Statistical Communication Theory (CT-314)

Tutorial 9.

01/04/2019

1. Which of the following cannot be valid autocorrelation function
   a) $e^{-\tau^2}$
   b) $|\tau| e^{-|\tau|}$
   c) $10\, e^{-(\tau+2)}$
   d) $\left(\frac{\sin \pi t}{\pi t}\right)^2$
   e) $\frac{\tau^2+4}{\tau^2+9}$
   f) 2, for $|\tau|<2$ and 0 elsewhere
2. Determine which of the following can and cannot be valid power spectral densities.
   (a) $S_X(w)=\frac{w^2}{w^6+3w^2+3}$
   (b) $S_X(w)=e^{-(w-1)^2}$
   (c) $S_X(w)=\frac{w^2}{w^4+1}-\delta(w)$
   (d) $S_X(w)=\frac{w^4}{1+w^2+jw^6}$
3. A WSS random process has power spectral density

$$S_X(f)=\begin{cases}1+\frac{1}{4}|f| & |f|\le 4\\ 0 & elsewhere\end{cases}$$

   Find the mean-square value of this process.
4. Let $Y(t)=X(t)A\cos(w_c t+\phi)$, $X(t)$ and ϕ are independent. ϕ is uniformly distributed between 0 to 2π. Find autocorrelation and power spectral density of Y(t).