1 Noise and Disturbance

$$\dot{x} = Ax + Bw,\ y = Cx + Dw + n$$

and observer,

$$\dot{\hat{x}} = A\hat{x} + L(y - \hat{y}),\ \hat{y} = C\hat{x}$$

where error dynamics are,

$$\begin{aligned}
\dot{e} &= Ax + Bw - A\hat{x} - L(y - \hat{y}) \\
&= Ae + Bw - L(Cx + Dw + n - C\hat{x}) \\
&= Ae + Bw - LCe - LDw - Ln \\
&= (A - LC)e + (B - LD)w - Ln
\end{aligned}$$