

ECED 4601 Digital Control Systems

Assignment #4

<http://www.jasongu.org/4601/assignments.html>

Due date: November 7 2017. Late submission will not be accepted.

Assignment #4 contains the following problems:

- 1) Problem B-5-2: obtain a state space representation of the following pulse transfer function system in the observable canonical form.

$$\frac{Y(z)}{U(z)} = \frac{z^{-2} + 4z^{-3}}{1 + 6z^{-1} + 11z^{-2} + 6z^{-3}}$$

- 2) B-5-15 Obtain the pulse function of the system defined by the equations

$$x(k+1) = Gx(k) + Hu(k)$$

$$y(k) = Cx(k) + Du(k)$$

Where ,

$$G = \begin{bmatrix} -a_1 & -a_2 & -a_3 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}, \quad H = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

$$, C = [b_1 - a_1b_0 \quad b_2 - a_2b_0 \quad b_3 - a_3b_0]$$

$$D = b_0$$

- 3) B-5-21 Determine a Liapunov function $V(x)$ for the following system:

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 1 & -1.2 \\ 0.5 & 0 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$