## Задания по блоку Численные методы линейной алгебры

**Задание 1.** Решить систему линейных алгебраических уравнений **методом Гаусса**. Вычислить определитель матрицы. Для заданной матрицы **методом Гаусса** вычислить обратную матрицу (Таблица 1).

**Задание 2.** Выполнить **UL разложение** и найти решение системы линейных алгебраических уравнений. Вычислить определитель матрицы и построить обратную матрицу (Таблица 1).

**Таблица заданий 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **№** | **Система уравнений** | | **№** | **Система уравнений** |
| 1 |  | | 2 |  |
| 3 |  | | 4 |  |
| 5 |  | | 6 |  |
| 7 |  | | 8 |  |
| 9 |  | | 10 |  |
| 11 |  | | 12 |  |
| 13 |  | | 14 |  |
| 15 | |  | 16 |  |
| 17 | |  | 18 |  |
| 19 | |  | 20 |  |
| 21 | |  | 22 |  |
| 23 | |  | 24 |  |

**Задание 3.** Методом **прогонки** найти решение системы линейных алгебраических уравнений. Вычислить определитель матрицы (Таблица 2).

**Таблица заданий 2**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Система уравнений** | **№** | **Система уравнений** |
| 1 |  | 2 |  |
| 3 |  | 4 |  |
| 5 |  | 6 |  |
| 7 |  | 8 |  |
| 9 |  | 10 |  |
| 11 |  | 12 |  |
| 13 |  | 14 |  |
| 15 |  | 16 |  |
| 17 |  | 18 |  |
| 19 |  | 20 |  |
| 21 |  | 22 |  |
| 23 |  | 24 |  |

**Задание 4.** Методом **простых итераций** решить систему линейных алгебраических уравнений с погрешностью . Указать количество итераций (Таблица 3).

**Задание 5.** Методом **Зейделя** решить систему линейных алгебраических уравнений с погрешностью . Указать количество итераций (Таблица 3).

**Таблица заданий 3**

|  |  |  |  |
| --- | --- | --- | --- |
| **№** | **Система уравнений** | **№** | **Система уравнений** |
| 1 |  | 2 |  |
| 3 |  | 4 |  |
| 5 |  | 6 |  |
| 7 |  | 8 |  |
| 9 |  | 10 |  |
| 11 |  | 12 |  |
| 13 |  | 14 |  |
| 15 |  | 16 |  |
| 17 |  | 18 |  |
| 19 |  | 20 |  |
| 21 |  | 22 |  |
| 23 |  | 24 |  |

**Задание 6.** Определитьсобственные значения матрицы с точностью не более . Реализовать **алгоритм QR** – разложения матриц. (Таблица 4).

**Таблица заданий 4**

|  |  |  |  |
| --- | --- | --- | --- |
| **№** | **Матрица** | **№** | **Матрица** |
| 1 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 3 | -5 | -4 | 7 | 8 | | 4 | 3 | 1 | 2 | 2 | | -2 | 3 | 4 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | -2 | | 2 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | -3 | -5 | 3 | 0 | 6 | | -4 | 3 | 1 | -2 | 2 | | 0 | -1 | 2 | 3 | 5 | | 1 | 2 | 4 | 0 | -3 | | 1 | -1 | -5 | -1 | 2 | |
| 3 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 3 | 5 | 0 | 7 | 1 | | 4 | 3 | 1 | 0 | 2 | | 1 | 1 | 4 | 7 | 0 | | 2 | 5 | 4 | 1 | 3 | | 1 | 3 | -5 | 1 | 2 | | 4 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 17 | -5 | -4 | 3 | 4 | | 4 | 11 | 1 | 2 | 2 | | -2 | 3 | 3 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 1 | 3 | -5 | 3 | -2 | |
| 5 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 11 | -5 | -4 | 7 | 1 | | 4 | 21 | 1 | 2 | 2 | | -2 | 3 | 4 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | 4 | | 6 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 0 | -5 | -10 | 11 | 8 | | 4 | 3 | 9 | 2 | 2 | | -2 | 3 | 4 | 7 | 5 | | 2 | 1 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | -2 | |
| 7 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 3 | -5 | -4 | 7 | -1 | | -1 | 17 | 1 | 2 | 2 | | -2 | 3 | 4 | -1 | 5 | | 2 | -1 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | -2 | | 8 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | -1 | -5 | -4 | 4 | 0 | | 4 | 11 | -2 | 2 | 2 | | -2 | 3 | 5 | 0 | 5 | | 2 | 5 | -4 | -2 | 3 | | 1 | 3 | -5 | 1 | 2 | |
| 9 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 4 | -5 | -3 | 7 | 4 | | 13 | 3 | 1 | 2 | 2 | | -2 | 11 | 4 | 7 | 5 | | 2 | 5 | -4 | 10 | 3 | | 1 | 3 | -5 | 1 | -2 | | 10 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 22 | -5 | -3 | 6 | 7 | | 4 | 13 | 1 | 2 | 2 | | -2 | 3 | 4 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | -2 | |
| 11 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | -3 | -5 | -4 | 0 | -3 | | 11 | 7 | 1 | 2 | 2 | | -2 | 0 | -1 | 6 | 5 | | 3 | 5 | -4 | 1 | 0 | | 4 | 3 | -5 | 3 | -2 | | 12 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 2 | -5 | -4 | 6 | 1 | | 4 | 3 | 1 | -5 | 2 | | -2 | 3 | 4 | 2 | -5 | | 2 | 0 | -4 | 1 | 3 | | 1 | 3 | -5 | -7 | -2 | |
| 13 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 2 | -5 | -4 | 3 | 1 | | 4 | 3 | 1 | -5 | 2 | | -2 | 3 | 4 | 2 | -5 | | 2 | 0 | -4 | 1 | 3 | | 1 | 3 | -7 | -2 | -2 | | 14 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 5 | 3 | -4 | 5 | 0 | | 4 | 0 | 1 | 2 | 2 | | 0 | 3 | 4 | 6 | 5 | | 2 | 5 | -4 | 0 | 4 | | 1 | 3 | -5 | 7 | 8 | |
| 15 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 1 | -5 | -4 | 11 | 1 | | 4 | 3 | 1 | 2 | 2 | | -2 | -13 | 9 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | -2 | | 16 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 5 | -4 | -4 | 7 | 1 | | 4 | 3 | 1 | 2 | 3 | | -2 | 0 | 4 | 2 | 7 | | -3 | 5 | -4 | -6 | 3 | | 7 | 3 | -5 | 0 | 8 | |
| 17 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 3 | -5 | -4 | -23 | 12 | | 4 | 3 | 0 | 2 | 2 | | -2 | 0 | 6 | -3 | 5 | | 2 | 5 | 2 | 1 | 3 | | 1 | 3 | 2 | -1 | -2 | | 18 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 1 | -5 | -4 | 11 | 8 | | 4 | 3 | 1 | 2 | 2 | | -2 | 3 | 13 | 7 | 5 | | 2 | -12 | -4 | 1 | 3 | | 1 | 3 | -5 | 1 | -2 | |
| 19 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 3 | -5 | 0 | 7 | 3 | | 9 | 0 | 1 | 2 | 2 | | -2 | 3 | 4 | 11 | 5 | | 15 | 5 | -4 | 2 | 3 | | 1 | 3 | -5 | 1 | -2 | | 20 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 1 | -5 | -4 | 3 | 9 | | 0 | 7 | 1 | 12 | 2 | | -3 | 3 | 0 | 7 | 5 | | 2 | 8 | -4 | 1 | 3 | | 11 | 3 | -5 | 5 | -2 | |
| 21 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 2 | -5 | -4 | 7 | 5 | | 13 | 3 | 1 | 2 | 2 | | -2 | 1 | 13 | 6 | 5 | | 2 | 5 | -4 | 1 | 3 | | 7 | 3 | -5 | 1 | -7 | | 22 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 10 | -5 | -4 | 0 | 5 | | 4 | 12 | 1 | 2 | 2 | | -2 | 0 | -14 | 7 | 5 | | 2 | 5 | -4 | 11 | 3 | | 1 | 3 | -5 | 1 | -2 | |
| 23 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 8 | -5 | -4 | 7 | 8 | | 4 | 3 | 1 | 2 | 2 | | 3 | 4 | 0 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 3 | 3 | -5 | 6 | -2 | | 24 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 13 | -5 | -4 | 7 | 8 | | 4 | 24 | 1 | 2 | 2 | | -2 | 3 | 4 | 7 | 5 | | 2 | 5 | -4 | 1 | 3 | | 1 | 3 | 5 | 1 | -2 | |