Unit 17 - Week 12- Power Spectral Density(PSD) for WSS Random Process, PSD Application in Wireless, WSS Random Process Through LTI System, Special Random Processes and Gaussian Process Through LTI System

Assignment-12

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

Due on 2020-04-22, 23:59 IST.

1) A random process $X(t)$ is — *1 point*

- Signal with auto-correlation equal to impulse
- A random variable for every instance of time t
- Signal with spectrum that is flat over the entire frequency
- A Guassian random random variable with zero-mean

No, the answer is incorrect.
Score: 0
Accepted Answers:
A random variable for every instance of time t

2) Consider the signal $X(t) = a\cos(2\pi f_c t + \theta)$ is — *1 point*

- Strict sense stationary
- Always Wide Sense Stationary
- Wide Sense Stationary when θ is uniformly distributed in $[-\pi, \pi]$
- A Wide Sense Stationary when θ is uniformly distributed in $[0, \frac{\pi}{2}]$

No, the answer is incorrect.
Score: 0
Accepted Answers:
Wide Sense Stationary when θ is uniformly distributed in $[-\pi, \pi]$

3) A real wide-sense stationary random process $X(t)$ must satisfy — *1 point*

- $E\{X(t)\}$ is constant
- $E\{X^2(t)\}$ is constant
- $E\{X(t)X(t+\tau)\}$ depends only on the shift τ
- All of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of these

4) The power spectral density of a WSS random process is — *1 point*

- Fourier transform of the random process
- Fourier transform of the auto-correlation function
- Square of the Fourier transform of the random process
- Constant in the frequency domain

No, the answer is incorrect.
Score: 0
Accepted Answers:
Fourier transform of the auto-correlation function

5) Consider $X(t)$ to be white Guassian noise with zero mean. Its autocorrelation function $R_{XX}(\tau)$ is of the form — *1 point*

- $\frac{\eta}{2}\delta(\tau)$
- $\frac{\eta}{2}$
- $\frac{\eta}{2}e^{-a|\tau|}, a > 0$
- $\frac{\eta}{2}\frac{\sin(\pi\eta\tau)}{\pi\tau}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\eta}{2}\delta(\tau)$

6) Consider $X(t)$ to be white Guassian noise with zero mean. Its power spectral density $S_{XX}(f)$ for $-\infty < f < \infty$ is of the form — *1 point*

- $\frac{\eta}{2}\frac{\sin(2\pi f)}{2\pi f}$
- $\frac{\eta}{2}$
- $\frac{\eta}{2}\delta(f)$
- $\frac{\eta}{2}e^{-a|f|}, a > 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\eta}{2}$

7) Consider a random process $X(t)$ with auto-correlation $R_{XX}(\tau) = \frac{1}{2a}e^{-a|\tau|}$, with $a = 10$ kHz. What is approximate bandwidth that contains 80% of the signal power? — *1 point*

- 3.3 kHz
- 4.9 kHz
- 6.7 kHz
- 8.2 kHz

No, the answer is incorrect.
Score: 0
Accepted Answers:
4.9 kHz

8) Consider WSS random process $X(t)$ with auto-correlation $R_{XX}(\tau)$ given as input to LTI system with impulse response $h(t)$. The auto-correlation of the output is — *1 point*

- $R_{XX}(\tau) * h(\tau)$
- $R_{XX}(\tau) * h^2(\tau)$
- $R_{XX}(\tau) * h(\tau) * h(-\tau)$
- $R_{XX}(\tau) * h(\tau) * h(\tau)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$R_{XX}(\tau) * h(\tau) * h(-\tau)$

9) Consider WSS random process $X(t)$ with power spectral density $S_{XX}(f)$ given as input to LTI system with transfer function $H(f)$. The power spectral density of the output is — *1 point*

- $S_{XX}(f)H(f)$
- $S_{XX}(f)H^2(f)$
- $S_{XX}(f) * H(f)$
- $S_{XX}(f)|H(f)|^2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$S_{XX}(f)|H(f)|^2$

10) Consider $X(t)$ to be white Guassian noise with zero mean and auto correlation function $\frac{\eta}{2}\delta(\tau)$. It is passed through an LTI system whose impulse response is $h(t) = \text{sinc}(2Wt)$. What is the power of the output random process $Y(t)$? — *1 point*

- $4\eta W$
- $\frac{\eta}{8W}$
- $\frac{\eta}{4W}$
- $\frac{\eta^2}{2W}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\eta}{4W}$