$$G_{read} = \frac{1/[A_2 S(\tau_I S+1)]}{1 + k_c\left(1+\frac{1}{\tau_I S}\right)\frac{(-1)}{A_2 S}}$$

$$G_{sp} = \frac{k_c\left(1+\frac{1}{\tau_I S}\right)\left(\frac{-1/A_2 S}{}\right)}{1 + k_c\left(1+\frac{1}{\tau_I S}\right)\left(\frac{-1}{A_2 S}\right)}$$

IV.Q11:

(a) $\bar{y}(s) = \frac{5 \cdot 1 \cdot 2 \,/\, [(s+1)(5s+1)]}{1 + 5 \cdot 1 \cdot 2 \,/\, [(s+1)(5s+1)]} \cdot \frac{2}{s}$

(b) $\bar{y}(s) = \frac{20}{S(3s^2+4s+11)} = \frac{20/11}{S(3s^2+4s+11)}$

$= \frac{20/11}{S} + \frac{(0.91 + j 0.3376)}{S - \frac{-4+10.1 j}{6}} + \frac{(-0.91+j 0.337)}{S - \frac{-4-10.1 j}{6}} - \frac{1}{S} - \frac{1}{6}$

Invert $\Rightarrow \bar{y}(t) = \frac{20}{11} - 1.9412\, e^{-2t/3} \cdot \sin\left[\frac{\sqrt{116}}{6} t + \tan^{-1}(2.9)\right]$

(c) form

$\bar{y}(s) = \frac{20}{S(3s^2+4s+11)} = \frac{20/11}{S\left(\frac{3}{11}s^2 + \frac{4}{11}s + 1\right)}$

we include that the response is 2nd order

with $\tau^2 = 3/11$ & $2\zeta\tau = 4/11$

i.e $\tau = \sqrt{3/11}$ & $\zeta = \frac{1}{2} \cdot \frac{4}{11} \cdot \sqrt{\frac{11}{3}} = 2\sqrt{\frac{4}{33}} = 0.348$