Week 4: Assignment 4

Due on 2021-04-01, 20:19:07.

Problem 1:
Consider the random variable $X = \cos(\theta)$, where $\theta$ is uniformly distributed over $[0, \pi]$. The mean of the random variable is given by $E[X] = \frac{1}{\pi} \int_0^\pi \cos(\theta) d\theta$. Calculate the mean value of $X$.

Problem 2:
A stationary Gaussian random process $X(t)$ is given by $X(t) = A \cos(2\pi f_0 t + \phi)$, where $A$ is the amplitude, $f_0$ is the frequency, and $\phi$ is the phase. Calculate the autocorrelation function $R_X(\tau)$.

Problem 3:
A stationary random process $X(t)$ has the autocorrelation function $R_X(\tau) = \frac{1}{2} e^{-|\tau|}$. Calculate the power spectral density $S_X(f)$ of the process.

Problem 4:
Consider a discrete-time random process $x[n] = a^n u[n]$, where $a$ is a constant and $u[n]$ is the unit step function. Calculate the mean value and the variance of $x[n]$.

Problem 5:
Consider the random process $X(t)$ with the autocorrelation function $R_X(\tau) = \frac{1}{2} e^{-|\tau|}$. Calculate the power spectral density $S_X(f)$ of the process.

Problem 6:
A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.

Problem 7:
Consider a discrete-time random process $x[n] = a^n u[n]$, where $a$ is a constant and $u[n]$ is the unit step function. Calculate the mean value and the variance of $x[n]$.

Problem 8:
A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.

Problem 9:
A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.

Problem 10:
A stationary random process $X(t)$ has the autocorrelation function $R_X(\tau) = \frac{1}{2} e^{-|\tau|}$. Calculate the power spectral density $S_X(f)$ of the process.

Problem 11:
Consider a discrete-time random process $x[n] = a^n u[n]$, where $a$ is a constant and $u[n]$ is the unit step function. Calculate the mean value and the variance of $x[n]$.

Problem 12:
A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.

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A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.

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A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.

Problem 30:
A stationary random process $X(t)$ has the power spectral density $S_X(f) = \frac{1}{2} |f|^2$. Calculate the autocorrelation function $R_X(\tau)$.