eenhspkjun14 Q1, 2 doodkb.

2014 Q1

Critically damped: $\zeta = 1$

$T_s = 0.5 = \frac{4}{\zeta \omega_n} \Rightarrow \omega_n = 8.$

$P_c = [B \quad AB \quad A^2B]$.

$= \begin{bmatrix} 0 & 0 & 2 \\ 0 & 1 & -6 \\ 1 & -4 & 16 \end{bmatrix}$

$\varphi(\lambda) = s^2 + 2\omega_n s + \omega_n^2$

$= s^2 + 16s + 64$

$k = [0 \; 0 \; 1] P_c^{-1} \varphi(A)$

$[0.5 \quad 0 \quad 0] \cdot A^2 + 16A + 64I$

$P_c^{-1} = \begin{bmatrix} 4 & 4 & 1 \\ 3 & 1 & 0 \\ 0.5 & 0 & 0 \end{bmatrix}$

$k = [33 \quad -4 \quad 32]$.

Q2

2.1. $x(k) + x(k-1) - x(k-2) = e(k-1) + 2e(k)$

$X(z) + X(z)z^{-1} - X(z)z^{-2} = E(z)z^{-1} + 2E(z)$

$X(z)[1 + z^{-1} - z^{-2}] = E(z)[z^{-1} + 2]$.

$\frac{X(z)}{E(z)} = \frac{z^{-1} + 2}{1 + z^{-1} - z^{-2}}$.

$= \frac{z + 2z^2}{z^2 + z - 1}$

2.2.