Prob 4.15, part a

$\dot{\tilde{x}} = [A - GC]\tilde{x}$ $\qquad C = [1 \;\; 1 \;\; 0]$

$$A = \begin{bmatrix} 0 & k_1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \qquad G = \begin{bmatrix} g_1 \\ g_2 \\ g_3 \end{bmatrix}$$

$$A + GC = A_c = \begin{bmatrix} 0 & k_1 + g_1 & 0 \\ 0 & g_2 & 1 \\ 0 & g_3 & 0 \end{bmatrix}$$

$$\det(\lambda I - A_c) = \begin{vmatrix} \lambda & k_1 + g_1 & 0 \\ 0 & \lambda - g_2 & 0 \\ 0 & 0 & \lambda \end{vmatrix}$$

$$= \lambda(\lambda - g_2)(\lambda) = \lambda^2(\lambda - g_2) \Rightarrow \lambda_{1,2} = 0 \;\&\; \lambda_3 = g_2$$

→ EXCLUDES ASYMPTOTIC STABILITY of ESTIMATION ERROR $\tilde{x}(t)$

$$\lim_{t \to \infty} \tilde{x}(t) \neq 0$$

$\hat{x}(t)$ DOES NOT CONVERGE TO $x(t)$!

UNABLE TO RECONSTRUCT SYSTEM STATE!