1586. $A = \begin{pmatrix} 17 & -8 & 4 \\ -8 & 17 & -4 \\ 4 & -4 & 11 \end{pmatrix}$ $A = A^T \Rightarrow \varphi$ — самоспряжений

$\Rightarrow \exists$ о. н. б. з власних векторів

$$|A - \lambda E| = \begin{vmatrix} 17-\lambda & -8 & 4 \\ -8 & 17-\lambda & -4 \\ 4 & -4 & 11-\lambda \end{vmatrix} = (17-\lambda)^2(11-\lambda) + 128 + 128 -$$

$$- 16(17-\lambda) - 16(17-\lambda) - 64(11-\lambda) = -\lambda^3 + 45\lambda^2 - 567\lambda + 2187 = 0$$

$$(\lambda - 27)(\lambda - 9)^2 = 0$$

$$\lambda_1 = 27, \quad \lambda_2 = 9$$

$\lambda_1 = 27$

$$A - 27E = \begin{pmatrix} -10 & -8 & 4 \\ -8 & -10 & -4 \\ 4 & -4 & -16 \end{pmatrix} \sim \begin{pmatrix} 1 & -1 & -4 \\ 0 & -18 & -36 \\ -10 & -8 & 4 \end{pmatrix} \sim \begin{pmatrix} 1 & -1 & -4 \\ 0 & -\cancel{18}\,1 & -2 \\ \cancel{0} & \cancel{-18} & \cancel{-36} \end{pmatrix} \sim \begin{pmatrix} 1 & -1 & -4 \\ 0 & -1 & -2 \end{pmatrix}$$

ФСР:

| $x_1$ | $x_2$ | $x_3$ |
|---|---|---|
| 2 | -2 | -1 |

$a_1 = (2, -2, 1)$

$e_1 = \frac{a_1}{|a_1|} = \left(\frac{2}{3}, -\frac{2}{3}, \frac{1}{3}\right)$

$\lambda_2 = 9$

$A - 9E = \begin{pmatrix} 8 & -8 & 4 \\ -8 & 8 & -4 \\ 4 & -4 & 2 \end{pmatrix} \sim \begin{pmatrix} 2 & -2 & 1 \end{pmatrix}$

ФРС:

| $x_1$ | $x_2$ | $x_3$ |
|---|---|---|
| 1 | 1 | 0 |
| 1 | -1 | -4 |

$a_2 = (1, 1, 0)$

$a_3 = (1, -1, -4)$

$e_2 = \left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0\right)$

$e_3 = \left(\frac{1}{\sqrt{18}}, -\frac{1}{\sqrt{18}}, -\frac{4}{\sqrt{18}}\right)$

$B = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{pmatrix} \quad Q = (e_1 | e_2 | e_3) = \begin{pmatrix} \frac{2}{3} & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{18}} \\ -\frac{2}{3} & \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{18}} \\ \frac{1}{3} & 0 & -\frac{4}{\sqrt{18}} \end{pmatrix}$