Converting the equation in Table 1 of the paper "Optimal Robust Filtering for Systems subject to Uncertainties" into systems of linear equations in the form of $A\mathbf{x} = B$; Givens rotation is used to obtain QR decomposition which is followed up by back substitution to obtain $\widehat{\mathbf{x}}_{k+1|k+1}$ and $P_{k+1|k+1}$.

$$\underbrace{\begin{bmatrix} P_{k|k} & 0 & 0 & 0 & 0 & I & 0 & 0 & 0 \\ 0 & Q_k & 0 & 0 & 0 & 0 & I & 0 & 0 \\ 0 & 0 & R_{k+1} & 0 & 0 & 0 & 0 & I & 0 \\ 0 & 0 & 0 & 0 & 0 & \mathcal{F}_k & \mathcal{G}_k & 0 & l \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & \mathcal{K}_{k+1} & \mathcal{H}_{k+1} \\ I & 0 & 0 & \mathcal{F}_k^T & 0 & 0 & 0 & 0 & 0 \\ 0 & I & 0 & \mathcal{G}_k^T & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & I & 0 & \mathcal{K}_{k+1}^T & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & l^T & \mathcal{H}_{k+1}^T & 0 & 0 & 0 & 0 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} \lambda_1 & \mu_1 \\ \lambda_2 & \mu_2 \\ \lambda_3 & \mu_3 \\ \lambda_4 & \mu_4 \\ \lambda_5 & \mu_5 \\ \lambda_6 & \mu_6 \\ \lambda_7 & \mu_7 \\ \lambda_8 & \mu_8 \\ \widehat{\mathbf{x}}_{k+1|k+1} & P_{k+1|k+1} \end{bmatrix}}_{\mathbf{x}}$$

$$= \underbrace{\begin{bmatrix} \widehat{\mathbf{x}}_{k|k} & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ \mathcal{Z}_{k+1} & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & -I \end{bmatrix}}_{B}$$