3.42

Saturday, October 14, 2023 12:58 PM

a) $P(s) = s^2 + s + 1 \qquad Q(s) = 2s^3 + 3s^2 + s + 1$

$Z(s) = P(s)\,Q(s)$

$Z(s) = \left[s^2 + s + 1\right] \times \left[2s^3 + 3s^2 + s + 1\right]$

$Z(s) = \left[2s^5 + 3s^4 + s^3 + s^2\right] + \left[2s^4 + 3s^3 + s^2 + s\right] + \left[2s^3 + 3s^2 + s + 1\right]$

$Z(s) = 2s^5 + 5s^4 + 6s^3 + 5s^2 + 2s + 1$

b) $Y(s) = \dfrac{(s+1)}{s^2\left(s+1\right)\left((s+4)^2 + 9\right)}$

$D(s) = s^2\left(s+1\right)\left((s+4)^2 + 9\right)$

$= \left(s^3 + s^2\right)\left(s^2 + 8s + 16 + 9\right)$

$= s^5 + 8s^4 + 25s^3 + s^4 + 8s^3 + 25s^2$

$= s^4 + 9s^4 + 33s^3 + 25s^2$