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Courses » Advanced Topics in Probability and Random Processes

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Unit 5 - Week 4: Applications of Convergence Theory

Course outline

How to access the portal

Week 1: Introduction to probability and Random Variable

Week 2: Random process basics and infinite sequence of events

Week 3: Convergence of Sequence of Random Variables

Week 4: Applications of Convergence Theory

Laws of Large Numbers

Central Limit Theorem

Large Deviation Theory

Quiz : Assignment 4

Week 5: Markov

Assignment 4

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-09-12, 23:59 IST.**

1) Consider the sequence of events on the real line given by $A_n = \begin{cases} (1, 3 + \frac{1}{n}), & n \text{ odd} \\ (2 - \frac{1}{n}, 5), & n \text{ even} \end{cases}$. Find $\lim_{n \rightarrow \infty} \sup A_n$ and $\lim_{n \rightarrow \infty} \inf A_n$. **1 point**

- (1,5),(2,3)
- (2,3),(1,5)
- (1,4),(2,3)
- (1,3),(3,5)

No, the answer is incorrect.

Score: 0

Accepted Answers:

(1,5),(2,3)

2) Suppose $\{A_n\}_{n=1}^{\infty}$ is a sequence of subsets of \mathbb{R} , given by $A_n = [1, 5 - \frac{1}{n}]$. find $\lim_{n \rightarrow \infty} \sup A_n$ and $\lim_{n \rightarrow \infty} \inf A_n$. **1 point**

- (1,5), (1,5)
- [1,5], [1,5]
- [1,5], [1,5]
- [1,5], [1,5]

No, the answer is incorrect.

Score: 0

Accepted Answers:

[1,5], [1,5]

3) $\{X_n\}$ is a sequence of independent random variables **1 point**

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Week 8:
Martingale
Process

New Unit

Assignment
Solutions

Score: 0

Accepted Answers:

BorelCantelli lemma 2

4) $\{X_n\}$ is a sequence of independent random variables 1 point
with $P(X_n = 0) = 1 - \frac{1}{n^2}$ and $P(X_n = n) = \frac{1}{n^2}$. Which one of the BorelCantelli lemmas
can be used to show if $\{X_n\}$ converges almost sure to $\{X = 0\}$ or not?

- BorelCantelli Lemma 1
 BorelCantelli Lemma 2

No, the answer is incorrect.

Score: 0

Accepted Answers:

BorelCantelli Lemma 1

5) Suppose $\{X_n\}$ is a sequence of independent random variables taking two 1 point
values $X_n = \sqrt{n}$ with probability $\frac{1}{n}$ and $X_n = 0$ with probability $(1 - \frac{1}{n})$. Examine
if $\{X_n\}$ converges to $\{X = 0\}$ in probability, in distribution or in mean square sense.

- Converges in probability
 Converges in distribution
 Converges in mean square

No, the answer is incorrect.

Score: 0

Accepted Answers:

Converges in distribution

6) Consider a random process $X(t) = A \cos(\omega_0 t)$ where ω_0 is a constant and A is 1 point
uniformly distributed between -5 and 5. Then

- $EX(t)$ is a constant
 $EX(t)X(t+t)$ is a function of lag t only
 $X(t)$ is a wide-sense stationary process
 $X(t)$ is a strict-sense stationary process

No, the answer is incorrect.

Score: 0

Accepted Answers:

$EX(t)$ is a constant

7) Consider a random process $X(t) = \cos(\omega_0 t + f)$ where ω_0 is a constant, f is 0 points
uniformly distributed between -p to p and A is zero mean random variable with variance
1 and independent of f . Then

- $EX(t)$ is a constant
 $EX^2(t) = A^2$
 $X(t)$ is a wide-sense stationary process

$X(t)$ is a strict-sense stationary process

No, the answer is incorrect.

Score: 0

Accepted Answers:

$EX(t)$ is a constant

$X(t)$ is a wide-sense stationary process

8) $\{X(t)\}$ is a wide-sense stationary Gaussian random process. Then

1 point

$EX(t) = 0$

$cov(X(t), X(t + \tau)) = 0$

The random variables $X(t_1), X(t_2), \dots, X(t_n)$ are jointly Gaussian

$\{X_n\}$ is strict-sense stationary

No, the answer is incorrect.

Score: 0

Accepted Answers:

The random variables $X(t_1), X(t_2), \dots, X(t_n)$ are jointly Gaussian

$\{X_n\}$ is strict-sense stationary

9) Suppose $X(t)$ is a constant-mean independent increment process. For $t_1 > t_2$

1 point

$X(t_1)$ and $X(t_2)$ are independent

$X(t_2)$ and $X(t_1) - X(t_2)$ are independent

$EX(t_1)X(t_2) = EX^2(t_1)$

$EX(t_1)X(t_2) = EX^2(t_2)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$X(t_2)$ and $X(t_1) - X(t_2)$ are independent

$EX(t_1)X(t_2) = EX^2(t_2)$

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