Hlutapróf 1

14/09/2012

Dæmi 1

a) $$y_{ss} = \lim_{s\to 0} sY(s) = \lim_{s\to 0} s \cdot T(s) \cdot \frac{1}{s} = \lim_{s\to 0} T(s) = T(0)$$

$$T(0) = \frac{10 \cdot \frac{2}{20}}{1 + 10 \cdot \frac{2}{20}} = \frac{1}{2}$$

$$\boxed{y_{ss} = \frac{1}{2}}$$

b) $$T(s) = \frac{G_c(s)\,G(s)}{1 + H(s)\,G_c(s)\,G(s)} = \frac{10(s+2)}{s^2 + 12s + 20 + 10s + 20}$$

$$\boxed{T(s) = \frac{10(s+2)}{s^2 + 22s + 40} = \frac{10}{s+20}}$$

c) $$R(s) = 1 \Rightarrow Y(s) = \frac{10}{s+20}$$

$$\boxed{y(t) = 10\,e^{-20t}}$$

Dæmi 2

a) $$E(s) = \frac{-G(s)H(s)}{1 + G_c(s)\,G(s)\,H(s)} \cdot T_d(s) \;;\; T_d(s) = \frac{1}{s}$$

$$\boxed{e_{ss} = \lim_{s\to 0} sE(s) = \frac{-G(0)}{1 + G(0)} = \frac{-2}{1+2} = -\frac{2}{3}}$$

b) $$E(s) = \frac{1}{1 + G_c(s)\,G(s)\,H(s)} R(s) \;;\; R(s) = \frac{1}{s}$$

$$\boxed{e_{ss} = \lim_{s\to 0} sE(s) = \frac{1}{1+2} = \frac{1}{3}}$$

Dæmi 2

c) $G_c = \frac{1}{s}$

fyrir $T_d(s) = \frac{1}{s}$ fast

$$E(s) = \frac{-G(s)\cdot s}{s + G(s)} \cdot \frac{1}{s}$$

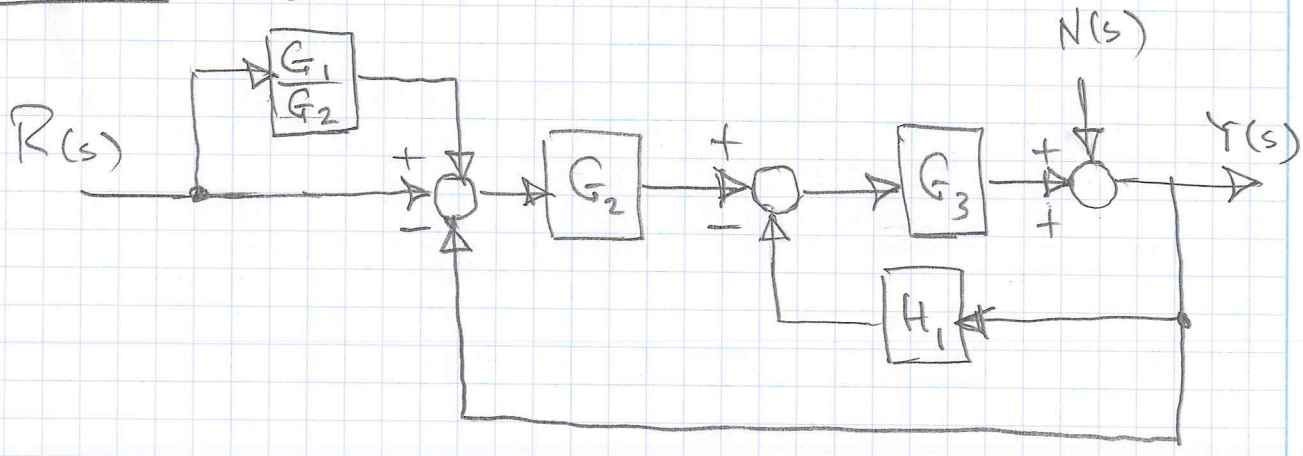
$$\boxed{e_{ss} = \lim_{s\to 0} sE(s) = 0}$$

og fyrir $R(s) = \frac{1}{s}$ fast

$$E(s) = \frac{s}{s + G(s)} \cdot \frac{1}{s}$$

$$\boxed{e_{ss} = \lim_{s\to 0} sE(s) = 0}$$

Dæmi 3 Umritum blokkritið



a) Með því að loka lykkjunum fast

$$\frac{Y(s)}{R(s)} = \left(1 + \frac{G_1(s)}{G_2(s)}\right)\left[\frac{G_2(s)\,G_3(s)}{1 + G_3(s)H_1(s) + G_2(s)G_3(s)}\right]$$

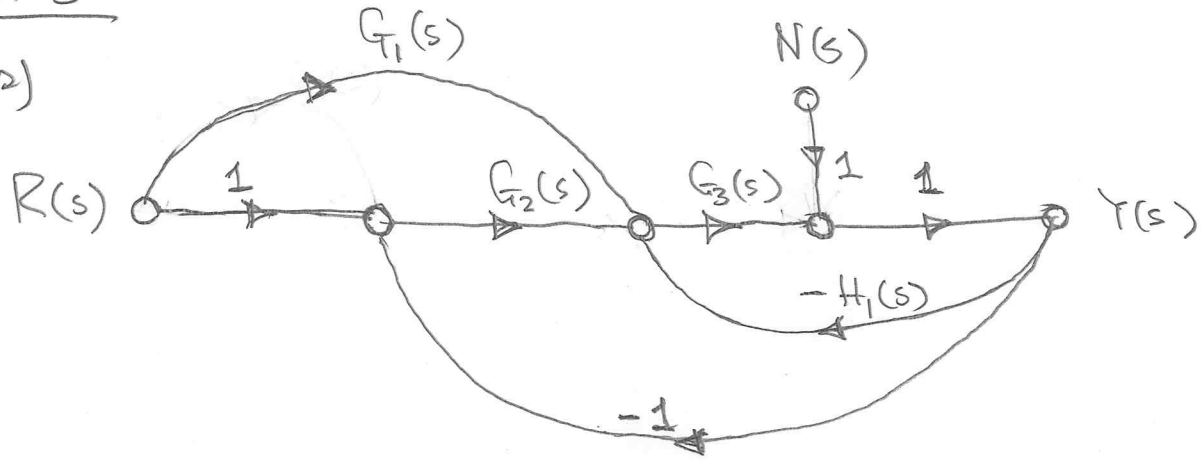
og

$$\frac{Y(s)}{N(s)} = \frac{1}{1 + H_1(s)G_3(s) + G_2(s)G_3(s)}$$

Ath. $Y(s)/N(s)$ er óháð $G_1(s)$

Dæmi 3

b)



Dæmi 4

a) Skrifum diffurjöfnurnar og notum Laplace vörpun:

$$sX_1(s) = X_2(s)$$

$$sX_2(s) = -4X_1(s) - 2{,}8X_2(s) + U(s)$$

með innsetningu fyrir $X_2(s)$ fæst:

$$s^2X_1(s) + 4X_1(s) + 2{,}8sX_1(s) = U(s)$$

$$\Rightarrow \quad \frac{X_1(s)}{U(s)} = \frac{Y(s)}{U(s)} = \frac{1}{s^2 + 2{,}8s + 4}$$

má líka finna sem

$$\underline{X}(s) = \begin{bmatrix} X_1(s) \\ X_2(s) \end{bmatrix} = \left[sI - A \right]^{-1} B$$

b)