Homework 5

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Problem 1. Draw a flowchart from which the following compensator can be programmed if the sampling interval is 0.1 seconds.

$$G_c(z) = \frac{1899z^2 - 3761z + 1861}{z^2 - 1.908z + 0.9075}$$

$$G_c(z) = \frac{X(z)}{E(z)} = \frac{1899z^2 - 3761z + 1861}{z^2 - 1.908z + 0.9075}$$

Cross-multiply and obtain

$$(z^2 - 1.908z + 0.9075)X(z) = (1899z^2 - 3761z + 1861)E(z)$$

Solve for the highest power of z operating on the output, $X(z)$,

$$z^2 X(z) = (1899z^2 - 3761z + 1861)E(z) - (-1.908z + 0.9075)X(z)$$

Solving for X(z) on the left-hand side,

$$X(z) = (1899 - 3761z^{-1} + 1861z^{-2})E(z) - (-1.908z^{-1} + 0.9075z^{-2})X(z)$$

Taking the inverse z-transform and substituting in $T = 0.1$,

$$x^*(t) = 1899e^*(t) - 3761e^*(t - 0.1) + 1861e^*(t - 0.2) + 1.908x^*(t - 0.1) - 0.9075x^*(t - 0.2)$$