pkjun16 2.2 & 2.3 memo.

2.2. $\dfrac{Q(z)}{R(z)} = \dfrac{D(z)4(z)}{1 + D(z)4(z)}$

$$= \dfrac{0.116875\left[\dfrac{z-0.9}{z-0.98}\right]\left[\dfrac{z+0.436}{(z-1)(z-0.8187)}\right]}{1 + 0.116875\left[\dfrac{z-0.9}{z-0.98}\right]\left[\dfrac{z+0.436}{(z-1)(z-0.8187)}\right]}$$

$$= \dfrac{1.116875(z-0.9)(z+0.436)}{(z-0.98)(z-1)(z-0.8187) + 0.116875(z-0.9)(z+0.436)}$$

2.3. $E(z) = R(z) - Q(z)$

$E(z) = \dfrac{R(z)}{1 + D(z)4(z)}$ [see ST2 memo on efund.]

$$E(z) = \dfrac{(z-0.98)(z-1)(z-0.8187)R(z)}{(z-0.98)(z-1)(z-0.8187) + 0.116875(z-0.9)(z+0.436)}$$

for a unit Ramp input:

$R(s) = 1/s^2 \Rightarrow R(z) = \dfrac{Tz}{(z-1)^2}\Big|_{T=0.1}$

$$= \dfrac{0.1z}{(z-1)^2}$$

$$E(z) = \dfrac{(z-0.98)\cancel{(z-1)}(z-0.8187)\cdot 0.1z}{\left[(z-0.98)(z-1)(z-0.8187) + 0.116875(z-0.9)(z+0.436)\right](z-1)}$$

$E(\infty) = \displaystyle\lim_{z\to 1} (z-1)E(z)$

$$= \lim_{z\to 1}\left[\dfrac{(z-0.98)\cancel{(z-1)}(z-0.8187)(0.1z)}{(z-0.98)(z-1)(z-0.8187) + 0.116875(z-0.9)(z+0.436)}\right]$$

$$= \dfrac{(0.02)(0.1813)(0.1)}{0 + 0.116875(0.1)(1.936)}$$

$$= 0.016 \quad \oslash.$$