Observer State Feedback Control

$$u(t) = -K\hat{x}(t) + v(t)$$

⇒ The overall system is then described by

$$\dot{x} = Ax + B[-K\hat{x} + vt]$$

$$\dot{\hat{x}} = A\hat{x} + B[-K\hat{x} + v] + L[y - C\hat{x}]$$

⇒ These equations can be written as

$$\begin{bmatrix} \dot{x}(t) \\ \dot{\hat{x}}(t) \end{bmatrix} = \begin{bmatrix} A & -BK \\ LC & A-LC-BK \end{bmatrix} \begin{bmatrix} x(t) \\ \hat{x}(t) \end{bmatrix} + \begin{bmatrix} B \\ B \end{bmatrix} v(t)$$

⇒ Now the overall system is 2n dimensional.

↳ 2n eigenvalues of this system are obtained from the characteristic equation.

$$\det[\lambda I_n - (A-BK)] \det[\lambda I_n - (A-LC)] = 0$$