

Шаг 10. $u_{ij}^k = c_{ij}^k / d_{ii}^k, j = 1, \dots, n,$
 $U^k,$
 $c_{jj}^k = c_{jj}^k - u_{ij}^k c_{ij}^k, j = i+1, \dots, n,$
 $c_j^k = c_j^k - u_{ij}^k c_i^k, j = i + 1, \dots, n, i = i + 1$

Шаг 11. $\gamma^k = \max_{1 \leq i \leq n} g_i^k, uk = \gamma^k u^k$

$$F(x) = \sum_{j=1}^{10} [\exp(-0.2j) + 2 \exp(-0.4j) - x_1 \exp(-0.2jx_2) - x_3 \exp(-0.2jx_4)]^2, \quad [26]$$

Задача 12 ():

$$F(x) = \sum_{j=1}^{10} [\exp(-0.2j) + 2 \exp(-0.4j) - x_1 \exp(-0.2jx_2) - x_3 \exp(-0.2jx_4)]^2,$$

$$x^0 = (0.5 \ 0 \ 2.5 \ 3)^T, x^* = (1 \ 1 \ 2 \ 2)^T.$$

Задача 13 ():

$$F(x) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2 + 90(x_4 - x_3^2)^2 + (1 - x_3)^2 + 10.1((x_2 - 1)^2 + (x_4 - 1)^2) + 19.8(x_2 - 1)(x_4 - 1),$$

$$x^0 = (-3 \ -1 \ -3 \ -1)^T,$$

$$x^* = (1 \ 1 \ 1 \ 1)^T, F(x^*) = 0.$$

Задача 14 ():

$$F(x) = (10(x_1 - x_2)^2 + (x_1 - 1)^2)^4,$$

$$x^0 = (-1.2 \ 0)^T, x^* = (1 \ 1)^T, F(x^*) = 0.$$

Программные реализации.
 Nmbm NmbmApp –

() [27, 28].

NmbmApp
 Nmbm

Visual Basic .NET,
 – Microsoft Visual Studio 2010.

<http://crm.ics.org.ru>

GNU.

NmbmsApp
 NmbmApp

. NmbmsApp –

() 3).

http://www.swsys.ru/uploaded/image/2017_2/2017-2-dop/6.jpg/.

[29].

$F(x)$ $x,$

: Nmbm, NmbmApp [6, 9, 14, 27, 28]
 NmbmsApp.

Таблица 1

Результаты численных исследований задач 12, 13, 14

Table 1

The results of numerical studies for problems 12, 13, 14

Метод	Функция	k	δF	δx	k ₀
NmbmApp		40	4.23·10 ⁻³³	0	1341
NmbmsApp		26	4.23·10 ⁻³³	0	837
Nmbm		13	0	0	36
NmbmApp		14	4.4·10 ⁻²⁷	2·10 ⁻¹⁴	470
NmbmsApp		16	0	0	325
Nmbm		12	0	0	163
NmbmApp		13	4.3·10 ⁻⁶¹	8·10 ⁻⁹	323
NmbmsApp		13	4.81·10 ⁻⁶¹	8·10 ⁻⁹	232

