# 第三次作业答案

## P108 6(2).

Gauss-Seidel 迭代矩阵

$$M = \begin{pmatrix} 0 & -t \\ 0 & \frac{1}{2}t^2 \end{pmatrix}$$

迭代收敛 $\rho(M) = \frac{t^2}{2} < 1 \Leftrightarrow |t| < \sqrt{2}$

## P108 7.

(1)

$$R = I - D^{-1}A = \begin{pmatrix} 0 & -2 & 2 \\ -1 & 0 & -1 \\ -2 & -2 & 0 \end{pmatrix}, \rho(R) = 0$$

Jacobi 迭代收敛。

$$S = I - (D+L)^{-1}A = \begin{pmatrix} 0 & -2 & 2 \\ 0 & 2 & -3 \\ 0 & 0 & 2 \end{pmatrix}, \rho(S) = 2$$

Gauss-Seidel 迭代不收敛。

(2)

$$R = I - D^{-1}A = \begin{pmatrix} 0 & \frac{1}{2} & -\frac{1}{2} \\ -1 & 0 & -1 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}, \rho(R) = \frac{\sqrt{5}}{2}$$

Jacobi 迭代不收敛。

$$S = I - (D+L)^{-1}A = \begin{pmatrix} 0 & \frac{1}{2} & -\frac{1}{2} \\ 0 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & -\frac{1}{2} \end{pmatrix}, \rho(S) = \frac{1}{2}$$

Gauss-Seidel 迭代收敛。

## P94 1(1).

注意要求四位有效数字。

Gauss 消元法

$$\begin{pmatrix} 0.002 & 87.13 & 87.15 \\ 4.453 & -7.260 & 37.27 \end{pmatrix} \to \begin{pmatrix} 0.002 & 87.13 & 87.15 \\ 0 & -1.940 \times 10^5 & -1.940 \times 10^5 \end{pmatrix} \Rightarrow \begin{cases} x_1 = 10.00 \\ x_2 = 1.000 \end{cases}$$

列主元法

$$\begin{pmatrix} 0.002 & 87.13 & 87.15 \\ 4.453 & -7.260 & 37.27 \end{pmatrix} \to \begin{pmatrix} 0 & 87.13 & 87.13 \\ 4.453 & -7.260 & 37.27 \end{pmatrix} \Rightarrow \begin{cases} x_1 = 10.00 \\ x_2 = 1.000 \end{cases}$$

## P94 3(2).

$$\begin{vmatrix} 10 & -2 & -1 \\ -2 & 10 & -1 \\ -1 & -2 & 5 \end{vmatrix} = \begin{vmatrix} 10 & -2 & -1 \\ 0 & 9.6 & -1.2 \\ 0 & -2.2 & 4.9 \end{vmatrix} = \begin{vmatrix} 10 & -2 & -1 \\ 0 & 9.6 & -1.2 \\ 0 & 0 & 4.625 \end{vmatrix} = 444$$