$$\Lambda = \frac{1}{4} \underbrace{\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix}}_{\mathbf{W}^*} \underbrace{\begin{bmatrix} a & b & c & d \\ d & a & b & c \\ c & d & a & b \\ b & c & d & a \end{bmatrix}}_{\mathbf{P}} \underbrace{\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & j & -1 & -j \\ 1 & -1 & 1 & -1 \\ 1 & -j & -1 & j \end{bmatrix}}_{\mathbf{W}} =$$

$$\frac{1}{4} \begin{bmatrix} a+d+c+b & b+a+d+c & c+b+a+d & d+c+b+a \\ a-jd-c+jb & b-ja-d+jc & c-jb-a+jd & d-jc-b+ja \\ a-d+c-b & b-a+d-c & c-b+a-d & d-c+b-a \\ a+jd-c-jb & b+ja-d-jc & c+jb-a-jd & d+jc-b-ja \end{bmatrix} \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & j & -1 & -j \\ 1 & -1 & 1 & -1 \\ 1 & -j & -1 & j \end{bmatrix}$$

$$\begin{aligned} (\Lambda)_{00} &= [(a+d+c+b)+(b+a+d+c)+(c+b+a+d)+(d+c+b+a)]/4 \\ (\Lambda)_{11} &= [(a-jd-c+jb)+j(b-ja-d+jc)-(c-jb-a+jd)-j(d-jc-b+ja)]/4 \\ (\Lambda)_{22} &= [(a-d+c-b)-(b-a+d-c)+(c-b+a-d)-(d-c+b-a)]/4 \\ (\Lambda)_{33} &= [(a+jd-c-jb)-j(b+ja-d-jc)-(c+jb-a-jd)+j(d+jc-b-ja)]/4 \end{aligned}$$

$$\begin{aligned} \lambda_0 &= (a+d+c+b+b+a+d+c+c+b+a+d+d+c+b+a)/4 \\ \lambda_1 &= (a-jd-c+jb+jb+a-jd-c-c+jb+a-jd-jd-c+jb+a)/4 \\ \lambda_2 &= (a-d+c-b-b+a-d+c+c-b+a-d-d+c-b+a)/4 \\ \lambda_3 &= (a+jd-c-jb-jb+a+jd-c-c-jb+a+jd+jd-c-jb+a)/4 \end{aligned}$$

$$\begin{aligned} \lambda_0 &= a+d+c+b \\ \lambda_1 &= a-jd-c+jb \\ \lambda_2 &= a-d+c-b \\ \lambda_3 &= a+jd-c-jb \end{aligned}$$

$$\begin{bmatrix} \lambda_0 \\ \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{bmatrix} = \underbrace{\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{bmatrix}}_{\mathbf{W}^*} \begin{bmatrix} a \\ d \\ c \\ b \end{bmatrix}$$