

AI1110

Assignment 6

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1 Question

2 Solution

Question

Show that if $s[n]$ is AR and $v[n]$ is white noise orthogonal to $s[n]$, then the process $x[n] = s[n] + v[n]$ is ARMA. Find $S_x(z)$ if $R_s[m] = 2^{-|m|}$ and $S_v(z) = 5$.

Solution

$$s_X(z) = s_S(z) + s_\nu(z) = \frac{1}{D(z)} + q = \frac{1 + qD(z)}{D(z)}$$

According to the question ; $R_S[m] = 2^{-|m|}$ and $S_\nu(z) = 5$.

$$s_S(Z) = \left(\frac{1.5}{2.5 - z^{-1} - z} \right)$$

$$s_X(z) = \left(5 + \frac{1.5}{2.5 - z^{-1} - z} \right)$$

$$s_X(z) = \left(\frac{5 - 14.5z^{-1} + 5z^{-2}}{1 - 2.5z^{-1} + z^{-2}} \right)$$