EE4002 Control Engineering Summer '08

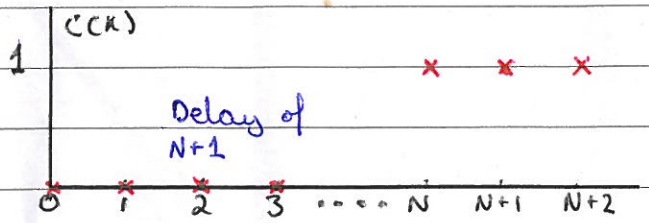
2 c) Deadbeat Control Specification:

- Settling time is finite
- Rise time is minimum
- Zero steady state error

} For a step change in setpoint

$$G(s)H(s) = \frac{B(s)}{A(s)} e^{-(NT+\Theta)s}$$

$$G(z) = \mathcal{Z}\left\{ \frac{1-e^{-sT}}{s} \cdot \frac{B(s)}{A(s)} e^{-NTs} \right\}_{m=1-\frac{\Theta}{T}} = (1-z^{-1}) z^{-N} \mathcal{Z}\left\{ \frac{B(s)}{sA(s)} \right\}_m$$



$$r = \begin{cases} 0 & k < 0 \\ 1 & k \geq 0 \end{cases}$$

$$R(z) = \frac{1}{1-z^{-1}} \qquad C(z) = z^{-(N+1)} R(z)$$

$$\frac{C(z)}{R(z)} = \frac{1}{z^{(N+1)}} = z^{-(N+1)}$$

$$D(z) = \frac{1}{G_m(z)} \frac{C/R}{1-C/R} = \frac{1}{G_m(z)} \frac{z^{-(N+1)}}{1-z^{-(N+1)}}$$

$$D(z) = \frac{1}{G_m(z)} \frac{1}{z^{+(N+1)} - 1}$$

$$G(z) = \frac{k(z-2)}{z(z-0.5)} \qquad D(z) = \frac{z(z-0.5)}{k(z-2)(z^{N+1}-1)}$$

$\Rightarrow$ Pole @ $z=2$ is outside the unit circle $\Rightarrow$ System is unstable