Unit 16 - Week 11 - Transformation of Random Variables, Gaussian Random Variable ,Special Case: IID Gaussian Random Variables, Application: Uniform Linear Arrays, Random Processes and (WSS) and WSS Examlpe

Course outline

Assignment-11

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

Due on 2020-04-15, 23:59 IST.

1) Any PDF $f_X(x)$ has to satisfy the properties *1 point*

i. $\int_{-\infty}^{\infty} f_X(x)dx = 1$
ii. $f_X(x) \geq 0$
iii. $f_X(x) \leq 1$

- Only i
- Only i and ii
- i, ii and iii
- Only i and iii

No, the answer is incorrect.
Score: 0
Accepted Answers:
Only i and ii

2) The probability density function of a Gaussian random variable X that has mean μ and variance σ^2 is *1 point*

- $\frac{\sigma^2}{2\pi}e^{-2\sigma^2(x-\mu)^2}$
- $\frac{1}{2\sigma}e^{-\frac{|x-\mu|}{2\sigma}}$
- $\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$
- $\frac{1}{\sigma}e^{-\frac{(x-\mu)}{2\sigma}}$ for $x \geq \mu$ and 0 otherwise

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

3) Let $X_1, X_2, \dots, X_L$ be independent identically distributed Gaussian random variables with mean 0 and variance σ^2 each. Then, the variance of $a_1X_1 + a_2X_2 + \cdots + a_LX_L$ is *1 point*

- $\sigma^2(a_1^2 + a_2^2 + \cdots + a_L^2)$
- $\sigma^2(a_1 + a_2 + \cdots + a_L)^2$
- $\sigma^2(|a_1| + |a_2| + \cdots + |a_L|)$
- $\sigma(a_1^2 + a_2^2 + \cdots + a_L^2)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\sigma^2(a_1^2 + a_2^2 + \cdots + a_L^2)$

4) Consider the random variable X with the probability density function (PDF) $f_X(x) = Ke^{-\lambda x}$ for $0 \leq x < \infty$ and 0 for $x < 0$. Given $\lambda > 0$. The value of the constant K is *1 point*

- $\frac{1}{\lambda}$
- λ
- λ^2
- $\frac{2}{\lambda}$

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

5) Consider a random variable X with the probability density function $f_X(x)$ and mean μ. The variance σ^2 of the random variable X is defined as *1 point*

- $\int_{-\infty}^{\infty} x^2 f_X(x)dx$
- $\int_{-\infty}^{\infty} x^2 f_X(x)dx - \mu$
- $\int_{-\infty}^{\infty} (x-\mu)^2 f_X(x)dx$
- $\int_{-\infty}^{\infty} x f_X(x)dx - \mu^2$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\int_{-\infty}^{\infty} (x-\mu)^2 f_X(x)dx$

6) Consider the random variable X with the probability density function (PDF) $f_X(x) = Ke^{-\frac{x^2}{\lambda}}$ for $-\infty < x < \infty$. The value of the constant K is *1 point*

- $\sqrt{\frac{\pi}{\lambda}}$
- $\frac{1}{\lambda}$
- $\sqrt{\frac{\lambda}{\pi}}$
- $\frac{1}{\sqrt{\pi\lambda}}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{\sqrt{\pi\lambda}}$

7) For the standard PDF of the power of the fading channel described in lectures, what is the approximate probability that the attenuation of the wireless channel is worse than 40 dB? *1 point*

- 0.1
- 0.01
- 0.001
- 0.0001

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.0001

8) For a wireless channel with the exponential power delay profile $\beta e^{-\beta\tau}$ for $\tau \geq 0$. Its average delay and RMS delay spread are given as *1 point*

- $\frac{1}{\beta}, \frac{1}{\beta^2}$
- $\frac{1}{\beta}, \frac{1}{\beta}$
- $1, \frac{1}{\beta}$
- $\frac{1}{\beta}, \frac{2}{\beta}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{\beta}, \frac{1}{\beta}$

9) Consider the random variable θ uniformly distributed in $[0, \frac{\pi}{2}]$. The distribution of $\phi = \sin\theta$ is *1 point*

- $\frac{2}{\pi}$
- $\frac{2}{\pi} \times \frac{1}{\sqrt{1-\phi^2}}$
- $\frac{1}{\pi}$
- $\frac{2}{\pi} \times \sin^{-1}\phi$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{2}{\pi} \times \frac{1}{\sqrt{1-\phi^2}}$

10) The levels of a $4-ary$ PAM constellation are $S = \{-3\alpha, -\alpha, \alpha, 3\alpha\}$ with $2P(\alpha) = 2P(-\alpha) = 3P(3\alpha) = 3P(-3\alpha)$. Let x_1, x_2 denote two symbols drawn independently from the constellation. The probability that at least one of x_1, x_2 belongs to the set $\{-\alpha, \alpha\}$ is *1 point*

- $\frac{21}{25}$
- $\frac{9}{100}$
- $\frac{3}{5}$
- $\frac{9}{25}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{21}{25}$