Step-1

Given matrix is
$$A = \begin{pmatrix} 1 & b & -b \\ b & 1 & b \\ -b & b & 1 \end{pmatrix}$$
with $|b| < 1$.

$$|A| = 1(1 - b^2) - b(b + b^2) - b(b^2 + b)$$

$$= 1 - b^2 - b^2 - b^3 - b^3 - b^2$$

$$= -2b^3 - 3b^2 + 1$$

Therefore, the determinant of matrix A is $-2b^3 - 3b^2 + 1$

Step-2

Let $-2b^3 - 3b^2 + 1 < 0$

Solving this using CAS

We get $b > \dfrac{1}{2}$, so let $b = \dfrac{2}{3}$.

Substitute this value in the given matrix.

So,

$$A = \begin{pmatrix} 1 & \dfrac{2}{3} & -\dfrac{2}{3} \\ \dfrac{2}{3} & 1 & \dfrac{2}{3} \\ -\dfrac{2}{3} & \dfrac{2}{3} & 1 \end{pmatrix}$$

Then the required matrix is
$$A = \begin{pmatrix} 1 & \dfrac{2}{3} & -\dfrac{2}{3} \\ \dfrac{2}{3} & 1 & \dfrac{2}{3} \\ -\dfrac{2}{3} & \dfrac{2}{3} & 1 \end{pmatrix}.$$