SFWR ENG 3DX4 – Assignment 5

1. Consider the following state-space model:

$$\begin{aligned} \dot{x} &= \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & -6 & 0 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \\ y &= \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} x \end{aligned}$$

   Design an observer to place the observer poles at -10, -10, -15.

2. Given the plant

$$\begin{aligned} \dot{x} &= \begin{bmatrix} -1 & 1 \\ 0 & 2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \\ y &= \begin{bmatrix} 1 & 1 \end{bmatrix} x \end{aligned}$$

   Design an integral controller to yield a 10% overshoot, 0.5 second settling time and zero steady-state error for a step input.