,i,j,sum_a,sum_b,ind_i,ind_j;
    n = Convert::ToInt32(textBox_n->Text);
        m = Convert::ToInt32(textBox_m->Text);
        tm = gcnew array<Int32>(1200);
        u = gcnew array<Int32>(200);
        b = gcnew array<Int32>(200);
        a = gcnew array<Int32>(200);
        v = gcnew array<Int32>(200);
        matr_koef = gcnew array<Int32,2>(200,200);
        matr = gcnew array<Int32,2>(200,200);
        matr_ind = gcnew array<Int32,2>(200,200);
        matr_pm = gcnew array<Int32,2>(200,200);
        F=0,min2=0;
        sum_a=0,sum_b=0,ind_i=0,ind_j=0;
        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
                {
                        matr_ind[i,j]=0;
                        matr_pm[i,j]=0;
                }
        }
        for(i=0; i<n; i++)
        {
                u[i]=100;
        }
        for(j=0; j<m; j++)
        {
                v[j]=100;
        }
```

```cpp
        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++){
                        matr_koef[i,j] = Convert::ToInt32(dataGridView_read_fill->Rows[i]-
>Cells[j]->Value);
                }
        }
        for(i=0; i<m; i++)
                a[i] = Convert::ToInt32(dataGridView_read_right->Rows[i]->Cells[0]->Value);
        for(i=0; i<n; i++)
                b[i] = Convert::ToInt32(dataGridView_read_left->Rows[i]->Cells[0]->Value);


        for(i=0; i<m; i++)
                sum_a+=a[i];
        for(i=0; i<n; i++)
                sum_b+=b[i];
        if(sum_a>sum_b)
        {
                richTextBox_result->Text = "Matritsa to\'g\'ri emas";

        }else
        if(sum_a<sum_b)
        {
                richTextBox_result->Text = "Matritsa to\'g\'ri emas";
        }else{
                        richTextBox_result->Text = "Matritsa to\'g\'ri \n";
                        for(i=0; i<n; i++)
                        {
                                min = 500;
                                for(j=0; j<m; j++)
                                {
                                        if(matr_koef[i,j]<min)
                                        {
                                                min=matr_koef[i,j];
                                                ind_i=i;
                                                ind_j=j;
                                        }
                                }
                                matr_ind[ind_i,ind_j]++;
                        }

                        for(j=0; j<m; j++)
                        {
                                min=500;
                                for(i=0; i<n; i++)
                                {
                                        if(matr_koef[i,j]<min)
                                        {
                                                min=matr_koef[i,j];
                                                ind_i=i;
                                                ind_j=j;
                                        }
                                }
                                matr_ind[ind_i,ind_j]++;
                        }

                        for(i=0; i<n; i++)
                        {
```

```
                for(j=0; j<m; j++)
                {
                        if(matr_ind[i,j]==2)
                                if(a[i]>=b[j])
                                {
                                        matr[i,j]=a[i]-(a[i]-b[j]);
                                        a[i]=a[i]-b[j];
                                        b[j]=0;
                                }
                                else
                                {
                                        matr[i,j]=b[j]-(b[j]-a[i]);
                                        b[j]=b[j]-a[i];
                                        a[i]=0;
                                }
                }
        }

        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
                {
                        if(matr_ind[i,j]==1)
                                if(a[i]>=b[j])
                                {
                                        matr[i,j]=a[i]-(a[i]-b[j]);
                                        a[i]=a[i]-b[j];
                                        b[j]=0;
                                }
                                else
                                {
                                        matr[i,j]=b[j]-(b[j]-a[i]);
                                        b[j]=b[j]-a[i];
                                        a[i]=0;
                                }
                }
        }
        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
                {
                        if(matr_ind[i,j]==0)
                                if(a[i]>=b[j])
                                {
                                        matr[i,j]=a[i]-(a[i]-b[j]);
                                        a[i]=a[i]-b[j];
                                        b[j]=0;
                                }
                                else
                                {
                                        matr[i,j]=b[j]-(b[j]-a[i]);
                                        b[j]=b[j]-a[i];
                                        a[i]=0;
                                }
                }
        }

        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
```

```cpp
                {
                        richTextBox_result->Text = richTextBox_result->Text + matr[i,j]+" ";
                }
                richTextBox_result->Text = richTextBox_result->Text +"\n";
        }
        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
                {
                        F+=matr[i,j]*matr_koef[i,j];
                }
        }
        richTextBox_result->Text = richTextBox_result->Text + "F(x)="+F+"\n";
        u[0]=0;
        richTextBox_result->Text = richTextBox_result->Text + "Patensial V:";
        for(i=0; i<n; i++)
        {
                richTextBox_result->Text = richTextBox_result->Text + v[i]+" ";
        }
        richTextBox_result->Text = richTextBox_result->Text + "\n"+"Potensial U:";
        for(j=0; j<m; j++)
        {
                richTextBox_result->Text = richTextBox_result->Text + u[j]+" ";
        }
        richTextBox_result->Text = richTextBox_result->Text + "\n";


        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
                {
                        if((matr[i,j]!=0)&&(v[j]==100)&(u[i]!=100))
                        {
                                v[j]=matr_koef[i,j]-u[i];
                        }
                        if((matr[i,j]!=0)&&(v[j]!=100)&(u[i]==100))
                        {
                                u[i]=matr_koef[i,j]-v[j];
                        }
                }
        }
        for(i=0; i<n; i++)
        {
                for(j=0; j<m; j++)
                {
                        if((u[i]==100)&&(v[j]!=100)&&(matr[i,j]!=0))
                                u[i]=matr_koef[i,j]-v[j];
                        if((u[i]!=100)&&(v[j]==100)&&(matr[i,j]!=0))
                                v[j]=matr_koef[i,j]-u[i];
                }
        }
```

```cpp
                            for(i=0; i<n; i++)
                            {
                                    for(j=0; j<m; j++)
                                    {
                                            if((matr[i,j]==0)&&(u[i]+v[j]-
matr_koef[i,j]>0.1))
                                            {
                                                    richTextBox_result->Text =
richTextBox_result->Text + "Potensial reja satri "+i+" va ustuni "+j+"\n";
                                                    matr_pm[i,j]++;
                                            }
                                    }
                            }
                    }
            }
private: System::Void pictureBox_info_Click(System::Object^  sender, System::EventArgs^
e) {
                    about^ a = gcnew about();
                    a->ShowDialog();
            }
private: System::Void panel_change_Paint(System::Object^  sender,
System::Windows::Forms::PaintEventArgs^  e) {
            }
};
}
```