**Assignment 12**

The due date for submitting this assignment has passed. As per our records, you have not submitted this assignment.

1) A WSS process \( \{Z(t)\} \) is given by

\[
X(t) = 0.5X(t-1) + \Pi(t) - 0.9X(t-1)
\]

where \( \Pi(t) \) is a zero-mean unit variance white noise. Then

\[ \begin{align*}
Z(t) & = 0 \\
Z(t) & = 0.5Z(t-1) + \Pi(t) - 0.9X(t-1) \\
Z(t) & = 0.5X(t-2) + 0.5\Pi(t) - 0.9X(t-1) \\
Z(t) & = 0.5X(t-3) + 0.5\Pi(t) - 0.9X(t-1) \\
Z(t) & = 0.5X(t-4) + 0.5\Pi(t) - 0.9X(t-1)
\end{align*} \]

No, the answer is incorrect. Score 0.

Accepted Answers:

\[ Z(0) = 0 \]

2) A WSS process \( \{Z(t)\} \) is given by

\[
X(t) = 0.5X(t-1) + F(t) - 0.9X(t-1)
\]

where \( F(t) \) is a zero-mean unit variance white noise. The power spectral density \( S_Y(f) \) of the process is

\[ \begin{align*}
S_Y(f) & = \frac{1}{2} + \frac{1}{2} \cdot 0.5^{|f|} \\
S_Y(f) & = 0.25 + 0.25 \cdot 0.5^{|f|} \\
S_Y(f) & = 0.25 + 0.25 \cdot 0.5^{|f|} \\
S_Y(f) & = 0.25 + 0.25 \cdot 0.5^{|f|}
\end{align*} \]

No, the answer is incorrect. Score 0.

Accepted Answers:

\[ S_Y(f) = \frac{1}{2} + \frac{1}{2} \cdot 0.5^{|f|} \]

3) A WSS process \( \{Z(t)\} \) is given by

\[
X(t) = 0.5X(t-1) + F(t) - 0.9X(t-1) + 0.1F(t-2)
\]

where \( F(t) \) is a zero-mean unit variance white noise. The autocorrelation functions of the process are related by

\[ \begin{align*}
\rho_Z(0) & = 0.5\rho_Z(-1) \\
\rho_Z(-1) & = 0.5\rho_Z(0) \\
\rho_Z(1) & = 0.5\rho_Z(0) \\
\rho_Z(2) & = 0.5\rho_Z(1) \\
\rho_Z(3) & = 0.5\rho_Z(2)
\end{align*} \]

No, the answer is incorrect. Score 0.

Accepted Answers:

\[ \begin{align*}
\rho_Z(0) & = 0.5\rho_Z(-1) \\
\rho_Z(-1) & = 0.5\rho_Z(0) \\
\rho_Z(1) & = 0.5\rho_Z(0) \\
\rho_Z(2) & = 0.5\rho_Z(1) \\
\rho_Z(3) & = 0.5\rho_Z(2)
\end{align*} \]

4) For a WSS process \( \{X(t)\} \), the autocorrelation matrix \( \rho_X(\tau) \) is

\[ \begin{align*}
\rho_X(\tau) & = \rho_X(-\tau) \\
\rho_X(\tau) & = \rho_X(-\tau) \\
\rho_X(\tau) & = \rho_X(-\tau) \\
\rho_X(\tau) & = \rho_X(-\tau) \\
\rho_X(\tau) & = \rho_X(-\tau)
\end{align*} \]

No, the answer is incorrect. Score 0.

Accepted Answers:

\[ \begin{align*}
\rho_X(\tau) & = \rho_X(-\tau) \\
\rho_X(\tau) & = \rho_X(-\tau) \\
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\rho_X(\tau) & = \rho_X(-\tau)
\end{align*} \]

5) The autocorrelation function of an AR(2) process are as follows:

\[ \begin{align*}
\rho_X(0) & = 1.1\rho_X(-1) + 0.842 \rho_X(0) \\
\rho_X(1) & = 0.842 \rho_X(0) \\
\rho_X(2) & = 0.842 \rho_X(1) \\
\rho_X(3) & = 0.842 \rho_X(2)
\end{align*} \]

No, the answer is incorrect. Score 0.

Accepted Answers:

\[ \begin{align*}
\rho_X(0) & = 1.1\rho_X(-1) + 0.842 \rho_X(0) \\
\rho_X(1) & = 0.842 \rho_X(0) \\
\rho_X(2) & = 0.842 \rho_X(1) \\
\rho_X(3) & = 0.842 \rho_X(2)
\end{align*} \]

6) Consider a white Gaussian noise process \( \{W(t)\} \) with variance \( \sigma^2 \). For this process,

\[ \begin{align*}
The \text{power spectral density} \quad S_W(f) & = \pi \sigma^2 \\
\text{the average power is} \quad \sigma^2 \\
\text{Samples} \ W(t) \text{and} \ F(t) \text{are uncorrelated} \\
\text{Samples} \ W(t) \text{and} \ F(t) \text{are independent} \\
\text{The} \ \text{autocorrelation function} \ \rho_W(\tau) = \sigma^2 \ \text{if} \ \tau = 0 \\
\text{No, the answer is incorrect. Score 0.}
\end{align*} \]

Accepted Answers:

\[ \begin{align*}
The \text{power spectral density} \quad S_W(f) & = \pi \sigma^2 \\
\text{the average power is} \quad \sigma^2 \\
\text{Samples} \ W(t) \text{and} \ F(t) \text{are uncorrelated} \\
\text{Samples} \ W(t) \text{and} \ F(t) \text{are independent} \\
\text{The} \ \text{autocorrelation function} \ \rho_W(\tau) = \sigma^2 \ \text{if} \ \tau = 0
\end{align*} \]