

# ECED 4601 Digital Control Systems

## Assignment #6

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

**Due date: November 30. Late submission will not be accepted.**

Assignment #6 contains the following problems:

- 1) Problem B-7-2: Consider the following Diophantine equation

$$\alpha(z)A(z) + \beta(z)B(z) = 1$$

Where

$$A(z) = z^2 - 0.7z + 0.1$$

$$B(z) = z^2 + 0.2z - 0.24$$

$$\alpha(z) = \alpha_0 z + \alpha_1$$

$$\beta(z) = \beta_0 z + \beta_1$$

Solve this Diophantine equation for  $\alpha(z)$  and  $\beta(z)$

- 2) B-7-7 consider the plant defined by

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

$$y(k) = Cx(k)$$

$$\text{Where } G = \begin{bmatrix} 0 & 0 & -0.25 \\ 1 & 0 & 0 \\ 0 & 1 & 0.5 \end{bmatrix}, H = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, C = [1 \quad 0 \quad 0]$$

Design a control system for the plant. For the pole placement part, we want to have three closed-loop poles at the origin, or

$$H(z) = z^3$$

And for the characteristic equation for the minimum order observer, we want to have

$$F(z) = z^2$$

Use the polynomial equations approach to the design.